



*New Frontiers in Historical Ecology*

# **CLIMATIC AND ECOLOGICAL CHANGE IN THE AMERICAS**

**A PERSPECTIVE FROM HISTORICAL ECOLOGY**

Edited by  
James Andrew Whitaker,  
Chelsey Geralda Armstrong, and  
Guillaume Odonne



# Climatic and Ecological Change in the Americas

This book offers a comparative analysis of the experiences, responses, and adaptations of people to climate variability and environmental change across the Americas. It foregrounds historical ecology as a structural framework for understanding the climate change crisis throughout the region and throughout time. In recent years, Indigenous and local populations in particular have experienced climate change effects such as altered weather patterns, seasonal irregularities, flooding and drought, and difficulties relating to subsistence practices. Understanding and dealing with these challenges has drawn on peoples' longstanding experience with climate variability and in some cases includes models of mitigation and responses that are millennia old. With contributions from specialists across the Americas, this volume will be of interest to scholars from fields including anthropology, archaeology, geography, environmental studies, and Indigenous studies.

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## 12 Owing Climate Change Among the Makushi and Akawaio

*James Andrew Whitaker*

Despite a slow start, anthropologists in recent decades have contributed foundational studies of Indigenous encounters with climate change through ethnographic engagements (Baer and Singer 2018; Batterbury 2008; Crate and Nuttall 2009, 2016; see Brown 1999; Rayner 1989). Many Indigenous peoples are at-risk for the negative impacts of flooding, drought, and related climatic phenomena. These impacts are often connected with land-based subsistence practices, as well as past and present colonization and marginalization (see also Vaughn 2022). Although Indigenous encounters with climate change are increasingly being documented by anthropologists, many depictions of these encounters still tend to center around standard Western discourses of climate change. However, ethnological literature exists concerning spiritual ideas and practices about weather in Amazonia (Wilbert 1996) and recent research has explored broader ontologies regarding weather and related phenomena associated with climate change among Indigenous peoples in the region (Rosengren 2018, 2021; Whitaker 2020a, 2020b; see Killick 2015). This resonates with work on Indigenous perceptions, knowledge, and knowledge production concerning climate change, which shows the divergence of many Indigenous perspectives on climate change from Western views (Barnes and Dove 2015; Byg and Salick 2009; Crate 2011, 2021; Cruikshank 2005; Sillitoe 2021; Strauss and Orlove 2003; Vedwan and Rhoades 2001; Welch-Devine et al. 2020; see also Jean-Jacques et al.'s chapter in this volume). Focusing on Indigenous lived-realities, which are often centered around local landscapes and related subsistence practices, such work is crucial to supporting communities undergoing negative climatic impacts and to understanding ontological alterities surrounding the concept of climate change itself.

This chapter will examine perceptions and ontologies related to climate change among Makushi and Akawaio villagers in Guyana. It is based on fieldwork in the Makushi villages of Surama (2012–2020) and Yupukari (2021) and the Akawaio village of Kamarang/Warawatta (2021). It is based on a combination of semi-structured interviews and participant observation. Most people in these three villages have some familiarity with the concepts

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and terminology used in Western discourses of climate change, and some now refer to climate change when speaking of various weather-related phenomena. However, climate change is mostly an outside concept recently introduced (primarily by Westerners) among Makushi and Akawaio groups. Neither language has an exact term for “climate” (see also Rosengren 2018, 2021). In recent years, climate change language and narratives have been exogenously introduced through villagers’ interactions with outsiders in contexts of education, governance, and eco-tourism. Knowledge of climate change varies among villagers and previous research has indicated that many use the concept in ways that vary from those of Western scientists (Whitaker 2020a). However, although the concept itself is introduced, many are keenly aware of alterations in weather-related patterns that are negatively impacting them. Although villagers sometimes speak of climate change, local ontologies underpinning climate-related weather phenomena reveal alterities that center around relational frameworks involving the historical–ecological landscape and the non-human beings within it.

