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Introduction

Introducing the Anthropocene of Weather and Climate

Paul Sillitoe

The world is hotting up. Globally, average atmospheric temperature increased by about 0.6°C in the twentieth century (IPCC 2001: 2). This may not seem much, but the predicted climatic and environmental changes are alarming, and include global sea-level rises,¹ ocean warming and acidification, shrinking polar ice sheets and retreating glaciers, as well as the increased occurrence of extreme weather events such as hurricanes and intense rainfall with floods. This ranks among the greatest challenges of our age. The scientific consensus is that we face accelerating climate change that will have serious environmental effects. The causes and extent of forecast changes and the anticipated environmental consequences comprise a large part of the climate-change debate (IPCC 2015). According to the scientific evidence, human activity is largely responsible, notably through the burning of fossil fuels for energy. While human activities have impacted on the environment and arguably influenced the weather for millennia, as climate-change sceptics point out, they are doing so on an unprecedented scale today, as recently acknowledged by the introduction of the term 'Anthropocene' to denote the current period geologically,² marking the time when human activity became a dominant influence on climate and the environment. Since the mid-twentieth century, the date proposed for this new era's start, atmospheric CO₂ levels have increased by 26.14 per cent.³ According to scientists, this is the main driver of changes in global climate, together with other so-called greenhouse gases,⁴ which cause the planet's atmosphere increasingly to trap solar radiation, leading to an increase in global temperatures.

Other terms that feature in the volume's title, albeit without the anthropocenic punning intent, and that it is as well to be clear about from the start, are 'weather' and 'climate' (Hulme 2017: 2–6). Weather refers to the atmospheric conditions at a certain place at a particular time and concerns variations in daily temperature, rainfall, cloudiness and winds. The climate, on the other hand, is the average of such weather conditions over an extended period of time, and regions are described as having a certain climate, such as tropical or temperate, according to the generally prevailing pattern of weather conditions. And, finally, the process of climate change is a global phenomenon extending over centuries, although only recently recognized as such, which, although attributed to worldwide atmospheric warming, affects various regions differently.

If human activities are responsible for these potentially catastrophic changes, anthropology surely has a significant part to play in our understanding of them, the discipline being, as the dictionary puts it, 'the study of humankind'. Yet it has been somewhat slow off the mark. After all, the United Nations (UN) Intergovernmental Panel on Climate Change has now produced five Assessment Reports, the first a quarter of a century ago. Until recently, anthropology had relatively little interest in peoples' experience and understanding of their regions' climates. When I was enquiring into the weather lore of a community in the mountains of Papua New Guinea, I could find few ethnographic contributions on the subject, and some thought the article that I subsequently published (Sillitoe 1994) decidedly wacky at the time, with one reviewer describing it as an 'offbeat topic'. In part, this lack of interest in meteorological issues was due to the rejection some time ago of arguments about climate determining cultural arrangements (Peterson and Broad 2009: 72–74; Rayner 2002).

Climatic determinism has a long history stretching back to classical Greek times, when Aristotle (1944: VII, 1327b) argued, for instance, that those living in cold European countries were 'full of spirit' and incapable of government, while those in hot Asian nations 'lack spirit' and were subject to slavery, and the Greeks, occupying a warm region, lived in well-governed liberty. A millennia or so later, among the medieval Arab philosophers, the renowned Tunisian historiographer Ibn Khaldun, in his global history of humanity, arguably 'saw everything in climate' (Gates 1967: 419), in attributing sociocultural dissimilarities to environmental differences. During the European Enlightenment three centuries later, de Montesquieu (1748: Books XIV–XVII) put forward a similar argument about the political influence of climate, in which liberty flourishes in frosty cold places and slavery in warm ones. And in the twentieth century, Ellen Semple, the pioneer human geographer, argued for the

climatic determination of cultural arrangements: 'Climatic influences are persistent, often obdurate in their control ... The debilitating effects of heat and humidity' are responsible for the 'inefficiency characteristic of the native races' living in such regions (Semple 1911: 7 and 10). Subsequent ethnographic enquiries have shown the error of such views; people who live under the same climate patently do not have similar cultures. This is not to deny that the weather sets certain environmental limits on what communities can do, as the challenges of climate change starkly underline.

Regardless of this limited start, anthropology indubitably has something to contribute, as this volume endeavours to show, one of several publications seeking to put the discipline at the forefront of the climate debate (Baer and Singer 2014; Barnes et al. 2013; Barnes and Dove 2015; Crate 2011; Dove 2014; Fiske et al. 2014) by exploring and clarifying the discipline's position regarding the weather and the climate-change argument. A key aspect of this perspective is that it proceeds through ethnographic enquiries with local communities, as the following chapters will illustrate. Drawing on research from communities around the world, they demonstrate the advantages of situating discussion of climate change ethnographically with respect to cultural context in order to better comprehend and accommodate different peoples' experiences, understandings and responses to ensuing environmental issues. While it is widely acknowledged that climate change is among the greatest global challenges of our times, it has local implications too. This volume brings these forward, amplifying anthropology's voice in this important debate, in which natural scientists and policy-makers have dominated so far.

