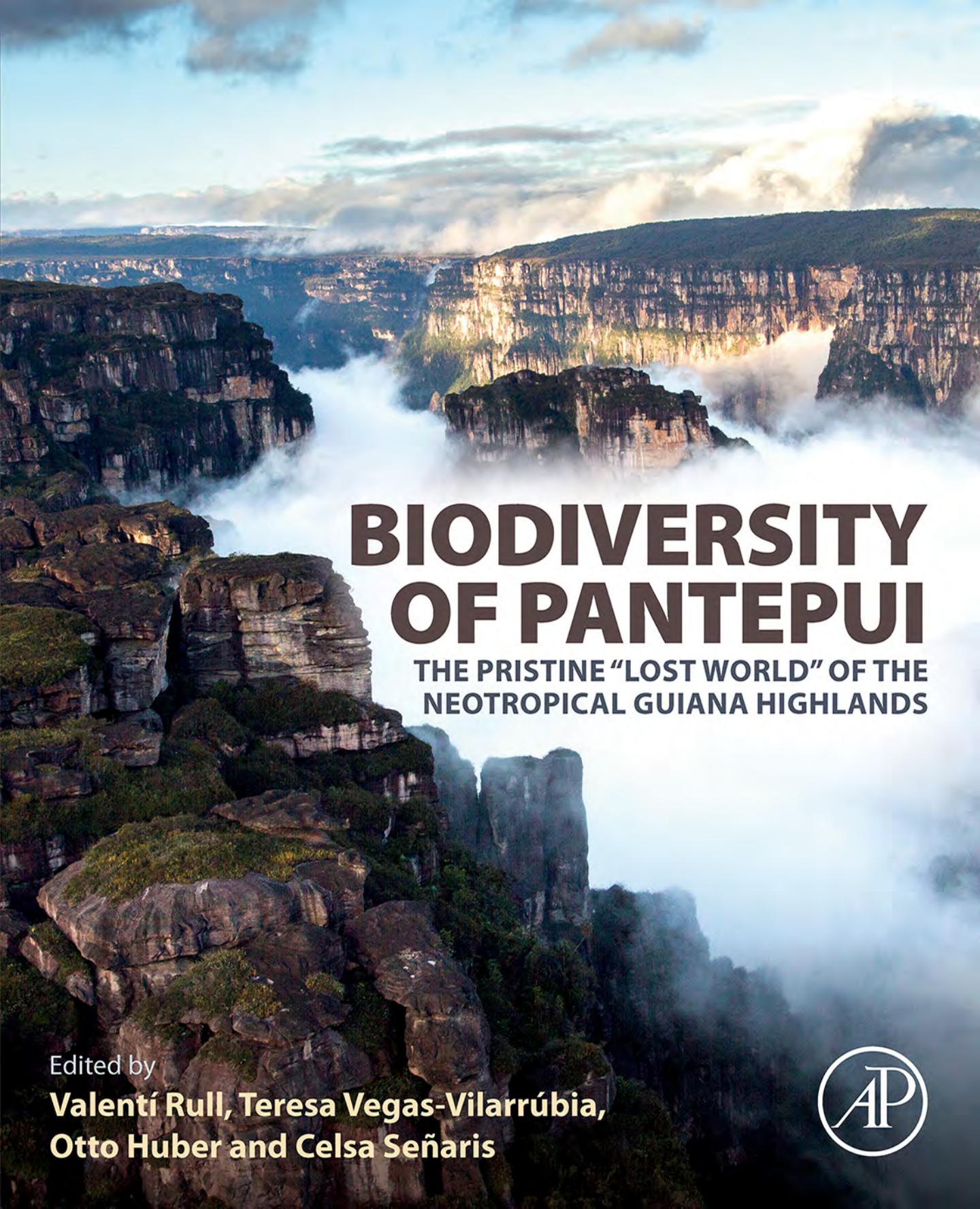

BIODIVERSITY OF PANTEPUI

THE PRISTINE "LOST WORLD" OF THE NEOTROPICAL GUIANA HIGHLANDS

Edited by
Valentí Rull, Teresa Vegas-Vilarrúbia, Otto Huber and Celsa Señaris

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The Pristine "Lost World" of the Neotropical Guiana Highlands