Despite sharing similar ontological concepts, Kamarang/Warawatta, Surama, and Yupukari represent different landscapes with heterogeneous demographic, environmental, and geological features. Surama is a mostly Makushi village of around 314 people that is located in the northern Rupununi region of Guyana. It lies in a savanna zone, which is surrounded by forest and located close to the Burro-Burro River. Although many villagers continue to rely on shifting agriculture (centered around cassava), the village is heavily involved in eco-tourism. Yupukari is a Makushi village of 648 people that is located in the middle Rupununi region of Guyana. It lies in a less forested savanna zone between the Rupununi River and a large lake. Villagers rely heavily on cassava farming in remote areas that are accessible by boat. Eco-tourism is present to a smaller extent there. Kamarang/Warawatta is an Akawaio village except for the government compound area where many non-Indigenous Guyanese reside. It is located in the upper Mazaruni region of Guyana in a mountainous and fluvial landscape. Cassava farming is common, but mining is the economic mainstay. Travel to farms and across the village is mostly by boat and tourism is rare. Despite these differences, all three villages report similar accounts of altered weather patterns and similar weather-related ontologies.

The fieldwork for this chapter was primarily conducted in 2021 in Yupukari and Kamarang/Warawatta and coincided with unprecedented levels of flooding in Guyana (see also Vaughn 2022). The flooding severely impacted cassava agriculture in both villages and reportedly destroyed houses in nearby communities. Several villagers readily attributed this flooding to climate change as a generalized phenomenon. Villagers often described changes in local weather and environmental conditions. Although reports were wide-ranging, accounts mostly centered around changes in the rainy and dry seasons, environmental disturbances (e.g., floods), and alterations in villagers’ livelihood practices due to weather and temperature.

This chapter explores the implications of ontologies related to weather among Makushi and Akawaio people in Guyana with an emphasis on historical ecology (Balée 1998, 2006; Balée and Erickson 2006). It will examine recent local experiences with “climate change” and how people describe and perceive these encounters within their landscapes. This chapter shows how climate change is situated in Makushi and Akawaio ontologies within the context of ongoing relations between humans and non-humans, for example, “owner” or “master” beings who dwell within “cultural forests” (Balée 2013). These interactions involve back-and-forth exchanges that implicate villagers in ongoing relations with beings who control, protect, and nurture aspects of the landscape, which includes in this sense plants, animals, forest, savanna, and even weather phenomena. In the case of Surama, as previously described (Whitaker 2020a, 2020b), these ontological relations have partially shifted to non-reciprocal giving relations with what is sometimes called “Mother Earth,” although notions of “Mother Earth” are apparently much less common in Yupukari and Kamarang/Warawatta. Regarding the historical-ecological landscape, contemporary climatic and weather-related disturbances occur due to breakages in normative relations with non-human entities that were managed in the past by shamanic practitioners. Such breakages have become more common as “development” – whether eco-tourism, mining, or other forms – displaces traditional ecological management in local landscapes (see Rival 2009). These breakages are associated with the declining prevalence of shamanic practices of managing relations within the landscape.

### Perceptions of Changing Weather Among the Makushi

Some of the clearest descriptions of weather changes in Surama and Yupukari concern alterations in the rainy and dry seasons (Whitaker 2020a; see Betts et al. 2008; Butt Colson and Armellada 2001; Wilbert 1996). Villagers report that the long rainy season typically starts around April or May and continues into late July or August when the long dry season begins. Villagers in Yupukari said that the later stages of the rainy season are indexed to sequential constellations of stars. The rising of *Tami’kan*, according to villagers in Yupukari (in contrast to other sources) refers only to the Seven Stars or Pleiades and corresponds with the heavy rains, preceding the rise of *Pebung* (locally identified as Orion) (see Butt Colson 2009; Butt Colson and Armellada 2001; Daly 2015; Grund 2017). *Tami’kan* is also associated with mastery/ownership over fish in some regional cosmologies (Butt Colson 2009; Butt Colson and Armellada 2001). Referring to a “leg” constellation, *Pebung* was described as separate from *Tami’kan* and marks the final stormy rains (with thunder and lightning) of the rainy season. However, the rainy season is now observed to last longer than before – that is, both starting earlier and ending later – in both villages.