Local Weather Lore: Precursors of Environmental Change

A common expectation of anthropology is probably that it will document other peoples' ideas pertaining to climatic phenomena in the ethnoscientific tradition. The way in which many people understand the weather may differ significantly from meteorological forecasts, as I discussed in my 'offbeat' article. Chapter 2 by Francesca Marin illustrates this further for Patagonian coastal fishermen,⁵ for whom the weather is daily a primary consideration. Their perception of the weather determines to a significant extent when and how they fish, notably in consideration of the wind direction and force, rainfall patterns and temperatures, which influence not only fishing activities but also the movements of fish shoals. These fishers predict the weather in a processual way, in contrast to the satellite-informed scientific modelling of meteorological forecasts,

although they refer to these today to supplement their understanding, a sign of globalization. Their predictions depend on a skilled perception of changes in their region's environment, drawing on experiential, multisensorial knowledge, deriving from observations of phenomena such as changes in the colours of seawater and a detailed familiarity of the coastline. Accessing and recording such embodied understanding presents particular challenges that are currently exercising anthropology (Garay-Barayazarra and Puri 2011; Tschakert, Tutu and Alcaro 2013; Yeh 2015).

Indeed, the idea of 'weather' itself is not universal, as Dan Rosengren discusses in Chapter 1 regarding the Matsigenka people of the Peruvian Amazon,⁶ who have no such category that encompasses all atmospheric phenomena. The implication, of course, is not that these people are unfamiliar with meteorological events such as rain, wind and sun, but that they simply do not conceive of them as collected together in a climate-equivalent category and they relate to them in a radically different way from us. Similarly, my Wola friends in the New Guinea mountains have no category equivalent to climate, focusing instead on the daily weather (Sillitoe 1994: 246). According to Matsigenka lore, these meteorological events are under the control of subjective animistic forces, not physical ones. They distinguish three types of precipitation, for example, which differ regarding both their pantheistic origin and effect. The natural world is a part of humans and they a part of it; they shape it as it shapes them. It is a challenge to represent such knowledge of the world without distorting the holders' perceptions or leading climate-minded outsiders to think them unusual aberrations, just as it is a challenge to represent experiential understandings, such as those of the Patagonian fishermen, which depend on embodied skills. According to Matsigenka cosmological views, which are consistent and logical, knowledge is also primarily experiential, resulting from culturally mediated personal engagements with the local environment and not, as for us, propositional.

The environmental observations and knowledge of local populations can act as a bellwether of changes that are occurring regionally and give valuable granularity to the global focus of climate-change discourse (Reyes-García et al. 2016). In some regions of the world, such as the Peruvian Andes and Alaskan Taiga, changes in the climate are seriously affecting peoples' lives. They are the metaphorical 'mine canaries' that indicate the graveness of the changes that are occurring, to which the international community should be paying close attention. Some people today already find themselves at a loss to understand what is happening, as their traditional knowledge and practices are seriously undermined. In Chapter 3, Nastassja Martin and Geremia Cometti report on

the Q'eros of Peru and Gwich'in of Alaska, two such communities where environmental changes are so extensive that they are starting to question their time-honoured ways of being-in-the-world and how they make a living on the land. Their reactions illustrate the different ways that people may construe, and consequently respond to, climatically driven environmental change that disrupts their relations with nature, shaking their values and beliefs. They illustrate internal versus external views of causality. The Q'eros blame themselves for devaluing relations with their divinities by prostituting their rituals in tourist performances, with the consequence that rain is too heavy in one season and absent in another (this is reminiscent of the 'moral meteorology' stance (Burman 2017; Elvin 1998)), whereas the Gwich'in blame others for invading their territory, holding the outside industrial world responsible for pollution that causes the changes in snowfall, ice conditions and animal migrations, along with increased river flooding and forest fires.

Local people may be largely unaware of the global warming debate itself, as shown in Mahbub Alam's and my discussion in Chapter 4 of a survey, conducted in the Hakaluki *haor* 'large lakes' region of Bangladesh, to assess knowledge of climate change. Nonetheless, local residents have observed considerable changes in their region's weather patterns, with flash floods, for instance, and also changes in the natural environment, such as shifts in lake flora and fauna, which they are at a loss to explain. There is an intriguing epistemological challenge for anthropology here, as Martin and Cometti point out. If people are struggling to comprehend what is happening in their region and why – their local lore destabilized by unpredictable changes, even apparently no longer relevant – how are anthropologists to make sense of indigenous ways of knowing and relating to the environment? There are other implications, as seen among the Matsigenka, who are understandably unaware of global debates over climate change, having no general idea of the 'weather' given their animistic understanding of meteorological phenomena; it puts them at a disadvantage today in discussions about environmental issues with the intruding Peruvian authorities. Those migrating into their region from the Andes, for instance, where they have problems attributed to climate change, are using their familiarity with global climate discourse to dominate the Matsigenka in dealings with the outside world.