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PART IV

Biodiversity Conservation

CHAPTER

16

Conservation of Pantepui: between complex emergency and climate change

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Introduction

The historical and present context of the conservation of the highlands of the Guiana Shield (Pantepui) was reviewed from the commitments and actions of the regional governments towards the conservation practice in the region. It has been concluded that they have been insufficient. This is due, on the one hand, to the social imagination that considers the remote, isolated, and difficult-to-access condition of Pantepui a guarantee for its perpetual conservation and, on the other hand, to the emergence of progressive and populist regional governments that promote the intensive use of natural resources, with the premise of redistributing income for social welfare. In this context, the protected areas of the Guiana Shield become vulnerable spaces and their borders become highly permeable to extractivism, given the failure of the natural resource management institutions. Some issues analyzed were the causes of this institutional failure and the factors that have made conservation priorities invisible and underestimated the importance of Pantepui as the last globally important frontier of tropical areas remaining on the planet (Potapov, 2017; WWF, 2012). Henceforth a question arises: Who is interested in Pantepui? Awareness needs to be raised of the importance of Pantepui's heritage and to promote cross-border collaboration to develop research-action capacities, such as interculturality, the defense of nature, and the construction of peace, with the long-term support of donors

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and cooperators of the international community. Finally, it is declared that the conservation of Pantepui will be sustainable to the extent that the fundamental role of indigenous people and traditional communities and their fundamental rights are recognized in the conservation and management of territories and good management practices of the common resources are promoted that allow their enjoyment for the next generations.

Antecedents in the conservation of Pantepui

The conservation of the high mountains of the Guiana Shield began in the 1960s with the creation of the Talferberg Nature Reserve in Suriname and the Canaima National Park in Venezuela (Fig. 16.1). This provided legal protection to the eastern peak of the sandstone mountains of the Guiana Shield in the Sipaliwini district, Suriname, and the tepuis in the western sector of the Gran Sabana municipality, Venezuela—including the Auyán-tepui with the highest waterfall in the world, Angel Falls, one of the most geographical landmarks in the region. Its creation, based on landscape, biological, and ecological values and to protect the headwaters of the Caroni for the Guri Hydroelectric Project (Castro-Morales and Gorzula, 1986; Huber, 1995; Bevilacqua, 2003; Yerena, 2011), followed the conservation model of that time, which was based on the belief that the protection of biodiversity is best achieved through the creation of protected areas where ecosystems can function isolated from human disturbance.

In the 1970s, several milestones marked a turning point in the development of international policy towards the environment from two complementary approaches: the mitigation

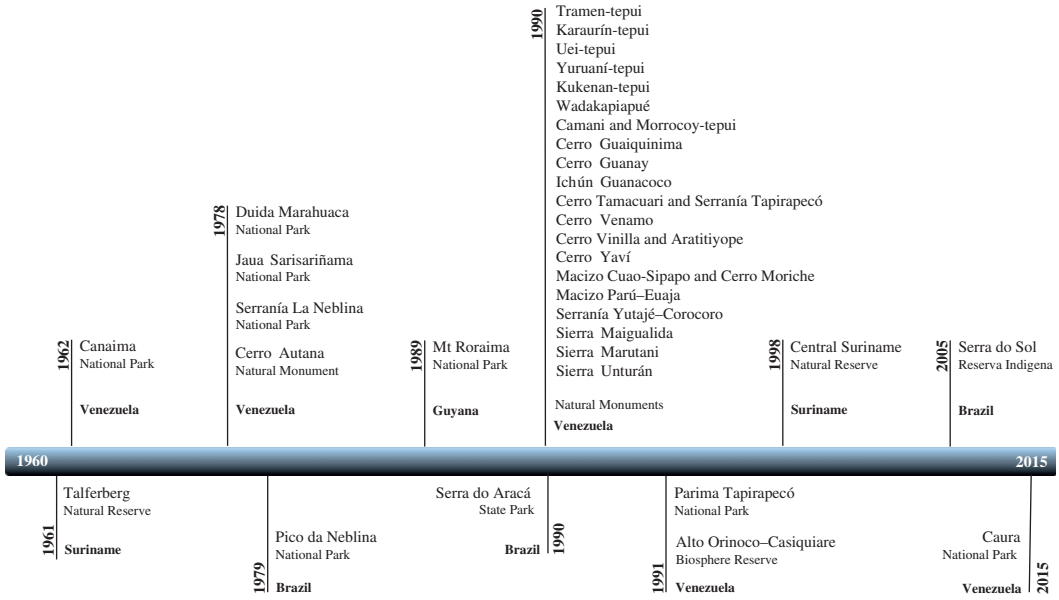

FIGURE 16.1 Timeline showing the sequence of creation of the protected areas of the highlands of the Guiana Shield.