There is a short rainy season that occurs between December and January, after which short dry season conditions return in February and continue until

around April or May. People in both Surama and Yupukari often indicate that rain sometimes now continues sporadically into the dry seasons, which complicates agriculture, and that even the long dry seasons have shortened. Villagers also indicate that the rainy seasons in some years are drier than normal and that the boundaries of seasonality have become unpredictable (Whitaker 2020a).

These changes in weather have led to several problems regarding local land-use and livelihood strategies. First, it has become difficult for villagers to know when to cut and burn sections of forest and bush for planting cassava. Both activities are generally done at the end of the now unpredictable dry seasons. Secondly, it has become difficult to know exactly where to plant cassava given that planting locations are decided, in part, on (now unpredictable) weather conditions. When expecting dry conditions, cassava is planted in low, wet, and flood-prone areas. These are often located in proximity to Ité palms (*Mauritia flexuosa* L.f.), which are said to be refuge areas in times of drought.

For rainy conditions, cassava is planted on higher ground to avoid flooding. Many in Yupukari mentioned the severe flooding of 2021, which went beyond usual seasonal inundations and destroyed farms due to subsequent root rot in cassava plants.

In response to this severe flooding, some cassava farms were relocated to higher ground in Yupukari. However, for many villagers, lowland cassava farms were already ruined by floods, which meant farmers had to re-plant their crops. For villagers in Yupukari, the relocation of crop fields is not a new strategy and is linked to past efforts to survive periods of extreme weather. Although reportedly less frequent today, drought was identified by many in Yupukari as a major problem in the past (see Rival 2009). Several villagers described a severe drought that occurred during the early 1980s that they had experienced or heard about from elders. This drought resulted in a major crop failure and food and water shortages. During times of drought, Makushi people traditionally relocate temporarily to areas near Ité palms in the wet lowlands and use what villagers call “ground provisions” – particularly, naturally occurring yams (*Dioscorea* spp.) and *eddoe* (a mix of *Colocasia* and *Xanthosoma* spp.) – and other foods when available (Rival 2009; Whitaker 2020a). For Makushi people, these untended yams and eddoe are occasionally used foods that can be relied upon in times when cassava is scarce. They are particularly prevalent around the settlement of Quatata, which is a satellite village of Yupukari, and the nearby village of Nappi. In contrast to these traditional strategies for drought, survival strategies for flooding (beyond merely planting cassava on higher ground) were much less frequently mentioned. Although droughts present different problems than floods, villagers in Yupukari indicated that severe flooding is a more recent concern, while droughts are now relatively uncommon.

In relation to ecological changes, many in Yupukari describe recent weather-related alterations in which the savannas have expanded and the high forest has receded to the central areas around the village. Some villagers attribute these changes to anthropogenic activities like savanna burning and the relocation of some cassava farms into nearby savannas. Others see such changes as part of a broader pattern linked to changes in rainfall and rising temperatures. In contrast, some villagers in Surama, where burning is more restricted, suggested in 2019–2020 that their savannas are shrinking. In both villages, people note that traditional phenological signs of rainfall – observations tied to animals and plant life histories – are now out of rhythm (Rival 2009; Whitaker 2020a: 851).

Villagers in Surama and Yupukari gave various accounts (some anthropogenic and others non-anthropogenic) regarding recent changes in the weather, the temperature, and the broader landscape. Concerning the temperature, many claim that it is hotter today than in the past. Some villagers suggest that increased logging of trees near the village has contributed to the rising temperatures. Others attribute the increasing heat to “climate change” as a more general phenomenon. The changes in forest cover, for example, the expansion of savanna in Yupukari, and the elevated temperatures are often described as interrelated. Other anthropogenic causes associated with temperature and weather center around logging, mining, modern technologies, and declines in traditional practices and beliefs. There are claims in both villages that recent weather-related changes are associated with unsustainable uses of gasoline around the world. However, many specifically point to deforestation as a major causal factor concerning weather-related changes (Whitaker 2020a; see Betts et al. 2008). Burning of savannas and changes in agricultural practices (particularly the location of cassava farms in savanna) are also mentioned. Concerning responses to recent changes, some in Yupukari spoke of pushes by village leadership to reduce savanna burning (similar to in Surama) and to relocate cassava farms further away from the village. However, these efforts do not seem to be fully implemented at present.