Adaptation to Change and Extension Assistance

The wider environmental interactions and their implications lead on to discussions about adaptation to foreseeable climate-change impacts

(Adger et al. 2012; Fresque-Baxter and Armitage 2012; Lebel 2013). Mitigation, the other widely discussed response internationally, hardly features at the local level in underdeveloped rural communities, many of which currently face the environmental brunt of disruptions to the global climate largely caused by the developed industrial world, which itself endlessly negotiates mitigating by offsetting, or better reducing, its damaging atmospheric emissions. Predictably, where people face unfamiliar environmental disturbances, they may struggle to adapt. In Bangladesh, where local communities will likely be largely liable for adaptation actions, Alam's and my data suggest limited capability to cope with predicted impacts. Responses were markedly limited (and possibly irrelevant) regarding potential community coping strategies that draw on local resources and ingenuity, referring to the wrath of nature and praying for help, maybe even staging a rain-making 'frog marriage' rite in a drought. Elsewhere, the situation may be less bleak. The 'seasons' along the Patagonian coast, for example, are complex, and unforeseen changes in the weather demand flexibility in selecting the right time and place to fish. This flexibility may further the resilience of the fishing communities, arguably helping them adapt to climate-change-driven variations in the marine environment, such as sea-level rises, 'disappearing seasons', and changing reproduction cycles and distribution of fish along the coast. But other changes in the region, such as market demands, urbanization and tourism, may increasingly limit their options, undermining this flexible adaptation.

Adaptation is a global issue, as Herta Nöbauer reminds us in Chapter 5. Climate change, after all, affects the developed affluent 'West', which is largely responsible for associated global warming, as much as the so-called underdeveloped poor 'South', which is largely blameless but equally impacted. Her chapter takes us to the Alps and focuses on the retreating glaciers and snow cover that are among the significant signs of global climate change. Their retreat is increasingly impacting on people's lives and understandings of the environment, as she discusses in the context of an Austrian ski resort.⁷ It is an unusual ethnographic location, anthropology having shown scant interest in alpine ski areas, although this chapter reflects growing interest in human-environment relations in the region, which is an obvious location for those interested in climate-change issues. She is particularly interested in how the retreating snow and glaciers are 'agents' impacting on resort workers' and managers' experiences and knowledge of the Alpine environment, which involve the interface between local-vernacular and global-scientific understandings of climate. The 'snow business' shapes the social and economic life of those who depend on it in these high-altitude regions. There are

implications for employment in the glacier area, which in turn has a cultural impact and is changing values and work ethics via concerns over job (in)security. Those involved are using various strategies to cope with the uncertainties and challenges posed by climate-related changes, and to ensure that the ski area remains a major tourist destination that contributes significantly to the regional economy.

There are arguably grounds for outside intervention where local communities are ill-informed about climate change, or its implications for them, though they may be observing changes in their environments. There is scope here for anthropologists, building on the development practice of extension (that seeks to educate the 'beneficiaries' of projects about issues), to pass on information about climate change, as Yunita T. Winarto outlines in her account of experiences of 'Science Field Shops' among farmers in Indonesia in Chapter 8, where changes in rainfall and temperature are already affecting rice yields. She is of the opinion that farmers alone, limited to their traditional ways, cannot meet the challenges of increasing climate variability. The Field Shops programme, which involves interdisciplinary collaboration between anthropologists and meteorologists, seeks to inform farmers' decision-making with meteorological knowledge so as to improve their resilience in the face of climate change by helping them to comprehend the global drivers behind their changing environment. The anthropologists' role is not only as an ethnographer understanding local perspectives of weather, but also as 'cultural mediator and translator' between the local and scientific domains, facilitating learning in both directions and beyond to policy-makers. It is a challenging and demanding role, as shown by the Field Shops experiences in Indonesia, where the authorities are suspicious of putting the needs of local farmers first and there is scant interdisciplinary interaction within institutions.

In order to meaningfully inform people about climate trends, it is necessary to pay attention to the so-called 'user interface', where relationships are built between local stakeholders and outside organizations. In Chapter 7, Maria Ines Carabajal and Cecilia Hidalgo explore the challenges that face such interface building, focusing on connections from global institutions, such as the World Meteorological Organization,⁸ to local communities, such as those of goat farmers in Argentina,⁹ where they work on these extension issues. They point out that despite meteorological advances in monitoring and forecasting the weather, local awareness and use of associated knowledge lags far behind. In their investigation of related collaborative processes, they identify three categories of users: local farmers, farmer associations and various institutions (such as governmental and research bodies). A key issue in

the establishment of user interfaces between these three categories of stakeholders is the unambiguous identification and recognition of the users who are to interact in the process, and how they understand and use climate information. The different and contested ways they make sense of climate-science data leads to their underuse. The chapter points to the importance of presenting scientific and actionable information comprehensibly and relevantly, in tune with the culture and experience of users, as a central feature of user-interface building, which should feature genuine dialogue and collaboration between all parties. Attempts to contribute to such mediation are not only challenging, as these chapters show, but are also subject to 'decolonial' critiques that censure outsiders, such as anthropologists, for assuming to speak on behalf of others and reducing 'their knowledge' to fit some foreign paradigm, although where fellow citizens do so, as with Winarto, Carabajal and Hidalgo, it takes some of the sting out of the criticism.