of the environmental impact of industrial development and the protection of nature. The most important milestones were the First Conference of the Human Environment, Economic Development and Environment of the United Nations Organization (Stockholm, 1972), the Second World Congress of National Parks (Yellowstone, 1972), the institutionalization of the "World Heritage" approach by UNESCO, and the Annual Report of the International Union for the Conservation of Nature for the creation of protected areas in 1978. At the Stockholm Conference, the problem of pollution associated with industrial development rose for the first time in the diplomatic sphere, and in the Second World Congress of National Parks, global attention was called for regarding the urgent need to protect geographic spaces of interest to save the planet, promote human development, achieve prosperity, and promote universal peace. As a result of these conferences and their policy guidelines towards the environment, a radical change in the existing paradigms of welfare, growth, and global economic development is demanded of the international industrial community, because these were being carried out at an environmentally high and unsustainable cost over time (Bruntland, 1987). The global commitment to the conservation of natural resources acquires greater relevance, and soon the conservation interest oriented towards the tropics, where the sites with the greatest biological diversity in the planet are concentrated. Venezuela welcomes and implements international environmental policies through (1) the expansion of the Canaima National Park in 1975 to 2,000,000 hectares in order to include the Roraima-tepui, which is shared with Brazil and Guyana; (2) the creation of the Ministry of Environment and Renewable Natural Resources (1977), the first in Latin America; and (3) the creation of three national parks and a natural monument (Fig. 16.1), which together comprise 1,900,030 ha, an unprecedented extension in the conservation of the Guiana Shield mountains (Bevilacqua, 2003). Brazil and Guyana, for their part, created the national parks Pico da Neblina (1979) and Mount Roraima (1989), which protect the highest tepuis of the shield.

In the 1980s international concern about the environment continued to grow, given the evidence of the impact of population growth and the volumes of industrial production documented in the Caring for the Earth report (IUCN, UNEP, WWF, 1991a,b). Here a warning was issued about the threat to the future of humanity if no action is taken to safeguard the planet's vitality or to move towards "sustainable development" as the only rational option to guarantee the survival of man. With the evolution of the concept of "biodiversity" in the 1990s towards a conceptual approach broader than the biological aspect, biodiversity acquired a discursive centrality of global political interest (Núñez et al., 2003). Biodiversity was central on the agenda of issued debated at the United Nations Conference on Environment and Development (Rio, 1992), a meeting among heads of state to reach agreements related to the environment, sustainable development, climate change, and biodiversity. The agenda was also present in the IV World Congress of National Parks and Other Protected Areas (Caracas, 1992), which brought together for the first time more than 2000 delegates to discuss the future of protected area management and technical guidance, issues of growing global interest to all nations. At the United Nations Conference (Rio, 1992), the Convention on Climate Change, the Declaration of Principles Relating to Forests, and the Convention on Biological Diversity were approved, which are universal legal frameworks that promoted the creation of new protected areas throughout the world, including in the countries of the Guiana Shield.

In the context of this political and scientific effervescence associated with biodiversity and sustainable development—but also from the perspective of two new approaches, such as environmental services and ecological viability—Venezuela has taken the unprecedented regional initiative to prohibit all forestry and mining activities in the Amazonas state (Venezuela, 1978, 1989), as well as in the upper Caroní River basin (Venezuela, 1991) and protected all highlands in the Guiana and Amazonas states under a strict form of legal protection. In 1990 an unpublished declaration of an "archipelago" of 25 tepuis under a single natural monument was made. A year later, two new protected areas were decreed encompassing the largest area under legal protection of all the Guiana Shield region and one of the most extensive in the world (approximately 80,000 km^2), designed to protect the biological diversity of the southern Venezuelan Amazon, its tepuis, and the territories of ancestral occupation of the Yanomami people. The areas decreed were the Alto Orinoco-Casiquiare Biosphere Reserve (1991), the first of its kind in the country and in the Guiana Shield, and the Parima-Tapirapecó National Park (Fig. 16.1). The first and most extensive biological corridor of the Amazon basin and the Guiana Shield is thus legally constituted in the group formed by the binational parks La Neblina, Parima-Tapirapecó (Venezuela), and Pico da Neblina (Brazil), the latter with 22,200 km^2. For its part, in 1990 Brazil protected the highlands of Serra do Aracho with a state park. The same year, Suriname extended the protection of the Talferberg Nature Reserve by including it as part of the 16,000-km^2 complex of lowland forests and mountains in the Central Suriname Natural Reserve.

