

***Is there Room for Other-than-Human Agency
in Transdisciplinary Research? An Ethnographic Reflection ****

**¿Hay lugar para la agencia no humana
en la investigación transdisciplinaria? Una reflexión etnográfica**

**Há espaço para agência não-humana
na pesquisa transdisciplinar? Uma reflexão etnográfica**

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The article argues that most of the debates on interdisciplinary and transdisciplinary research and co-production focus solely on human actors and human agency and, as a result, fail to acknowledge the role of other-than-human agency in fields where it plays a central role, environmental governance being one of them. Two cases are presented and analyzed. In the first, climate scientists and technicians in South America co-produce solutions for an environmental crisis brought about by a drought. The article argues that the drought was what enabled co-production to happen meaningfully. The second contrasts the thinking of Yanomami Indigenous author and shaman Davi Kopenawa about the environment and the agencies involved in shamanistic action with the ontological basis of the work of the Intergovernmental Panel on Climate Change (IPCC), in which the integration of Indigenous knowledge has been a goal for over a decade. Based on the analysis of these cases, it is argued that other-than-human agencies need to be recognized in environmental governance.

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Keywords: *co-production; transdisciplinary research; other-than-human agency; indigenous knowledge; IPCC*

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El artículo argumenta que la mayoría de los debates sobre la investigación interdisciplinaria y transdisciplinaria, y también sobre la coproducción, se centra únicamente en los actores humanos y la agencia humana, y en consecuencia no reconocen el papel de la agencia no humana, donde esta juega un papel central, siendo la gobernanza ambiental uno de ellos. Se presentan y analizan dos casos. En el primero, científicos del clima y técnicos en América del Sur coproducen soluciones para una crisis ambiental provocada por una sequía. El artículo argumenta que la sequía fue lo que permitió que la coproducción sucediera de manera significativa. El segundo contrasta el pensamiento del autor y chamán indígena yanomami Davi Kopenawa sobre el medioambiente y sobre las agencias involucradas en la acción chamánica con la base ontológica del trabajo del Panel Intergubernamental sobre Cambio Climático (IPCC), en el que la integración de los conocimientos indígenas se ha anunciado como una meta desde hace más de una década. Con base en el análisis de estos casos, se argumenta que las agencias no humanas necesitan ser reconocidas en la gobernanza ambiental.

Palabras clave: coproducción; investigación transdisciplinar; agencia no humana; conocimiento indígena; IPCC

O artigo argumenta que a maioria dos debates sobre pesquisa interdisciplinar e transdisciplinar, e também coprodução, são focados apenas em atores humanos e agência humana e, como resultado, falham em reconhecer o papel da agência não-humana em campos onde ela possui um papel central, sendo a governança ambiental um deles. Dois casos são apresentados e analisados. No primeiro, cientistas do clima e técnicos da América do Sul coproduzem soluções para uma crise ambiental provocada por uma seca. O artigo argumenta que a seca foi o que permitiu que a coprodução acontecesse de forma significativa. A segunda contrasta o pensamento do autor e xamã indígena Yanomami Davi Kopenawa sobre o meio ambiente e sobre as agências envolvidas na ação xamânica com a base ontológica do trabalho do Painel Intergovernamental sobre Mudanças Climáticas (IPCC), em que a integração dos saberes indígenas é anunciada como meta há mais de uma década. A partir da análise desses casos, argumenta-se que as agências não-humanas precisam ser reconhecidas na governança ambiental.

Palavras-chave: coprodução; pesquisa transdisciplinar; agência não-humana; conhecimento indígena; IPCC

Introduction

This article aims to discuss the role of other-than-human agency in co-production research. The analysis and discussion will be based on two distinct sets of empirical materials: the first is an ethnographic vignette from a research project on the co-production of water and energy governance tools in South America; the second is a collection of fragments of an autobiographic account by an important Amazonian Indigenous leader and shaman. The two cases will be presented sequentially with the intent that the first introduces the topic of non-human agency in environmental governance at a local scale, and the second then connects these two elements – non-human agency and environmental governance – at the level of scientific bodies linked to multilateral agencies, such as the Intergovernmental Panel on Climate Change (IPCC), where the mainstream sciences have been called to engage with Indigenous knowledge systems.