Indigenous Knowledge and Science

The aim of the extension approach is primarily to inform local communities about issues, in this case those pertaining to climate change. But as both the Indonesian and Argentinean experiences indicate, it is necessary to know about the cultural contexts of local communities to inform them in ways that correspond with their values and lifeways, and their understandings of the world, which are rooted in local circumstances and critically shaped by social and historical contexts. This highlights the significance of the above ethnographic accounts of peoples' weather lore and awareness of climate change. But cultural context involves considerably more than knowledge of some narrow domain, as the anthropological tenet of holism underscores. This is the argument of the 'indigenous knowledge' (IK) approach, notably in development contexts, which builds on the (to anthropologists) self-evident premise that local communities and peoples' knowledge should feature prominently in any interventions that affect them (Sillitoe 1998, 2015). It includes all knowledge held more or less collectively by a population that informs their understanding of things. It also points to the importance of interdisciplinary collaboration to address issues in the round.

Adapted to local conditions and focusing on provincial interests and concerns, IK is often communicated in foreign idioms and features aforementioned tacit experiential knowledge, which we anthropologists appreciate and understand to varying extents. But no matter how strange IK may seem, it would be unwise to dismiss it as irrelevant. In another

weather-related paper, for instance, I discussed how my Papua New Guinean friends coped with the climatic perturbations that impacted on their livelihoods, sometimes resulting in serious famines and starvation (Sillitoe 1993). This publication was more acceptable to an anthropological audience, as it dealt with myth and ritual activities employed to appease the supernatural forces believed to be responsible for the adverse conditions, which were attributed to a pale-skinned female spirit being. But to a technoscientific audience, it is seemingly irrelevant, with meteorologists pointing to the recent correlation of such conditions with the El Niño Southern Oscillation, which is an irregularly occurring and complex series of climatic changes involving the warming of the Pacific Ocean that triggers large fluctuations in the region's weather, with serious consequences for the people living there (Ellis 2002). But when people believe in such supernatural causations (an issue taken up by anthropology's current 'ontological turn'), it is counterproductive to denigrate or ignore them because they seem so far away from scientific understandings, as they will inform their behaviour nevertheless, and therefore need to be accommodated in some way.

The implication is not that the IK approach rejects the contribution of science. If it did, we should presumably ignore the issue of global warming altogether as a fiction of scientists, like the climate-change deniers. The gulf that separates IK and science is not unbridgeable; they may often overlap. My 'offbeat' weather paper (Sillitoe 1994) overtly draws parallels, presenting meteorological observations and measurements made over several years alongside a discussion of local understandings of the same atmospheric phenomena. The implication of an environmental anthropological perspective that seeks to pay attention to scientific evidence is not, I might add, to translate local views into scientific terms, as some critics suggest, devaluing them in all probability in the process. However, their contrast furthers understanding of both local culture and climate, which undeniably set certain limits on, although they do not determine, human activities. The association of avowedly nonlocal understandings of environmental conditions with what I thought I understood about local views was also a critical response to postmodernism, which has argued that we cannot ever really understand other ways of being-in-the-world, by signalling that some of us never imagined it was possible.

Furthermore, using scientific data allows us to address questions that occur to us, but that local views may not focus on. This applies to climate-change framed enquiries too, as indicated by Marin's, Rosengren's, and Alam's and my chapters, which concern communities that have limited or no acquaintance with the climate-change debate, but whose locally focused concerns and understandings may nevertheless include

observations of environmental changes that we may attribute to global warming. This interdisciplinary approach acknowledges the central part that the natural sciences play currently in our understanding of climate change. An in-depth understanding of IK and science furthers interfacing between them. In addition, local communities often absorb aspects of scientific knowledge, adapting new information coming from without alongside that generated within (Burnham, Ma and Zhang 2015). This shows the inadequacy of portraying IK in opposition to scientific knowledge rather than seeing it interacting to yield hybrid and multifaceted knowledge with a range of sources and subject to continual revision in the light of information received from elsewhere. IK is a dynamic mix of past practice and present invention with a view to the future, yet it maintains its distinctive cultural character.

The practices and knowledge of scientists and technologists are culturally situated too (Dove and Kammen 2015: 94–117). They are not neutral players or purveyors of purely objective understanding, and this has significant political implications. While international political forums and associated transnational scientific networks consider climate change to be a global phenomenon, insufficient attention has been paid to how natural scientists develop their assumed universally valid understandings that go on to inform political debates. Both the ‘global’ and ‘universal’ aspects of science are the result of complex, extensive, ongoing processes – as investigated, for instance, by science and technology studies – which are themselves informed by local concerns. Consequently, countries in the so-called Global South, such as Brazil, seek to influence the direction of climate-change science, in the light of the geopolitics of their regions and associated national discourses, as André S. Bailão shows in Chapter 11 discussing the contribution of Brazilian scientists to the production of regional and global climate models, focusing particularly on aspects that revolve around ‘local’ climate-change discourse. He confirms and critiques the idea of location in social studies of science, and the role of alliances and disputes between local scientists, and with policy-makers, in the formulation of national climate-change views and policies.