The current set of protected areas of the Guiana Shield demonstrates the commitment of the countries of the region to adopt and implement environmental conservation strategies, primarily promoted during 1970–99. The objectives of creation and management of the protected areas at the time reflect the evolution of the conceptual approaches for the conservation of landscapes, sites with high biodiversity and endemism, but also of the interest in attending to the complex relations between the people and ecological feasibility in response to the growing pressure of society towards a management of "parks for life," sustainable development ,and the mitigation of climate change. In addition to the striking physiographic landscape of large plateaus with slopes and summits above 1000 m a.s.l., broad valleys and low hill systems are incorporated into the design of the protected areas, densely covered by subtropical, moist broadleaf forests on gently rolling plains or peneplains that separate the tepuis, with the objective of protecting a set of ecosystems that have conservation value for the ecological viability and the protection of the territories of native indigenous societies. Relevant forest areas are zoned as buffer areas for the use of natural resources, for indigenous ancestral occupation, and for intangible protection of lands surrounding Pantepui. Accordingly, Brazil has decreed the Serra do Sol Indigenous Reserve (2005) with an area of 17,430 km^2 and Venezuela declared the extensive ecoregion of the Caura River as El Caura National Park (2015) with c.75,000 km^2. Both measures open a new chapter for the conservation of the Guiana Shield, and this is impressive due to the magnitude of the surfaces, the contradictions in conception, and the socioenvironmental conflicts with the territories of existing indigenous peoples.

Today the greater representation of the natural heritage of Pantepui has a legal conservation status under one of the most restrictive management categories II and III of the universal protected areas system: national park and natural monument (IUCN, 1994). For many years it has been considered that the isolated conditions, the remote location, and

the difficulty in accessing the tepuis are sine qua non factors for the conservation of Pantepui. However, as will be discussed later, these conditions are no longer a guarantee against the effects of climate change and global changes in the regional economic, social, and political contexts. The Declaration of Paramaribo on conservation priorities in the Guiana Shield (Huber and Foster, 2003; Bernard et al., 2011) marked a milestone in terms of international attention to the relevance of the natural and cultural heritage, traditionally invisible in the geopolitical boundaries of the Amazon region and its regional cooperation treaties.

Failure of natural resource management institutions

With the arrival of the new millennium, the interdependence between social, economic, and environmental agendas was recognized at the highest global level through the approach adopted by the United Nations in the Sustainable Development Goals (UN, 2017). However, the set of nations still fails to translate this awareness and commitment into action and change. The paradigm of human development is still associated with economic growth, and, especially in Latin America, the idea prevails that it will generate well-being in the population (employment, consumption, etc.) through the intense and efficient appropriation of natural resources, to the increase in exports, and to foreign investment (Gudynas, 2011; Svampa, 2013). Thus global policies towards the environment continue to be subordinated to the economic policies that set the course for human development and economic growth, the consequence of which is the ecological mark documented in the annual report of the WWF (2016). This document indicates that human activities and the demand for associated resources have grown so dramatically that the environmental conditions that encouraged this development and growth are beginning to deteriorate to such an extent that the resulting damage to human health and ecosystems threatens to undermine the economic and social advances of industrialization itself.

In the new millennium, a series of progressive and popular governments are emerging in Latin America. Their policies converge on the premise that inequality and poverty are essentially solved by economic means (Gudynas, 2011; Moreira, 2017). The thesis of promoting increases sustained in the extraction of minerals, hydrocarbons, and various extensive crops is booming in the region as a mechanism to finance social programs, reverse inequalities, promote inclusion and social mobility, recover infrastructure, and build a new critical consciousness to capitalism (García-Guadilla, 2014; Gudynas, 2017). In this way, Latin America enters a new economic and political–ideological order sustained by the boom in international prices of raw materials and consumer goods (commodities), increasingly demanded by the most industrialized countries and emerging powers (Svampa, 2013). The governments in the region increase their role as suppliers of raw materials, for their economic growth and to increase their monetary reserves, consolidating a neoextractivist style of development (Gudynas, 2011), based on the overexploitation of natural resources, especially nonrenewable ones. Economic growth expands to other geographic spaces, including those traditionally protected due to their value for the conservation of biodiversity, water, forest, and natural reserves for indigenous populations