Despite some villagers using climate change discourses as explanatory or interpretive frameworks for observed changes in weather and ecological processes, concepts of climate change are widely perceived in both villages as associated with outsiders (see also Moore 2016; Rudiak-Gould 2016). In Yupukari, many who know about climate change indicate that they first heard about it either in school, through workshops, or in meetings involving the North Rupununi District Development Board (NRDDB). The NRDDB is located relatively far from Yupukari, but villagers in Surama actively participate in the organization since it is closer to them. Villagers in Yupukari often say that people in Annai and surrounding communities (e.g., Surama) are the ones who “really know” about climate change. In Surama, climate change is more often associated with Europeans, North Americans, and

NGOs (Whitaker 2020a). In both villages, people express anxieties about what climate change entails and the impacts that it will continue to have on them.

### **Ontologies of Weather Among the Makushi**

Many Indigenous groups across Amazonia speak of “owners” or “masters” who control and lead other beings within the landscape (Costa 2017; Fausto 2012). Such entities emerge in accounts from Surama and Yupukari and are sometimes thought to influence certain adverse weather events. In the present, traditional notions of ownership are often described by villagers using contemporary discourses of conservation and ecological management. Within this framework, some suggest that past shamans maintained strategic relations with owner-beings as a way of managing and conserving the local landscape. These relations are central to local ontologies and are situated within the broader historical ecology of the Makushi in Guyana.

Ownership and mastery relations extend across several domains that include kinship, interactions between certain outsiders, and human relations with non-humans (Costa 2017; Erikson 2005; Whitaker 2021b). In Makushi, such owners are called *putori* (sometimes pronounced *padru*), *pa-tamona* (different from Patamona people), or *mogo* (referencing a grandfather); in some cases, such as cassava, fishes, and peccaries (wild hogs), they are called “mamas” (Daly 2015; Grund 2017; Whitaker 2016; see also Butt Colson and Armellada 2001). These owners are particularly associated with game animals, fish, and forested areas where cassava farms are often located. The *putori* controls and protects his or her wards. In Surama, for example, it is sometimes said that peccaries are led through the forest by a bird-like being (see Butt Colson and Armellada 2001) and that one howler monkey leads the others. Shamans maintain strategic relations with owners, but non-shamans also normatively offer them tobacco before hunting or harvesting their wards (Whitaker 2020a, 2020b). Such relations combine mutualistic exchanges, such as giving tobacco and receiving game, with the potential for asymmetric predation, such as taking without giving (see Descola 2013).

Makushi notions of ownership entail that hunting, fishing, and other practical engagements with the landscape are positioned within a relational context between humans, plants, animals, and spirits. Failure to maintain normative relations of mutuality, for example, by overharvesting, overhunting, or excessive mining, may result in reprisals involving sickness and sometimes weather disruptions. Ownership can extend to weather phenomena such as thunder and lightning, and can be associated with certain astronomical formations (Butt Colson and Armellada 2001; Grund 2017; Koch-Grünberg 1979–1982). In some Makushi accounts, peoples’ actions are therefore causally implicated in events like violent storms and floods. For example, thunder (*uranhi* or *wuranhapi*) is understood by some Makushi as



controlled by the *uranbimi* in the sky (see Butt Colson and Armellada 2001; Daly 2015). Villagers in Yupukari claim that it is important during the corn season not to let roasting corn pop loudly because it frightens the children of the *uranbimi*. The *uranbimi* perceive this as gun-like, become angry, and fire back with thunder in order to scare the offender's children in retaliation. Running loud mechanical engines can also antagonize the *uranbimi* and lead to retaliatory thunder. To stop the thundering and lightning, according to villagers in Surama, one must aim the hole of a cassava squeezer (*matapi*) at it. One man in Yupukari said that one might similarly aim one's anus instead. Both responses would imply that one was threatening to "fire back" at the *uranbimi*. As such, thunder and lightning are ontologically situated within a relational context centered around reciprocal interactions (see also Wilbert 1996).