In the debate on inter-multi-transdisciplinarity, I also intend to present a brief reflection on what disciplines look like and how actors and relations are perceived from the perspective of ethnographic work, contrasting this with how they are portrayed in most of the bibliography on inter and transdisciplinary research. My main argument is that the current academic debate on the matter is excessively logocentric and anthropocentric, that is, focused on epistemological aspects of relations between groups of humans. This is problematic because it does not appropriately portray the challenges of cooperation between different communities nor how this happens in practice.

First, let me state my positionality. I am a white male Brazilian anthropologist of science and technology who has recently begun to work on the issue of the participation of Indigenous peoples in climate debates and governance. My projects developed through my career in Latin America, particularly in Argentina, Brazil, and Uruguay, and have focussed on the interface between climate scientists and non-scientific communities, including peasants, politicians, religious groups, and engineers (Taddei, 2017). Recently, with the growth in references to Indigenous knowledge in international environmental governance efforts such as the IPCC (2022) and the IPBES (2019), I decided to investigate the challenges in the interaction between the practices of these organizations and Indigenous philosophies and how they portray environmental issues (Taddei, 2020). This context fits the literature's general definitions of transdisciplinary work (Vienni-Baptista, 2023). Yet, there are crucial elements that seem to have escaped the debate. I intend to point to some of them and discuss whether they can fruitfully contribute to current inter and transdisciplinary research discussions. The critical element refers to the question of what the central variables in question are and where agency resides.

Inter and transdisciplinary research (IDR/TDR) is a dynamic field of academic activity that has been thriving for many decades. This intense activity and the relevance of the topic to practically all sectors of academia and applied sciences is reflected in the abundance of definitions of what counts as inter or transdisciplinary work. Some authors have tried to solve the problem of ambiguity in these definitions by stripping the analysis to the most basic, common elements in inter and transdisciplinary work.

For example, one early analysis in the field of the social sciences mentions a widely adopted conceptual structure often used in other academic realms as well:

“Interdisciplinary then remains the generic all-encompassing concept and includes all activities which juxtapose, apply, combine, synthesize, integrate or transcend parts of two or more disciplines. Multi-disciplinary activity involves juxtaposing, but experiencing little contact between the participating disciplines. Cross-disciplinary approaches involve real interaction across disciplines, though the extent and nature vary considerably. Trans-disciplinary approaches feature overarching thought models which propose to replace existing disciplinary world views” (Miller, 1981, p. 6).

More recently, Klein has suggested that a common feature of different takes on interdisciplinarity is to see it as “a means of solving problems and answering questions that cannot be satisfactorily addressed using single methods or approaches” (1990, p. 196). According to Nissani (1995), the richness of interdisciplinary experiences is a function of the number of disciplines, the distance between them, novelty, and integration.

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Transdisciplinarity is generally understood as bringing non-academic elements to the organization of the work. In the words of Vienni-Baptista, “transdisciplinarity is understood as a reflexive, integrative, method-driven scientific principle (...) Authors focus on how to solve societal problems by integrating knowledge from various scientific and social bodies of knowledge” (2023, p. 64). The author also mentions that one of the strands identified in the literature on transdisciplinarity is a contestatory and transgressive one, often evoked in contexts of critique of educational practices and systems of knowledge or in situations that aim to transform reality (p. 65).

In recent years, transdisciplinary approaches have been systematically linked to the concept of co-production (Chambers *et al.*, 2021). Co-production is also difficult to define; what perhaps distinguishes it from more traditional understandings of IDR/TDR is the expectation of much deeper participation from non-academic stakeholders in all phases of the research process (through co-design, collaborative governance, and social learning, for instance). With more integral involvement of non-academic partners, the range of possible forms of co-production grows considerably. For instance, Bremer and Meisch (2017) identified eight co-production perspectives when analyzing how the concept is operationalized in climate change research alone. Some of these perspectives are associated with more traditional IDR/TDR elements, such as promoting interaction between scientists and other stakeholders; others are more directly related to political variables, such as the empowerment of traditional ecological knowledge.

Similarly, in their analysis of 32 research projects on six continents, Chambers *et al.* (2021) identified six co-production modes based on how the issues of purpose, power, politics, and pathways are approached. These six modes are: researching solutions, brokering power, navigating differences, empowering voices, reframing power, and reframing agency. Notably, the avoidance of the term “discipline” in the concept of

co-production may reflect a much higher awareness of the political dimensions in the interaction between academic and non-academic actors.