Politics of Climate Change

The political dimensions of cultural identity, often expressed in terms of national interests, complicate the climate-change debate further. The culturally mediated understanding that people have of the world, notably their environment, is a significant aspect of their identity. This can become particularly evident when their cultural ways are under threat.

There are few people more menaced than the Palestinian Arabs, as Mauro van Aken recounts in Chapter 10 when discussing their knowledge of seasons. One of these is *murba'nia*, the 'winter rainy season', characterized by three months of unpredictable and fluctuating rainfall and chilly intervals, during which the farmers in this semi-arid environment skilfully manage to conserve surface water and soil moisture through cisterns and land use that 'harvests weather' in order to see them through the dry, hot summer. Regardless of its apparent 'irrelevance' in the context of intensive irrigated agribusiness and modernization debates, this management continues as an aspect of family farming that emphasizes people doing work with their 'own hands', passing on skills and knowledge not merely to conserve past 'traditional' ways, but to prepare for the future by focusing on their practices for cultivating their own food, which are central to their fragile sense of autonomy under Israeli domination. Their weather lore is one aspect of their *fellah* 'peasant' identity, which expresses their cultural independence in confronting the displacement and marginalization deriving from Israeli appropriation of land and water. Furthermore, although Palestinians and Israelis face the same climate-change challenges, the contentious nationalistic politics surrounding natural resource access, along with the absence of shared knowledge about its use, make it unlikely that they will jointly deal with them successfully.

In short, the challenges of climate change are equally political as environmental, as the Bangladeshi work reported on by Alam and myself indicates, with a substantial number of respondents referring to political problems impacting on coping strategies, not natural changes, which poses some awkward questions for those in authority. If climate-change impacts are of the order some forecast, Bangladesh is at particular risk, notably to sea-level rises and catastrophic flooding – on one of the world's largest deltas – together with cyclones and drought. These threats have prompted a national policy debate about strategies to meet the challenges, but limited political action. Local adaptation options should figure in any reckoning, no matter how inadequate they may seem, because effective interventions need to chime with residents' experiences and ways, as pointed out and as the negative outcomes of the 'Flood Action Plan' illustrate. The policies and actions of national governments, often responding to those of international bodies, also inevitably influence local-level responses to any perceived climate-change threats.

Climatic change is a 'real-world' human problem and, as such, is increasingly subject to the politicization of associated knowledge (Barnes et al. 2013). In Chapter 12, which also focuses on Bangladesh, Camelia Dewan analyses certain climate-change discourses in development contexts as sites of associated power struggles between competing interests,

conflicting agendas and divergent conceptions of climate impacts. Similar to development catchphrases before it, climate change presents events in a way that creates expectations of causality that legitimize particular development interventions (Mosse 2005). Adaptation has become a development buzzword and one that attracts donor funding. Embankments on the Bangladesh floodplain are currently framed as 'climate-change adaptation' infrastructure, defences in need of strengthening to protect communities from devastating floods following rising sea levels. Yet, Dewan's chapter uses archival sources and oral histories to show that this 'flood-protection' infrastructure has, from the 1850s onwards, inhibited beneficial monsoon floods (*borsha*), increased siltation of waterways, and resulted in frequent and damaging *jalabaddho* floods (waterlogging). The World Bank's current framing of embankments as climate-change adaptation is based on mismatched causal explanations that will only serve to make Bangladesh even more vulnerable to rising sea levels, increased and heavier monsoons, and more frequent tidal surges and cyclones. This climate narrative will further detract funding and attention away from other things that require immediate attention in the face of global warming: excavation of silted canals and rivers, and repairs of sea-facing embankment sections. The chapter emphasizes the importance of history and context in improving interventions aimed at addressing climatic change, and this is where anthropologists can play an important role.

In Chapter 9, Pasang Yangjee Sherpa investigates the associated interconnections between various institutions in neighbouring Nepal, a country also predicted to be significantly affected by climate change. She focuses on core climate-change policies and government agencies authorized to address associated issues, notably of 'adaptation' and 'resilience', and shows how these conceive of programmes to reduce climate-caused risks as involving technocratic solutions, and are subject to a controlling and constraining political environment, similar to that of top-down development generally. The interactions within and between these agencies, and beyond to other national and international bodies and local collaborators, feature constant manoeuvring for influence and control over the climate-change agenda. The local communities, together with nongovernmental organizations (NGOs) and civil society groups, are not powerless, but with varying effect interact tactically with these agencies, as Sherpa illustrates by drawing on the experiences of her own Himalayan community.¹⁰ The ongoing unstable political situation in Nepal results in some uncertainty regarding the government's response, although its dependence on international funding to address perceived climate-change threats brings with it some predictability, albeit subjecting

it to external influence that may further mute the voice of local communities experiencing the impacts of climate change; moreover, donors too may be unreliable and may instead exacerbate the instability.