(RIGBYY, 2017). A dynamic invasion of territories occurs as a result, destroying regional economies, national institutions, and biodiversity and deepening the process of land appropriation; displacing rural, peasant, and indigenous communities; and violating citizen decision processes, as well as generating new asymmetries and social, economic, environmental, and political–cultural conflicts (Svampa, 2013). These conflicts mark the opening of a new cycle of struggles, which increasingly affect the region, as recorded by the Latin American Observatory of Environmental Conflicts (http://olca.cl/oca/index.htm). The criminalization of human rights also advances, and the socioenvironmental problem is sacrificed or made invisible, and is considered secondary in view of the serious problems of poverty and exclusion in societies (Terán-Mantovani, 2016).

In this context, protected areas emerge as highly vulnerable geographic spaces, and their limits become more flexible and more permeable in the face of the ideological discourse that the social goal justifies the means and economic growth is based on the appropriation of nature. New socioeconomic asymmetries affect local populations and other actors linked to protected areas, mediated by the absence of individual capacities to convert rights into real freedoms and achieve what people value and aspire to, according to the terms described in Sen's approach to capabilities (1985, 1999). The absence of freedom to maintain lifestyle and culture, linked to the territory and access to natural resources, is a permanent source of conflict in environmental management and constitutes a vital force that perpetuates the perverse cycle of poverty–environmental crisis–poverty in the region.

Acheson (2006) suggests that the cause of global environmental degradation is institutional because the rules, mechanisms, and governance structures that control access and regulate the use of natural resources are absent, do not apply, or otherwise are not effective, and then the institution fails in its pursuit of the conservation of common resources. In the Guiana Shield in Venezuela, there is evidence of the institutional failure to manage natural resources. Novo and Díaz (2007), in their environmental assessment of the Canaima National Park, conclude that the conservation of biodiversity in the highlands is at risk due to the lack of adequate government resources in terms of budget, park rangers, and a plan for the management of such a large and remote protected area. On the other hand, Bevilacqua et al. (2009) delve into the factors that contribute to the failure of the natural resource management institutions of the Canaima National Park and suggest that, in addition to clear rules to regulate the use of natural resources for conservation purposes, two groups of other factors must be taken into consideration. The first group refers to the broad participation of stakeholders and their homogeneity, the recognition of rights, the social and community sense, their dependence on the resource, and adaptive management structures and techniques, as well as conservation costs and benefits shared in a fair and equitable manner. The second group refers to knowledge and understanding of the location and distribution of natural resources, especially biodiversity, and their state of conservation, as well as diagnoses of opportunities and threats to their sustainable use. In this regard, the extreme difficulties and limitations to produce knowledge relevant to the practice of conservation as a consequence of the bureaucratic process in Venezuela to obtain research permits in the tepuis of the Canaima National Park and the Guiana region can be observed (Rull and Vegas-Vilarrúbia 2008; Rull et al., 2008).

As the government of Venezuela deepens its progressive and populist model based on the appropriation of nature, the social and solidary community economy permeates the borders of protected areas (García-Guadilla, 2014). This disturbs its regulatory frameworks and invades spaces that are integral to protection and managing the natural environment for conservation purposes, thus affecting the integrity of biodiversity and ecosystem functioning. Environmental impacts permeate the boundaries of the tepuis, due to intensive and uncontrolled tourism use (Rull et al., 2016). Yerena (2011) concludes that the future of the environmental heritage of the Guiana region is uncertain, describing the changes in Venezuela's environmental policy towards protected areas in Bolívar and Amazonas states, which resulted in the withdrawal of conservation efforts in favor of a development model based on geopolitical and economic alliances with neighboring governments (Guyana and Brazil), sustained at the local level by corrupt military, civil, and community alliances that were complacent when it came to extractivism. The invasion of territories with the purpose of extracting mineral resources in natural and protected areas in the Venezuelan Amazon has been a chronic and cyclical problem, which has had governmental impunity, causing severe violations to the human rights of the Yanomami people, including massacres in indigenous communities and environmental impact to their territories (Bello and Tillet, 2015; RIGBYY, 2017). In the Venezuela of the 21st century, mining extractivism is consolidated as a state policy towards the territories of the Guiana region (Venezuela, 2018). At the same time, the vision of the new paradigm of economic development associated with permissive mining, protected by military alliances, paramilitaries, and corrupt criminals from the highest governmental level, has been consolidated in the social imagination, as has been described in similar contexts of extractive policies in Latin America (Gudynas, 2017) and global forest policies (Lloyd, 2008).