The intention of this overtly schematic presentation of some of the critical dimensions of the academic literature on IDR/TDR and co-production is to prepare the ground for the next section of this article, where I will argue that the strict focus on human ideas and interaction is a structural problem in the debate. But first, I want to briefly comment on how research methodologies are vital in defining the lenses through which the forms of collaboration are seen in the IDR/TDR literature.

I want to present and discuss ethnographic (and autobiographic) data. Much has been written about ethnographic work; as with any research method, it has its problems and limitations. One interesting aspect of the ethnographic approach is its assumption that concepts and standards for understanding reality vary considerably across sociocultural settings. Therefore, the ethnographer should relax their categorical thinking and pay attention to how connections between things are perceived in the unfamiliar setting to apprehend the prevailing cultural patterns. One of the most immediate things that tend to dissolve in ethnographic work is precisely disciplinary boundaries and the identities they define. Let's take the work of anthropologists as an example. Many people have never heard the term anthropology, do not know what anthropologists do, and may have mental and cultural representations about the axiomatic elements of reality that do not replicate those that ground the social sciences in Western settings. Some, on the other hand, may understand anthropology from what it may have done to the community or regions – in the recent colonial past, for instance – and, as a result, have a sense of what is politically implied by the presence of the researcher that is much more realistic than that of the anthropologist. In any of these alternatives, categorical equivocations abound, dramatically affecting how the research unfolds. Things can only move ahead when a different, non-disciplinary, but often contextually meaningful and practice-based identity is ascribed to the researcher by the group or community. In research circumstances like these, academic disciplines, their practitioners, and their collaborations often look different from how they are featured in the literature. I will use these contrasts in the following analysis.

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1. Other-than-human actors in co-production

The ethnographic vignette refers to a project that aimed to enable climate scientists to co-produce climate knowledge with technicians at a governmental agency (hereafter called the “agency”) in a South American country involved in water and energy services. The report on this case requires anonymization due to the sensitive political nature of the issue in the region. I intend to demonstrate that human interaction alone cannot account for the results of transdisciplinary or co-produced environmental governance interventions. The environmental processes in question are actors, in the sense of the word used by authors linked to the Actor-Network Theory (Latour, 1993, 2009), so attempts at diagnosing the problems and challenges of inter or transdisciplinarity that focus solely on humans interacting with humans – a dominant feature of the literature – are doomed to be limited and reductionist at best. The reported case goes beyond that, as it shows that transdisciplinary co-production among humans, measured

according to standard anthropocentric metrics, would have been impossible without the unexpected interference of non-human processes.

The project was active in the second half of the 2010s. Co-production was a requirement of the funding agency, as was the inclusion of a “human dimensions” component with the participation of social scientists. The identified research problem was that the agency did not make productive use of climate forecasts in its management of hydrological resources. Incorporating climate forecasts into the agency’s planning was believed to offer an opportunity to reduce vulnerability to droughts and improve efficiency in many sectors, with water distribution and energy production the two main important ones. The research team was hosted at a local university with an important meteorology department; the sub-team of social scientists was based at a different university.

The governmental agency had a meteorology department in which the leading meteorologist had previously done research at the university department where the main team of scientists was based. Team leaders understood this to be an indicator that the relationship between the climate researchers and technicians would run smoothly – so much so that most of the climate scientists believed that if there was any interdisciplinary work going on, it was related to the presence of social scientists and not to their relation to the technicians.

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In the early stage of the project, the technicians told the climate scientists that they needed monthly climate forecasts for the most strategic reservoirs. The climate scientists did not have forecasts at the required spatial resolution or temporal scale. Additionally, the atmospheric processes in the region are less predictable than in other areas in South America, which means that computer models for the region don’t produce forecasts that are as accurate as for areas where climate patterns are highly correlated to the surface temperature of the equatorial Pacific Ocean (the El Niño phenomenon). This fact meant that there was no certainty about the requested forecast efficacy at that point. Relatively recently discovered atmospheric patterns bringing humidity from the Amazon to the southern region of South America (the so-called “atmospheric rivers”) were still to be studied in detail, and it was perceived by the researchers that in the exploration of these patterns resided the potential for success. So, the general expectation was that research would at once contribute to the climate sciences and help improve water management in the country. But expectations of the project’s results were very abstract and generic in the written project; more practical expected results only became explicit when problems started to appear. Intuitively, the climate scientists’ team expected that the new types of climate forecasts requested by the technicians would have been successfully produced by the end of the project and that the agency would have incorporated them into their operational routines. The first goal involved understanding the relevant atmospheric systems, adapting existing computer models according to the specificities of these systems, testing their predictability, and seeing whether computer models could predict essential climate variables such as expected average precipitation (rain) and temperature. The second goal was entirely outside the researchers’ reach and involved the agency’s internal procedures.