Climate-Change Sceptics

Anthropologists have been investigating international- and national-level climate-change discussions together with local experiences of environmental changes attributable to global warming, not only to contribute to the formulation of meaningful policies with respect to possible actions, but also to make scientific observations pertinent and predict consequences relevant to various communities (Rayner and Malone 1998: 75–85, 127–29). The risk otherwise is scepticism, which may prove a significant barrier to action. Calibrating official discourse against local understandings of climate-cum-environmental change will help to avoid promoting scepticism with proclamations and policies that seem out of touch with lived reality. Local experiences can tell us what is actually happening currently on the ground, as several of the chapters in this volume show, serving as a reality check against climate-change models (Reyes-García et al. 2016). If the climate-change predictions do not match up in some measure to local events, they will promote disbelief inimical to policy proposals to tackle problems. After all, it is with respect to their experiences and perceptions of current weather patterns that people assess such forecasts the world over and respond to initiatives.

Again, this applies not only to rural regions elsewhere, which are often of interest to anthropologists, as this volume shows, but also to metropolitan locales, where readers likely reside, and notably to opinion-shaping climate-change sceptics living there. Those who deny such change may point to notoriously inaccurate daily weather forecasts as evidence, which are subject to endless complaints, certainly my experience in Western Europe and seen elsewhere in the world. The inaccuracy increases considerably with week-long forecasts, which seem to be no more than computer-generated guesstimates about the movement of high- and low-pressure zones.¹¹ What are we to make of forecasts for longer timespans, such as those that comprise climate-change predictions, when according to chaos theory we only need a proverbial butterfly to flap its wings vigorously in Amazonia to generate a cyclone elsewhere a month later? An additional challenge is that the scientific community itself disputes the possible environmental consequences of global warming, with some media and political activists citing the most dramatic predictions, notably those of the highest

IPCC's Representative Concentration Pathways¹² (IPCC 2015: 57), which many climate scientists argue are the least likely (Riahi et al. 2011, 2017; Ritchie and Dowlatabadi 2017; van Vuuren et al. 2011), thus confusing the public debate. Those scientific predictions that are 'too far out there', notably those that incline towards the most extreme possible future global warming scenarios that are open to considerable dispute (Pielke 2018), encourage climate-change sceptics, particularly when they match nothing in current experience. Climate scepticism not only concerns knowledge levels, from aware to unaware, of associated science, but also cultural identity issues (Kahan 2015), notably when these feature political competition,¹³ as noted above. It is a major challenge facing those who advocate the need for urgent action over climate change, with people not sensing the need given their own current experiences or their political allegiances and for whom the climate-change warnings seem like so much additional hot air.

The tendency to simplify changes in the environment by ascribing them to a single cause exacerbates scepticism, given the complexity of any ecosystem. Today, with the advent of climate-change awareness, the favoured cause is often climatic. This detracts from other important issues, such as poverty leading to communities degrading the environment, just as wealth results elsewhere in unconscionable pollution. It is a new version of aforementioned climatic determinism, promulgated by scientists who are narrowly specialized, and underlines the need for a broader interdisciplinary perspective, such as anthropology can bring to the discussions. In her historical and ethnographical review of Bangladesh's coastal embankments, Camelia Dewan underlines the shortcomings of such 'climate reductionism' (Hulme 2011). A long-term view of these environmental interventions shows that they are more than responses to changing climatic conditions, complicating current discussions of flood risks. The colonial authorities worked on the embankments long before global warming was an issue. The East India Company constructed them to protect the land from saline intrusion with deforestation of the Sundarbans mangroves, and the British colonial authorities erected more of them as railway and road infrastructure. It was not until the mid-nineteenth century that they were considered 'flood protection' and they have served this function since, as seen in the Flood Action Plan of the late twentieth century. It is a function that, with the advent of climate change, has increased in significance with concerns about rising sea levels. As pointed out above, it is thought that future development interventions should engineer higher and wider embankments, though these will arguably exacerbate the precarity of communities by conflicting with the delta's natural hydrology.

It can be argued that anthropology may also help us better understand the position of sceptical climate-change deniers, as one class of local knowledge holders (Dunlap 2013; Hamilton 2015; Hansson 2017; Kemp, Milne and Reay 2010; O'Neill and Boykoff 2010). The discipline is equipped to further understanding of human behaviour, which, as we know, is a challenging task. It is not only the natural environment of any region that is complex, but also the behaviour of human beings living there, which can be contradictory to boot. For instance, how many of us regularly walk or cycle to our destinations rather than travel by car, bus or train, and on these occasions how often do we make serious CO₂ offset arrangements to cover fully our contribution to climate changing atmospheric gases? And what about our diet, which is a culturally inflected behaviour for us all? The majority of us are regular meat-eaters, while knowing that livestock farming contributes significantly to global warming. Few of us are climate-change sceptics and most readers of this book probably accept, and are concerned by, the meteorological evidence for climate change. And yet we are behaving in ways that make it worse. We may argue that institutions are responsible for enabling such behaviour, but these are ultimately subject to collective human endorsement. Are we all hypocrites? It seems that we are struggling to understand our own behaviour, which suggests a need for some urgent social science research (Larsen 2015; Rudiak-Gould 2013a, 2013b).