Makushi people often speak of owners in rivers and lakes. Although reportedly more common in the past, these beings are said to live in deep water holes that never dry out even during severe droughts. They can cause violent storms and boat-sinking waves when certain restrictions are violated, such as by: (1) dropping hot peppers into particular rivers or lakes, (2) going to a river or lake soon after a close family member's death, or (3) visiting a river or lake during menstruation. Each implies a break in normative relations with a river or lake owner and may result in sickness or the offender being taken underwater. Many accounts also associate events like rain, storms, and sometimes flooding with such owners and their potential acts of retaliation and negative reciprocity. In the past, elders could apotropaically stop these storms by using *taren* (a form of magical spell) (see Carneiro de Carvalho 2015; Daly 2015; Whitaker 2016; see also Wilbert 1996) while throwing burning wood into the water. This wood was possibly from a *Virola* species (Butt Colson and Armellada 2001; see also Wilbert 1996). Similar to "firing back" at the *uranbimi*, preventing or turning back storms involves a retaliatory act of reciprocation.

In Yupukari, there is a story about an underwater owner called Pragwa who lived at the bottom of a whirlpool and caused storms and waves to sink boats until he was removed by a *pia'san* who willfully allowed his boat to sink into the whirlpool. Once underwater, the *pia'san* caused the boat to explode (using gasoline from sunken ships). This dislodged the Pragwa who subsequently relocated to Brazil where he reportedly remains today. In this case, instead of burning firewood, an exploding boat was used to send a reprisal for the adverse weather and to end the negative exchange within the landscape. In other stories, underwater or forest-dwelling owners are tied up or chained by a *pia'san* to prevent them from causing further sickness or weather-related problems. Sometimes owners are said to be relocated to mountains. Although maintaining relations with owners is often useful for ensuring provisions of game, fish, and so on, they are sometimes seen as overly predatory, and the relationship is ended (sometimes temporarily) by the *pia'san* through relocation or constraint.

The concept of tying or chaining owners connects to ontological notions concerning adverse weather. One villager in Yupukari associated the regional flooding in 2021 with owners and suggested the following:

*what I have heard a little bit is like how we start to get flood. And then them pia'san did tie them [owners] up with their head up so they not making no more trouble. But we believe that when the young girls start to get their health and go bathe . . . And the chain that the piaiman tie them [owners] with get rotten then. And some say that may be why we get flood.*

When asked for clarification, she explained:

*The owner of the waters. They are dangerous. He tie [sic] them for them to make trouble no more. But the tie that he used must be start to rotting [sic]. And that is why they must be coming back like before. It happening now.*

Similarly, another villager from Yupukari suggested that a dragon-like owner had once been locked up in a nearby mountain and that it caused earthquakes when it awakened from sleep. The problems of managing relations with owners are complicated today because neither village has a *piaiman* to manage these relations. Adverse weather-related phenomena are reportedly emerging (at least partially) because past strategies for shamanic management of the landscape through normative relations with owners have fallen into desuetude. As such, recent flooding is a result of breakages in historical–ecological relations within the landscape.

### Perceptions of Weather Changes Among the Akawaio

Akawaio villagers in Kamarang/Warawatta and visitors from neighboring villages, which include Jawalla, Kako, Philippi, and Waramadung, described similar changes in weather patterns as Makushi villagers in Surama and Yupukari. They claim that the rainy season now lasts longer, and that the length of rainy and dry seasons is more variable and unpredictable than in the past. Akawaio villagers also point to phenological signs from stars (especially the “seven stars” or Pleiades), plants (e.g., *Mora* species), and birds (e.g., Alcedinidae genera) that are traditionally used to predict the starting and ending points of the seasons. However, these signs are reportedly no longer reliable indicators given that they are sometimes now out of sync with the seasons.