It was there that the team of social scientists entered the picture. The social sciences team comprised two anthropologists working in Science and Technology Studies, one master's student, and a small, fluctuating group of undergrads. Besides other more generic goals stated by the project (such as understanding vulnerability patterns), the team had to map out the sociotechnical network that linked climate scientists, climate information, the operational systems used by the agency, and their practical results. The idea was to understand the constraints and transformations of climate information and identify possibilities for using climate information that might be beyond the technicians' radar. The social scientists would do this by combining ethnographic assessments and interviews.

Since the co-production partners were from the agency's meteorology department, the social scientists requested permission to visit them at their headquarters for stays long enough for ethnographic work to be carried out. At first, the technicians did not understand the request, which was systematically rejected. It was unclear to them why the social scientists needed to observe administrative procedures if the project's goal was to develop the required forecasts – something to be done at the university, not at the agency headquarters. They also felt uneasy with the idea that their everyday work would become an object for the analyses of social scientists. The same applied to the climate scientists, who believed the social scientists would only analyze the agency technicians' work, not their own.

However, the most critical reason for agency technicians to object to the physical presence of the social scientists was that the information they handled in their everyday operations was very sensitive. The agency technicians centralize the logistic planning for water use, affecting not only the water and energy infrastructure of the country but also market prices for water and energy. Planning thus involves protecting the system's physical infrastructure and minimizing the overall costs of water and energy. Among the many hundreds of private companies that are part of the national water and electricity markets, some consultancy firms and companies operate in the futures market. Both types of companies would benefit immensely from insider information about how the agency plans its actions. The fear that this could create distortions in the markets led the national government to develop strict protocols for how the agency handles information, including how it produces and uses weather and climate forecasts. In practice, these protocols include three things. First, adopting an attitude of complete secrecy about the agency's internal operations. Second, promoting periodic open public meetings with representatives of the water and energy companies where past decisions are explained and future operation guidelines are announced. Third, the requirement that any new technology must be approved according to a strict consultation protocol with the market.

The social sciences team realized that ethnographic research could only be carried out in settings like public meetings. But the third element, the requirement that the companies that compose the water and energy markets approve the technologies used by the agency and can replicate its results, had profound implications for the project. It meant that the effective adoption of the new forecast models the project intended to develop was beyond all partners' control, including the agency meteorologists. The approval protocol was bureaucratic and involved a regulatory body that was

hierarchically superior to the agency. In practice, the chances that the final results of the project would include an operational forecast running on the agency's computers were minimal, regardless of how good the new forecast might be, because the timing of the official protocol for approval of new tools and technologies was much longer than the project calendar. This was bad news for the research team.

With hindsight, it was clear that the problem reflected a canonical co-production mistake: that of only incorporating stakeholders when the project had already been designed and funded. In the face of all these challenges, the research team decided to develop the scientific aspects of the collaboration, which included work in science and technology studies by the social sciences team, and to follow the activities of the agency and the water and energy markets from a distance. The general perception among the group of social scientists was that the chances of genuine transdisciplinary co-production practically disappeared.

But then two dramatic environmental elements profoundly transformed the context of the research: the intensification of a drought that had begun a few years earlier and that by 2019 put the country in a situation of crisis, with the impending possibility of a collapse in water and energy provision; and the COVID-19 pandemic. Both events disturbed the functioning of the meteorological infrastructures at different levels.

The COVID-19 pandemic generated a dramatic fall in commercial air traffic around the planet. Airplanes are important sources of real-time atmospheric information, and most commercial flights collect information and send it to the World Meteorological Organization through the Aircraft Meteorological Data Relay program. The drop in air traffic during 2020 was up to 90 percent, generating concerns at WMO about the performance of the meteorological models (Miguel *et al.*, 2021). On top of that, in the case of the country where the research was being developed, the agency technicians had to address the unprecedented reduction in industrial demand for electricity and manage production at extremely low levels of water accumulation and river flow. The higher management at the agency became concerned about the performance of their simulation models, adjusted and optimized for typical conditions over the years, in such non-typical circumstances.