Some climate-change deniers – both those who deny the science and those who accept it and argue that current policy approaches are misconceived – may be doubly hypocritical, particularly those representing some institutions, such as large corporations that lobby for scepticism and Western governments, whose policies support them for economic reasons. They want to avoid both the costs of changing their operations and the charge of responsibility for global warming, with the attendant claims for damages. Here we see that climate change raises not only difficult scientific issues but also moral ones, and that an overly technocratic focus that sidelines and disempowers local communities may have serious ethical implications. There are also some NGOs, as Alam and I point out in Chapter 4, which are climate-change disaster promoters rather than deniers, whose actions are also ethically dubious in seeking to attract philanthropic funding for their own ends by emphasizing the worst-case forecasts, often with dramatic images of flood victims. A question for many is how those largely responsible for climate change are going to compensate others for its effects on them. These communities are largely from 'less developed', and so less industrialized, nations, such as Nepal, which Sherpa tells us is responsible for only 0.025 per cent of global greenhouse-gas emissions (with 0.4 per cent of the world's population).

In Chapter 6, Noah Walker-Crawford explores the issues from an intriguing local perspective, through the experiences of a Peruvian farmer who filed a pioneering lawsuit against a German energy company,¹⁴ demanding that it help his Andean hometown reduce flood risk from the melting of glaciers, which was attributed to global warming that the firm was responsible for, contributing to it with its coal-fired power stations. The legal system framed the lawsuit as a scientific-technical issue, equating global greenhouse-gas emissions with specific climate impacts such as flood risk and judging responsibility in terms of monetary compensation. This effectively sidelined the Peruvian farmer's knowledge and experience of climate change as a force that threatens his community. The legal focus on its quantifiable impacts as a worldwide phenomenon, albeit observed through local impacts, overlooked his understanding based on a first-hand encounter with the severe impacts of global warming. It judged his views as 'local' or 'anecdotal', and to have little to contribute, being incommensurate with such a global framing of climate change. Only those elites with the necessary technical expertise can participate in discussions in this global scientific context, which excludes individuals who know climate change only through their practical experiences, and hampers their moral claims for fair dealing. Nonetheless, the lawsuit afforded the farmer an opportunity to air some personal nonquantifiable aspects of climate change and to argue forcefully for 'climate justice', which he also did at the 2015 UN Climate Summit in Paris, where his identity representing marginalized people facing climate-caused environmental disaster gave him some moral legitimacy. It permitted him to make claims that unsettled climate politics as usual, in struggling to expand the climate-change debate from a scientific-technical to a moral-ethical discussion that concerns transnational relations – although it could arguably encourage representatives of the capitalist order, seeking to defend its assets and power, to promote further the sceptical 'climate-change denial' agenda.

Anthropology's Stance

Whatever the doubts surrounding meteorological data and associated computer modelling, they still point to accelerating climate change with epic environmental effects. Some authorities warn that global warming is speeding up and predict ever-worsening environmental outcomes, which is doubly disturbing as earlier accounts predicted the end of the world as we know it. A World Bank (2012) report, for instance, warns of a possible 4°C temperature increase above pre-industrial levels by the

century's end, reaching a tipping point with sea-level rises bringing catastrophic floods to large parts of the world. While the uncertainty of long-term climate predictions recalls short-term weather forecasts, the stakes are clearly much higher than being caught in a rainstorm without an umbrella. In concluding my early Was valley climate essay, I pointed out that people around the world are, of course, aware that their 'region's climate' sets 'limits on their activities' and that how a 'population perceives of these limits and explains the weather regime responsible for them will have some bearing on its behaviour' (Sillitoe 1994: 268). Anthropology is the discipline pre-eminently qualified to further appreciation of such understandings and behaviour, which will indubitably inform responses to predicted alarming climate changes.

The chapters in this volume demonstrate that climate change is not a challenge solely for scientifically informed international resolution and global media debate, but that local experiences of environmental changes attributable to global warming and community responses to them also need to be taken into account. They are of a piece with anthropology's concern to contribute to debates over environmental issues, and the need for more sustainable ways, generally. While definition of the discipline is a topic of endless debate, with its unclear boundaries melting into cognate subjects (arguably promoting the necessary interdisciplinarity), something that continues to characterize it is working ethnographically at the local level. It has a great deal to contribute from this perspective. This volume shows what an ethnographic focus can offer in furthering our understandings, with contributions from around the world discussing local knowledge of, and responses to, the weather, climate and atmospheric perturbations, which need to feature in scientifically framed policies regarding adaptation and any mitigation measures. The volume is unique in advancing anthropology's growing response to the climate change challenge not only with its marked ethnographic focus – with some half the contributors being nationals of the countries featured – but also for opening up different perspectives on what the discipline has to offer in documenting diverse and sometimes conflicting perceptions, in focusing on experiences and critiques (including legal challenges) from the 'margins', in furthering collaborations to assist farmers and fishers among others, and so on.