As in Surama and Yupukari, changes in weather patterns in Kamarang/Warawatta have caused difficulties for cassava farmers. Unpredictable weather conditions have complicated applications of traditional knowledge. In particular, it is now difficult to know when to prepare farms. The cutting

down of forest or bush areas prior to burning fields in preparation to plant cassava must be carefully timed to allow for sufficient dryness for burning before regrowth occurs. This was observed firsthand during September and October of 2021 as rain sporadically fell every day or two. This prevented successful burning of forest and bush areas for planting. Many villagers reportedly now cut forest and bush and prepare land for farming at varying times, which sometimes even changes from one year to the next. Farmers sometimes now have to cut forest and bush for their farms more than once. This difficulty is due to rain continuing after the initial cutting. The other major difficulty for villagers in the Upper Mazaruni has been an increase in the intensity of flooding, which causes even greater disruption to local farming, housing, and livelihood. Villagers in Kamarang/Warawatta showed pictures from 2021 that illustrated extreme flooding conditions. In addition to cassava farms, some houses were partially flooded. In the nearby Akawaio village of Jawalla, floods reportedly destroyed several houses. Parts of these houses subsequently floated downriver. Although several respondents acknowledged that some seasonal flooding occurred annually, many claimed that the level of flooding and destruction in 2021 were unprecedented and record-breaking.

In contrast with Surama and Yupukari, villagers in Kamarang/Warawatta often said that there is little they can do to avoid or prevent destruction to cassava farms during severe flooding episodes. Although villagers' accounts varied, most said that flooding in the Upper Mazaruni affects both the highland and lowland areas, so relocating farms to higher areas would only help marginally. However, some villagers mentioned that a few farmers are now planting one cassava crop on high land and another on low land to hedge against the heightened risk of flood damage. In contrast with flooding, drought was generally not considered a significant problem in the fluvial setting of the village, although some people did remember drought episodes that had caused difficulties in the past. Unlike Surama and Yupukari, many villagers in Kamarang/Warawatta claimed that they had few strategies for surviving periods of drought or flooding. No reports were heard concerning "survival foods" or refuge areas during times of extreme weather. Many suggested that they would survive such episodes (especially flood-related crop failure) by receiving food from the government, purchasing food from shops, and intensifying employment in mining for money to make such purchases. The unreliability of seasonal weather and flooding has also reportedly increased youth participation in mining due to frustrations with farming. Mining is seen as providing more reliable and faster returns relative to the risks of farming.

Villagers in Kamarang/Warawatta often reported that they perceived the general temperature to be hotter now than it was in the past and especially during the dry season. Combined with the unpredictability of seasonal changes and rainfall, the increased temperature has complicated work schedules and made life more difficult. In response to the heat, many people try to avoid doing physical work during the hottest times of the day. Some

have reportedly lost crops due to rising temperatures and there are accounts of heat-related reductions in game animals in the forest, large die-offs of fish in ponds, and disrupted fruiting cycles. However, compared to Surama and Yupukari, hunting and fishing are somewhat less significant sources of food in Kamarang/Warawatta. Increased temperatures have also reportedly exacerbated dryland conditions and receding forests. In contrast with Yupukari, many in Kamarang/Warawatta attribute forest contraction to increased heat and not to anthropogenic burning near the village. Increased temperatures have reportedly contributed to natural fires in some cases. Nevertheless, the overall temperature in the Upper Mazaruni is considerably cooler than in the Rupununi savannas due to the higher elevation.

Some villagers in Kamarang/Warawatta pointed to climate change as a cause of increased temperatures. However, they pointed to multiple culprits, and accounts differed in relation to whether or not such changes are anthropogenic. They also variously suggested that deforestation, foreign industry, gasoline usage, and overuse of the forest were causal factors in the changing temperatures. Some villagers said that the increases were because of “nature” while others suggested that they were the work of God and a sign that the world was coming to an end. Also, as will be described in more detail below, some respondents drew connections between recent weather-related changes and the mining taking place across the region.