This infrastructural emergency forced the agency to loosen model usage restrictions. The technicians had to address the model efficiency crisis by creatively using other available resources, including models that were not official according to the regulatory protocols. It included using new forecast tools, such as the ones developed by the research team. Regarding co-production, the proximity between the technicians and the climate scientists generated by the project was strategic and instrumental during the crisis, with scientists informally helping technicians make difficult decisions, including on matters unrelated to the climate models developed in the project.

Returning to the discussion about IDR/TDR and co-production, the most relevant element, in this case, is that due to structural constraints at a higher level (the regulations imposed upon the agency by the country's regulatory body about how to handle sensitive information), stakeholders and scientists could organize their interactions and adopt definitions of what they were doing according to any combination

of ideas found in the IDR/TDR and co-production literature and still no practical results would be possible (at least, within the time frame of the project). The only possibility for success was the appearance of an external factor that put the entire system in emergency mode, in which regulations could be renegotiated or temporarily set aside. In this case, the external factor was the combination of the long and severe drought, the sudden variation in information availability and energy demand brought about by the COVID pandemic, and the infrastructural crisis this generated in the country. The environmental processes were, in fact, the most relevant actors in the co-production achieved by the project.

One question that arises here is whether this case is exceptional or all co-production involving environmental governance inevitably has environmental elements as other-than-human participants, regardless of scholars' and technicians' recognition of this fact. Some may argue that this may not be an instructive case because producing generalizable conclusions from extraordinary facts, such as climate or epidemiological anomalies, is inappropriate. There are two reasons, nevertheless, to take examples like the case here reported as something other than exceptional. The first is related to the predicted and documented increase in the frequency of extreme atmospheric events associated with climate change, on the one hand, and of epidemic outbreaks related to zoonotic diseases as a direct effect of environmental degradation on the other. The contrast between "normal" and "abnormal" in ecosystem processes has been dramatically reevaluated in recent decades. From the theorization about the contexts and implications of post-normal science by Functowitz and Ravetz (1993) and the risk society by Beck (1992) and Giddens (1990) to the enunciation of the inevitable intrusion of Gaia by Stengers (2015) and Latour (2017) to the critical evaluations of the concept of Anthropocene (Taddei *et al.*, 2022; Ferdinand, 2019), nature, science, and non-scientific forms of understanding reality are being dislocated and repositioned in ways that give more recognition to other-than-human agency and promote more horizontal political alignments between science and other (human and other-than-human) stakeholders. The other reason for the relevance of cases such as the one reported above is that they present, on a local scale and in ways that are easier to grasp, crucial political developments going on at higher governance levels, such as the scientific panels linked to the United Nations.

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The second set of empirical materials refers to how, in some settings, other-than-human agencies are seen not as an outcome of ecosystemic events but rather as constitutive elements of reality. Even though this may be a radical leap from what is described in the case above, this is the challenge brought to ongoing efforts to construct global environmental governance schemes when the issue of integrating Indigenous knowledge is considered.

2. Non-human actors as partner stakeholders

The second case refers to current attempts at increasing diversity at high-level organizations of environmental governance. More specifically, it relates to the integration of Indigenous knowledge at the Intergovernmental Panel on Climate Change (IPCC), the platform created in 1988 by the United Nations Environmental Programme (UNEP)

and the World Meteorological Organization (WMO). Despite the good intentions, many are skeptical about whether the IPCC has the degree of flexibility and openness in its internal procedures to question and discuss its underlying epistemological and ontological assumptions. From this angle, the case brings provocations that may function as fruitful contributions to the current debates on transdisciplinarity and co-production. That partners in transdisciplinary collaboration or co-production are not aligned epistemologically is a given. The relevant question is whether ontological alignment is required.

Since its creation, the IPCC has produced six cycles of review and evaluation of the state of knowledge about the planet's climate. The sixth assessment cycle (also referred to as AR6) has recently published its final synthesis report. The IPCC aims to produce reports in formats that effectively affect climate policy (and climate politics) across the planet. Over the platform's history, knowledge has been systematically used as a synonym for scientific knowledge, and participants have been predominantly white male specialists in the Earth system sciences from or based in the Global North (Standing, 2023).