Given all this, the failure of institutions to manage natural resources is also due to a third set of factors linked to dynamic forces that link the governments with developmentalist and extractive policies to destroy with premeditated intent, the institutional bases that allowed the state to design, create, and manage the extensive set of protected areas for conservation and human welfare in general.

Complex crisis

In the mid-2000s, the developmental cycle in Latin America came to an end as a consequence of various factors that prevented governments from maintaining economic growth (León, 2015). Various changes were introduced in the political, economic, social, and environmental spheres in the region, but an inability or lack of will to achieve the sustainable development objectives that governments committed to comply with in global forums prevails (UN, 2017). Throughout the region, environmental heritage is still widely threatened by the continuity of extractive policies and, in the case of Venezuela, the complex crisis promises to bring the environmental and cultural impacts on the protected areas of the Guiana Shield to an unprecedented level. Next, the Venezuelan case will be analyzed in detail not only due to personal experience but because the greatest geographic representation of Pantepui is concentrated in this country, and its conservation will depend on the national and international response to this complex emergency.

Over time, the voices warning about the complex emergency in Venezuela, characterized by a partial or total breakdown of the legal, institutional, and administrative structure of the state (ACAPS, 2018; Bermúdez et al., 2018; España and Ponce, 2018; OPS, 2018), have increased. This situation has also profoundly and structurally affected environmental management. This translates into multiple and massive violations of the environmental legal framework with widespread damage to society in general, but particularly important to the indigenous people and the natural heritage of the Guiana Shield. In the 21st century, Venezuela went from the failure of the natural resource management institutions described by Acheson (2006) to an environmental crisis induced by the same factors that underlie the complex humanitarian emergency, as described by human rights defenders (ACNUDH, 2018; Civilis Derechos Humanos, Acción Solidaria and Codevida, 2018; PROVEA, 2018; OEA, 2018). From the environmental point of view, this can be specified in terms of (1) groups with power conflicts around the control of natural resources and territorial domains with strategic value in the economic order; (2) dismantling legitimate institutions and the rule of law with environmental competences; (3) denial of guarantees to a timely and effective protection and to an independent justice in the form of nonconforming occupation of the territory and affecting natural resources; (4) systematic use of violence by official, military, and civil forces, as well as fragmentation of power linked to the use of natural resources; and (5) the appearance of corrupt economic and social forms that impacts natural resources, especially in the lowlands of the Guiana Shield. The combination of these factors destroys the nation's capabilities to protect the environment and assist the population that depends on it. Since the Venezuelan government deepens the neoextractivist model of metallic and nonmetallic minerals as a state policy for export purposes (Venezuela, 2018), it will be a matter of time before the induced socioeconomic asymmetries promote groups of people to look for mineral resources in other territorial spaces with less pressure of current use, such as the tepuis, encapsulated in the historical imagination of the promise of "El Dorado." Local communities report incipient mining exploration on slopes in tepuian formations at low altitude in the Paragua River basin and the Caroní and Caura Rivers, and a binational information exchange network has an extensive record of illegal mining (mechanized and manual) as well as clandestine landing strips in protected areas and indigenous territories of the Yanomami and Ye'kwana peoples in the Amazonian and Guiana region (RIGBYY, 2017). These activities are carried out in the context of an absolute rupture of national and local environmental authority, but also in a breakdown of the traditional indigenous authorities and their customary institutions for the management of common resources. In the absence of environmental authority, other uses may increase in the tepuis, such as illegal biodiversity trade; mass tourism; and expeditions for scientific, extreme sports, documentary, recreational, adventure, and elite purposes, which increase environmental impacts due to the fragility of tepuian ecosystems. This will extend the impact already documented in some tepuis (Gorzula and Huber, 1992; Rull et al., 2016; Fernandez-Delgado, 2016). The remote condition of these areas has not prevented the realization of these activities in the past, so an increase of them is feasible before the breakdown of environmental management institutions and the advance of neoextractivism occur. This situation brings us to the verge of one of the

greatest ecological crimes against mankind's natural heritage, which should cause an alert, raise awareness, and mobilize action from the international environmental and academic community.