Knowledge of climate change in Kamarang/Warawatta remains associated with outsiders and is not a common topic of conversation. Most villagers interviewed indicated that they first heard about it in school or through activities involving outsiders. This is again similar to Surama and Yupukari. Government workshops were frequently mentioned in this regard. Many said that they did not fully understand climate change. A few (mostly elderly) villagers claimed not to know about it other than that it somehow meant that things were changing. Overall, there is much concern about the drastic changes to weather and seasonality that are negatively affecting villagers across the region.

### **Ontologies and Weather Among the Akawaio**

Although Akawaio villagers in Kamarang/Warawatta did not mention owner-beings becoming “unchained” or “untied,” there were accounts concerning “owners” or “masters” influencing adverse weather events as a result of broken relations within the landscape. Akawaio villagers in Kamarang/Warawatta sometimes use the term *poido'ma* to refer to owners or masters (cf. Butt Colson and Armellada 2001). At other times, Akawaio groups use different terms, such as *siwon* (Cooper 2020), *esak*, or *potori* (similar to the Makushi term *putori*) to refer to them (Butt Colson 2009). The basic ontological contour of ownership relations in Kamarang/Warawatta, as well as among visiting Akawaio people from neighboring villages nearby Kamarang/Warawatta, is generally similar to those in Surama and Yupukari. As owners, sometimes in the form

of stones, *poido'ma* are associated with control over game animals, fish, and remote areas of the landscape. There is an emphasis in the Upper Mazaruni on ownership in relation to mining – *poido'ma* are said to control gold and diamonds underground. Although similar ideas were occasionally mentioned by Makushi in Surama and Yupukari, mining is much more common in the Upper Mazaruni than in the Rupununi and “ownership” of precious stones and minerals is more salient. Similar to hunting game and fishing, extraction of minerals in the region requires maintenance of normative relations with *poido'ma*. Excessive mining results in a breakdown of normative relations with owners and causes reprisals, such as severe storms and sickness.

Many identified *poido'ma* as sometimes creating adverse weather conditions similar to those associated with climate change. Similar to accounts in Surama and Yupukari, adverse weather and sickness are often said to result from violations of restrictions in relation to bodies of water. This includes visits to lakes or rivers by menstruating women (see also Wilbert 1996) or people in mourning, as well as dropping pepper in lakes or rivers. Some said that deaths in general could cause rains or storms. A local prophetic leader said that severe weather would result only from the death of a baptized man or prophet. This was especially the case if the man died through drowning. Furthermore, he claimed that the flooding in 2021 coincided with the death of a major prophetic leader in another village. Rains, storms, and flooding are also said sometimes to occur when strangers (typically non-Amerindian outsiders) visit “sacred sites” near Akawaio villages. Sickness and storms also reportedly result from forest fires, which are said to kill the owners’ children. For example, one man suggested that the Covid-19 pandemic resulted from the fires in Australia in 2020. As such, adverse weather can variously be centered (directly or indirectly) around owners.

Although there are parallels between Akawaio and Makushi ontologies, Akawaio accounts in Kamarang/Warawatta draw unique conclusions concerning climate change. Among the Akawaio, water spirits are generically called *laado* (similar to Makushi *rato*). This is the underwater equivalent of *poido'ma* and can refer to a number of different kinds of related beings. For example, one kind of *laado* is called *panagaru*, which is related to the Makushi term *prankru*. Both terms refer to water spirits. However, *panagaru* is also sometimes associated with white people (particularly Western Europeans and North Americans) (see Whitaker 2020c). For example, one man stated in Kamarang/Warawatta in 2021 that:

*Old people used to tell us that when white people coming then that is laado. That is a belief. They say that white person going to come and carry you [away] and [you] might think they boyfriend. And it is a big snake [associated with underwater beings].*

The Makushi term *prankru* is a shortened form of the term *paranaghiri* (a cognate term of the Akawaio *panagaru*). *Paranaghiri* is found directly and

indirectly in colonial era documents dating from the 17th through the 19th centuries (Edmundson 1904; Rivière 2006). The term in Makushi combines *prana* (meaning sea) with a term *kru* or *kuru* (referring to people from the sea) (Schomburgk 1923; Whitaker 2020c). Since most white people historically arrived in Guyana by sea, they are *prankru* (Makushi) or *panagaru* (Akawaio) (Whitaker 2020c). With these connotations, white people are associated with non-human owners relevant to weather and are linked to adverse weather events (see also Wilbert 1996). As among the Makushi (Whitaker 2020a; Whitaker 2020b), notions of ownership serve as frameworks through which relations with outsiders are conceptualized.