References to Indigenous peoples have always been present, but until the fourth assessment cycle (AR4), Indigenous peoples were mentioned predominantly as victims of climate change and as rights holders for the preservation of their cultural heritages, demanding protection from national governments and multilateral agencies. This is also how they appear in the UN 2030 Agenda and its 17 Sustainable Development Goals.

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The AR4 is the first report that mentions Indigenous peoples as holders of knowledge about the adaptation of local communities to environmental change that may not be available to science. Even if timid, this fact marks a significant shift in attitude. It also reflects the increased number of social scientists and researchers from the humanities in the IPCC. The direct participation of Indigenous thinkers is practically non-existent in the main IPCC report to this day (Carmona *et al.*, 2022a, 2022b; Van Bavel *et al.*, 2023), although there are signs that this may change in the near future.

In the AR6, and particularly in the summary for policymakers' report issued by the working group II (impacts, adaptation, and vulnerability), explicit references to co-producing solutions with Indigenous peoples can be found, as seen in the passages reproduced below:

"This report recognises the value of diverse forms of knowledge such as scientific, as well as Indigenous knowledge and local knowledge in understanding and evaluating climate adaptation processes and actions to reduce risks from human-induced climate change" (p. 5).

"Cooperation, and inclusive decision making, with local communities and Indigenous Peoples, as well as recognition of inherent rights of Indigenous Peoples, is integral to successful forest adaptation in many areas" (p. 24).

"Inclusive planning initiatives informed by cultural values, Indigenous

knowledge, local knowledge, and scientific knowledge can help prevent maladaptation” (p. 28).

“A wide range of top–down, bottom–up and *co-produced* processes and sources can deepen climate knowledge and sharing, including capacity building at all scales, educational and information programmes, using the arts, participatory modelling and climate services, Indigenous knowledge and local knowledge and citizen science” (p. 29; emphasis added).

Nevertheless, it is not clear how exactly the engagement of Indigenous peoples and Indigenous thinkers may happen. As extensively discussed in the literature (Cointe, 2023; Edwards, 2010; Guillemot, 2023; Standing, 2023), the IPCC is primarily dominated by climate modelers, and the most important knowledge products made public by the reports of the assessment cycles have been the different climate change scenarios, generated by heavy modeling and computing, and their implications.

In this context, initiatives have emerged to systematically document the perceptions of Indigenous peoples on the local effects of climate change in various parts of the globe (Guáqueta-Solórzano and Postigo, 2022; Reyes-García *et al.*, 2023). Part of these initiatives aims to convert the records of such patterns of perception of ecosystem alterations into databases and eventually transform these qualitative assessments into numerical scales capable of being statistically tested and related to ecosystem simulation models. These efforts, however, are grounded in a series of epistemological and ontological assumptions – about the nature of information, its transmutability, and its relationship with things in the world, for example – which do not reproduce how epistemologies and ontologies are present in Indigenous ways of life. Hence, there is the possibility that the structures of Indigenous knowledge are mischaracterized, with profound political implications. Attention to data sovereignty (Reyes-García *et al.* 2022) has been proposed as a solution to the problem. However, if the ontological requirements imposed on data for it to be conversable with scientific databases are not problematized, protecting data sovereignty will have little effect.

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Still, the political implications of being part of the IPCC are recognized as valuable by many Indigenous organizations (Carmona, 2022a, 2022b), and some have been striving for more direct participation. In 2020, the Inuit Circumpolar Council (ICC) was granted a role as an external observer, making the organization the first Indigenous entity to participate directly in the panel’s internal workings (ICC, 2022). The participation of Indigenous authors in the 2019 IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (IPCC, 2019) is also a sign of changing attitudes.

The ontological question mentioned in the opening paragraph of this section is relevant because different partners may have different ideas about who or what the agencies populating the arena are and about the context in which co-production work will unfold. To illustrate this, I will evoke the thinking of one of the most remarkable Indigenous philosophers of the present times – author and shaman Davi Kopenawa, one of the political leaders of the Yanomami Amazonian people, whose lands are located in northern Brazil and southern Venezuela. I first heard Kopenawa speak at the National Museum of Rio de Janeiro in 2011. In his talk, he discussed the matter

of climate change and mentioned that Amazonian shamans are aware of the sensitive nature of the problem and have been intensely working on it for many years now. He stated that everything that non-Indigenous peoples (scientists included) perceive of global warming is what the shamans cannot mitigate (Taddei, 2023).