Climate change

The First Academic Report on Climate Change in Venezuela (Villamizar et al., 2018) reveals the lack of evidence to attribute the effects of climate change on protected areas, and the capacity for adaptation and resilience of each of the protected ecosystems is unknown. Future assessments are necessary to evaluate whether this lack of evidence is a recurrent pattern in the rest of the protected areas in the highlands of the Guiana Shield and a product of geopolitical positions in the context of climate change (Terán-Mantovani, 2016). Given the lack of evidence, the contributions based on predictive models and the traditional ecological knowledge of indigenous peoples become relevant for policies of adaptation and mitigation to climate change. Some of the findings on this topic are hereby presented.

As explained in Chapter 17: Pantepui and global warming, estimates of the effects of global warming in the Guiana highlands based on simulation models predict severe threats to plants and communities of Pantepui due to a substantial habitat loss. Given these predictions, the authors propose conservation strategies based on ex situ techniques to mitigate the loss of genetic and species diversity (Rull et al., 2009; Safont et al., 2012). On the other hand, the main author of this chapter started a participatory action-research group in 2017 focused on the perceptions of climate change, ethnoclimatological knowledge, and its implications in the processes of change and adaptation by the Ye'kwana people. They are an indigenous society of hunters, collectors, and horticulturists, with a population that lives in the upper basin of the Caura River and at the foot of Jaua-Sarisariñama-tepui and Sierra Maigualida in Bolívar state, Venezuela. Their preliminary findings show that more than 89% of Ye'kwana respondents perceive some type of climate change in their territories, including the decrease in rainfall, the general increase in temperature, the modification of floods and droughts, and changes in climate seasonality (Bevilacqua, 2018). The Ye'kwana also perceive an increase in the uncertainty associated with the prediction of climate, the frequency of abnormal or extreme weather events in their traditional territory, climatic seasons occurring outside of time, flood pulses, and descending rivers synchronized with the flowering and fruiting of species of interest, which are all considered alarming. The study also identified environmental and astronomical indicators widely used by Ye'kwana elders for climate prediction, including plant phenology and behavior and movement of birds, animals, and insects (Table 16.1). Taking into account that the contributions of local climate observations are recognized for their contribution to studies on climate change (Reyes-García et al., 2015; Alexander, 2011), research on Guiana Shield highlands can benefit from data collection and indigenous observations in lands surrounding the tepuis to improve climate models, expand records in localities where information is lacking, and inform strategies for effective adaptation of biodiversity that are finely tuned to the specific characteristics of unique environments and contexts such as the tepuis.

TABLE 16.1 Type and quantity of bioindicators and environmental and astronomical indicators used in climate prediction by indigenous households of the Ye'kwana people, in the Caura River basin, Bolívar state, Venezuela.

Generic use	Type of indicator	Quantity
Announces arrival of summer (agriculture cycle)	Zoo-indicator	11
	Phyto-indicator	3
	Astronomic	3
Announces arrival of winter	Zoo-indicator	9
Predicts rain	Zoo-indicator	3
	Astronomic	4
Predicts flood	Phyto-indicator	2
Announce warmer days	Atmospheric	1

Final reflection

Seen in retrospect, the performance and commitments of regional governments towards the practice of conservation in the highlands of the Guiana Shield have been insufficient. This is partly due to the social imagination that its remote, isolated, and difficult-to-access condition is a guarantee for its conservation. On the other, it is due to the urgency of addressing the conservation of biodiversity in the lowlands where human populations are concentrated, the occupation of the territory, and the challenges for sustainable development. These factors have made conservation priorities invisible and underestimated the importance of Pantepui as the last frontier of tropical wilderness.

In the last decade, two initiatives have concentrated invaluable effort on conservation actions for the Guiana Shield. The first, the Guiana Shield Initiative (2000–2008) with UICN-NL funds that later evolved into the multidonor platform Guiana Shield Facility (2011–2014), funded by the European Union, promoted the goal of empowering the six countries that share the great ecoregion of the Guiana Shield, and its local communities, to benefit from the conservation and sustainable development of its natural resources. In practice, the initiative focused efforts on lowland territories with occupation and use pressure in areas of conservation value in Colombia, Guyana, and Suriname. The initiative led to the creation of the International Society of Biodiversity of the Guiana Shield and formed ties of cooperation between conservation institutions, communities, and universities that continue to this day.