One Akawaio leader suggested that villagers sometimes associate *laado* (as underwater owners) with weather phenomena linked to climate change, but that this association can go beyond interactions involving lakes and ponds. He said that white people (as *panagaru*) are also seen as a type of *laado*. In other words, there is a connection between ontological notions concerning local weather phenomena caused by “owners” and the responsibility of people in the Global North for high levels of carbon emission and resulting changes to local weather and climate. This elucidates Akawaio associations between climate change and foreign industrialism (see also Rosengren 2018). The association highlights Akawaio understandings of weather disruptions as resulting from failures to manage normative (although not necessarily reciprocal for the Akawaio) relations involving “others” in the landscape or beyond. Akawaio people point to a failure of whites to maintain normative relations with non-human beings in the landscape in Guyana and abroad. Excessive resource extraction, mistreating non-humans, and abusing the landscape have angered the non-human owners and incurred weather changes that now threaten Akawaio people. As such, disruptions to weather and climate emerge again as the result of breakages in relations within the landscape.

## Conclusion

This chapter has examined weather-related alterations associated with climatic changes from the perspectives of Makushi and Akawaio villagers in Guyana. Although some interpret these changes through Western discourses of “climate change” as recently introduced by outsiders, the ontological underpinnings of these phenomena traditionally center around animistic notions of non-human ownership. This chapter’s goal has not been to evaluate the Western-focused “scientific accuracy” of these accounts or the underlying physical causes of related phenomena. For example, villagers rarely mentioned the El Niño and La Niña cycles highlighted by Western scientists in relation to periodic drought and flooding throughout the region (see Rival 2009). Instead, this chapter elucidates the importance of local accounts in their own right. Emphasizing a relational landscape centered

around animism, such accounts may help scientists to examine blind spots in their own theories.

Of course, ontologies concerning weather can change. For example, villagers often expressed uncertainty about the kinds of astronomical seasonal markers described by Butt Colson and Armellada (2001), although a few mentioned Orion (identified as *kaiwonok*), the Pleiades (identified as *chirikö pupai*), and *tumön*. Some said that traditional signs (both cosmic and ecological) are now out of sync with seasonal and ecological cycles. Although such knowledge may have been partially lost in Surama, Yupukari, and Kamarang/Warawatta in recent decades, there is also a shifting emphasis towards ownership within the landscape and less focus on astral ownership. Even traditional knowledge can change over time.

Nevertheless, many Makushi and Akawaio people continue to associate experiences regarding irregular weather with ontologies concerning non-human ownership. Although evincing degrees of totemism and naturalism (Whitaker 2021b), these ontologies are primarily animist (Bird-David 1999; Descola 2013; Rosengren 2018, 2021). This supports Rival's (2009) suspicion:

*that further ethnographic research would show that, for the Makushi, the best way to deal with weather vagaries is not so different from the way one "cultures" the land so that manioc can grow, or tames wild spirits so that the ill can be cured.*

Weather, agriculture, fishing, and hunting implicate shamanic ontologies of ownership that require management of normative relations involving back-and-forth interactions within the landscape. These ontologies also influence "cultural forests" and facilitate landscape management (Balée 2013). As such, they are part of local historical ecologies (Balée 1998, 2006) and are central to local perspectives on climate change. As historical–ecological phenomena, climatic change and variation emerge ontologically as the results of broken relationships with the landscape and its owners. Stemming from a current absence of resident *piaimen*, as arbiters of traditional knowledge and managers of relations within the landscape, there are uncertainties about how to rectify emerging problems with weather and seasonality in Surama, Yupukari, and Kamarang/Warawatta. Like people around the world, local villagers are unsure how to "tie" or "chain" the forces now wreaking havoc on their climate and broader landscape.

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