In 2010, Kopenawa published a book in France with anthropologist Bruce Albert entitled *La Chute du Ciel*. The book appeared in English in 2013, Portuguese in 2015, and Italian in 2018, and editions are currently being prepared in Spanish, German, and Korean. The work has been cited over a thousand times, according to Google Scholar, and by 2023 Kopenawa had received two honorary doctoral degrees and had been elected a member of the Brazilian Academy of Science. It is important to mention these facts as evidence that there has been broad recognition of the relevance of Kopenawa's ideas in general and regarding the current environmental crisis in particular. The problem, though, is that this recognition is mainly restricted to the humanities and the social sciences.

Kopenawa's book gives one of the most detailed descriptions of Amazonian shamanism, with vivid accounts of his training and descriptions of what happens during a shamanistic trance. It also describes the functioning of the world, including the dimensions that are not accessible to non-shamans, and offers criticism of Western modes of existence, with all the environmental devastation it entails.

I will briefly mention a few aspects of his description relevant to this text's discussion. First, as his statement at the museum in Rio made clear (and numerous passages in the book reinforce and provide detail), the most critical dimension of reality is that of spiritual beings of the forest called *xapiri* by the Yanomami. Material circumstances, including environmental processes of all kinds, reflect what happens in the spiritual domain. Other-than-human entities such as animals, plants, rivers, mountains, geographic accidents, and astronomical bodies have associated *xapiri* spirits and, through them, have volition and intentionality akin to humans. This means that engagement with other-than-human beings are social and political endeavors and must happen in the spiritual domain, which shamans access through ritual substances. In practical terms, this means that there is no nature; that is, there is no realm composed of beings that may be materially alive but are understood to have no consciousness. All beings that matter have social and political lives as complex as those of humans. Still, humans cannot access these dimensions, for bodies impose specific forms of perception that, under normal circumstances, make the conscious lives of different species mutually incommensurable. Shamanistic technologies may partially bridge this existential breach, but the situation is usually dangerous and requires tremendous inter-species political abilities.

In Kopenawa's perspective, what explains the seemingly incomprehensible tendency of non-Indigenous (and non-traditional) peoples to destroy the very land that nourishes them is that they cannot access the realm of spirits and, therefore, cannot see the actual mechanisms of reality and adjust their behavior accordingly. The result is patterns of conduct guided by a childish desire for material accumulation, greed, self-centeredness, and vanity. Material accumulation may manifest in the thirst for knowledge, although of a shallow and illusory nature, with no effects on what is most

important: the protection of life. It explains why non-Indigenous people can study the Amazon as never before while their relatives destroy the forest. It leads Indigenous leaders to conclude that for the non-Indigenous, knowing and caring are disconnected (Taddei, 2023).

Additionally, the notion of personhood, as Western ideas conceive it, is somewhat dissolved through shamanism. Kopenawa describes how becoming a powerful shaman means establishing cooperation networks with as many different xapiri kinds of spirits as possible. Specific xapiri are involved in certain events or aspects of life in the world; the more allied xapiri a shaman has, the more capable they are of handling the many challenges that may come up in everyday life. But beyond that, becoming a shaman also involves having one's personhood disassembled and reassembled by some xapiri, so the abilities and power of those spiritual beings are fused into the spiritual body of the shaman. In the following paragraph, Kopenawa explains how the xapiri prepared his body to enable his performance as a shaman:

“After they cut me up, the xapiri quickly escaped with the different parts of my body they had just sliced off (...) The images of the yōrixiana thrush, the ayokora cacique, and the sitipari si birds, masters of songs, tore out my tongue. They seized it to remake it, to make it beautiful and able to utter wise statements (...) Then I was finally able to imitate their voices and answer their words with right and clear songs” (Kopenawa & Albert, 2013, p. 95).

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The meaning of all this is (among other things) that the shaman is not a manifestation of human personhood but a meshwork of human and other-than-human agencies. Some of these agencies may be related to the spiritual entities directly linked to the environmental elements, such as the atmosphere. As a result, the distinction between what is human and what is atmospheric, and which should exert influence and power over which, is dramatically disorganized and shuffled in the shamanistic view of things. This is one example, well documented in the literature, that demonstrates that traditional Indigenous life modes do not share Western cultures' human exceptionalism. As some authors put it (Taddei, 2023), the shaman is one venue through which the spirits of the forest manifest agency in the human realm – in all settings, including, eventually, the IPCC.