The second initiative is the Andes-Amazon-Atlantic Ecological–Cultural Corridor (See https://www.gaiaamazonas.org/), a macroregional effort promoted from Colombia, which aims to safeguard the cultural and biological diversity and encourage sustainable models of development through the effective protection of 2.6 million km^2 of forest that connect the Amazon with the ecosystems of the Andes and the Atlantic Ocean, through nine South American countries. The area of interest is defined, on the one hand, by hydrographic limits of the Amazon River basin and, on the other, by extensive protected areas and interconnected

indigenous territories. The approach leaves out the largest concentration of extensive, emblematic, biodiverse, legendary, and culturally relevant mountains of the central-eastern area of the Guiana Shield in Venezuela and Guyana. Thus an opportunity is missed to capitalize on the interconnection of protected areas and indigenous territories already existing in countries that share the Guiana Shield, which would allow the Pantepui province as a whole to be included in the strategic vision of large-scale conservation of the environmental and cultural heritage of the South American continent.

The tepui ecosystems have gone through many climatic fluctuations in the last millennia, and certainly, the evidence of climate change will have its repercussion in Pantepui, and we must prepare ourselves to anticipate actions of protection and management of the highland biodiversity. Nevertheless, we want to draw attention to the fact that the threats and impacts due to anthropogenic use of the protected areas and the tepuian complexes from local sources are very real and already carry environmental and socioeconomic costs that are constantly accelerating, which must mobilize an urgent call and action plan to protect the Guiana Shield highlands and the world heritage as a whole.

The conservation of Pantepui, and the management of protected areas which contain them, requires courage, coherence, consistency, resilience, and, above all, long-term continuity in action, based on universal values of peace, freedom, human rights, and inclusion. In countries where political, social, and economic contexts limit academic freedoms—as evidenced in Venezuela with the decrease of academic production capacity (Requena and Caputo, 2016), the destruction of spaces for the exercise of science at the service of social welfare (See http://factor.prodavinci.com/institutodemedicinatropical/index.html), the progressive deterioration of autonomy and academic freedom in the country's universities (Coalición de Cátedras y Centros de Derechos Humanos, 2017), and the extreme bureaucracy that limits scientific cooperation for environmental studies (Rull and Vegas-Vilarrúbia, 2008; Rull et al., 2008)—cooperation to study, understand, defend, and conserve Pantepui—require creative and innovative forms and mechanisms of association to maintain the research and practice of conservation. The key challenge is to increase awareness of the importance of the heritage of Pantepui and boost cross-border collaboration to develop community, academic, and technical-professional capacities in interculturality, defense of nature, and peace building, from action research and long-term support of the academy and the international community of donors. Finally, the conservation of Pantepui will be sustainable to the extent that the management of protected areas and other territories that contain it recognize indigenous rights, especially the collective ownership of their ancestral lands, and foster integration of traditional ecological knowledge into natural common-pool resource management and successfully address co-management plans.

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BIODIVERSITY OF PANTEPUI

THE PRISTINE "LOST WORLD" OF THE NEOTROPICAL GUIANA HIGHLANDS

A scientific compendium of environmental, ecological, evolutionary, biogeographical, and conservational studies of the Pantepui biogeographic province.

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Biodiversity of Pantepui: The Pristine "Lost World" of the Neotropical Guiana Highlands provides the most updated and comprehensive knowledge on the biota, origin, and evolution of the Pantepui biogeographical province. It synthesizes historical information and recent discoveries, covering the main biogeographic patterns, evolutionary trends, and conservational efforts.

Written by international experts on the biodiversity of this pristine land, this book explores what makes Pantepui a unique natural laboratory to study the origin and evolution of Neotropical biodiversity under the influence of only natural drivers. It discusses the organisms living in Pantepui, including algae, plants, several groups of invertebrates, birds, amphibians, reptiles, and mammals. The latter portion of the book delves into the effects of human activity and global warming in Pantepui, and current conservational efforts to combat these threats.

Biodiversity of Pantepui is an important resource for researchers in ecology, biogeography, evolution, and conservation, seeking to understand the biodiversity and natural history of this region, and how to help conserve and protect the Guiana Highlands from environmental and human damages.

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