In summary, while the following chapters deal with the usual anthropological repertoire – such as IK of weather, local perceptions of environmental change and climate-change impacts – they have a critical edge, considering, for instance, the different ways of framing global warming problems, whether from the perspective of, and attributed to, the international order or local activities. They touch on various contemporary

debates within the discipline, such as the ontological turn, in discussing the incommensurability of different cultural ways of understanding atmospheric phenomena that we call collectively 'weather' and 'climate'. In this regard, they contrast the dominant scientific understanding, and how it is sociopolitically situated, with that of various local communities. Here the ethnography of institutions features, complementing the focus on the ethnography of communities. The current climate change challenge is complex, as intimated here, and this volume makes no claims to comprehensively cover this complex and contentious topic, nor the various strategies that have emerged to mitigate its affects, for instance, carbon offsetting, new 'climate change commodities', migration to elsewhere (sometimes in response to conflict exacerbated by environmental degradation) or emissions-reduction programmes such as the UN's 'Reducing Emissions from Deforestation and Forest Degradation' (REDD+) initiative. Besides mitigation issues, O'Reilly et al. (2020) discuss a range of further opportunities for anthropology to contribute to understanding the implications of climate change, including a critical appraisal of climate science's claims to authority, sustainable transformations, envisioning futures, and paying particular attention to vulnerability, risks and resilience.

Although local perceptions of climate-cum-environmental changes will inform people's responses to national strategies, they currently hardly feature in them, with the scientific causes and extent of forecast changes and anticipated environmental consequences dominating the climate-change debate (Ford et al. 2016). International policy discussions need to accommodate global cultural variation of knowledge and experiences, and not impose global science-informed views on communities. Among the contributions that anthropology has to make is advocacy for IK, arguing that the climate-change debate is not only an issue for scientists, policy-makers and politicians. There are further self-interested reasons for the discipline to engage with these challenges. Involvement has something to offer the discipline as it emerges, or is forced, from its postmodern tailspin by the 'impact agenda'. Contributions to understanding the impact of climate change on the world's environment, and possible adaptation and mitigation, are surely going to meet demands to demonstrate the relevance of the discipline's work (Simpson 2015). Furthermore, while we may be unable to answer the question about what anthropology is exactly, such work will put us in a better position to answer another question increasingly put combatively by student-consumers: 'What is the use of studying anthropology?'

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Notes

1. Sea levels rose about 17 cm in the twentieth century; the rate in the first decade of the twenty-first century is almost double this rate (Church et al. 2013: 1146–50).
2. Since the coining of the term 'Anthropocene' at the turn of the century, there has been a flurry of anthropological commentary (see, for instance, Haraway et al. 2016; Latour 2017; Mathews 2020; Moore 2016), doubtless prompted in part by the 'Anthropo' morpheme in this proposed new geological epoch label. It is beyond the scope of this volume to delve into this debate and other suggested labels such as 'capitalocene' (Haraway 2015), which connect tangentially with climate-change issues.
3. Atmospheric CO₂ levels in 1958 (the year full instrument measurement started on Mauna Loa) were 315.28 ppm and by early 2018 had increased to 408.35 ppm. Retrieved 2 March 2021 from https://www.esrl.noaa.gov/gmd/ccgg/trends/co2_data_mlo.html–https://www.esrl.noaa.gov/gmd/ccgg/trends/co2_data_mlo.html.
4. Notably methane (CH₄), water vapour (H₂O), nitrous oxide (N₂O) and ozone (O₃).
5. On the Valdés Peninsula of Argentina.
6. The Matsigenka occupy the Upper Urubamba region in the southeastern Peruvian Amazon.

7. The Pitztal glacier ski resort is located in the Ötztaler Alps of the Tyrol province, bordering Austria and Italy.
8. Through the Global Framework for Climate Services-GFCS, a UN-led initiative overseen by the World Meteorological Organization, which seeks to further the 'application of science-based climate information and services' (see www.wmo.int/gfcs).
9. In the north Santiago del Estero Province.
10. The Sherpa community in the Everest region, and those living in the Kailash Sacred Landscape Conservation and Development Initiative region.
11. While the United Kingdom's Meteorological Office, for instance, may dispute this, pointing out that modern Numerical Weather Predictions are accurate – running large amounts of forecast data using general circulation models – the everyday experience of many of us is that medium-term forecasts are unreliable.
12. These comprise a set of greenhouse-gas concentration trajectories.
13. As Steve Rayner put it to me: 'In the US, "I don't believe in climate change" is simply code for "I am a conservative Republican".'
14. Rheinisch-Westfälisches Elektrizitätswerk.

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