3. Discussion

The two cases presented and analyzed above are interconnected. The first introduces the theme of non-human agency at a local scale and in a familiar techno-scientific setting. In contrast, the second pushes the discussion to the limit, taking it to an unfamiliar context where the very mechanisms of global climate governance are under construction. This section will keep the debate in the contrast between modern (in the Latourian sense) and Indigenous modes of being. The setting of the first case, nevertheless, is not lost from view if we remember that important trends in the field of science and technology studies, such as Action-Network Theory, impute agency not

only to elements of ecosystems but also to inanimate objects in places like scientific labs (see, for instance, Latour & Woolgar, 1979).

The question that remains is whether it is possible for (non-Indigenous) scientists and Indigenous thinkers and leaders to co-produce environmental solutions for climate change in a context in which there is no agreement about how the world functions, what the most fundamental dimensions of existence are, what needs to be done to address the crisis, and which species of agent should do it. The challenges for integrating Indigenous knowledge at the global levels of climate governance are enormous, as non-Indigenous scientific and political organizations are equipped with several tools for erasing all these dimensions from the debate.

One of these tools is the reduction of the relevance of Indigenous knowledge to the local scale. While the IPCC has not advanced in materializing such integration, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) is a more recent creation set up with Indigenous participants from the start. Despite this, the IPBES treats indigenous knowledge as irremediably local, that is, very important in how it produces indicators of how ecosystems and biodiversity are transformed, but limited to this scale. The most important report of the platform published to date says: "local and indigenous knowledge systems are locally based, but produce regional impacts and, therefore, are globally relevant" (IPBES, 2019, p. 32). The dimensions of indigenous thought that refer to more general and systemic issues are ignored.

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If we take into account the fact that both the IPCC and the IPBES, through their connection to the United Nations system, are immersed in diplomatic structures, it is not surprising that their reports produce the erasure of dimensions of Indigenous discourse that tend to be harshly critical of the modes of existence of modern societies – and this criticism is precisely what the messages of thinkers such as Davi Kopenawa, Ailton Krenak (2021), Jerá Guarani (2022), and Vine Deloria Jr. (1969) bring in a systematic way. Additionally, Indigenous criticism is recurrently perceived as excessively metaphysical or religious. Thus, the speech of Indigenous thinkers is often felt to be cognitively uncomfortable and is dismissed. On the other hand, descriptions made by Indigenous groups of ecosystem alterations that converse with ecology, biology, and meteorology models without significant noise are maintained. Thus, even if never overtly stated, the terms imposed on indigenous peoples if they wish to participate in international debates are established.

This is an important frontier in the transdisciplinary co-production debate. It may seem distant and unrelated to most of the examples cited in the co-production literature, especially that relating to climate issues (e.g., the burgeoning bibliography on climate services). Yet, the challenge brought by the second case refers to nothing less than the most important platform for collective climate knowledge systematization on the planet, one that has tremendous political implications. And, if anthropological theories such as Amerindian Perspectivism (Viveiros de Castro, 2014) are correct in how they affirm that the structural elements of Kopenawa's ontology are in some way pervasive across Indigenous peoples around the planet (and particularly so in the Americas), it

is to be expected that ideas somewhat related to Kopenawa's will at some point be brought by Inuit representatives and other Indigenous peoples to the IPCC and similar contexts.

The IDR/TDR and co-production debates need to acknowledge other-than-human agencies as inevitable environmental governance actors and be prepared to engage in co-production with them. How exactly to go about it in ways that are not unexpected and fortuitous, as mentioned in the first case, is a crucial and pressing research agenda for the social sciences, one that must be co-designed by researchers from all ontological walks of life. Global climate governance may profit immensely from it.

References

Beck, U. (1992). *Risk Society: Towards a New Modernity*. Thousand Oaks: Sage Publications.

Bremer, S. & Meisch, S. (2017). Co-production in climate change research: reviewing different perspectives. *WIREs Clim Change*, 8: e482. DOI: 10.1002/wcc.482.

Carmona, R., MacDonald, J. P., Dorough, D. S., Rai, T. B., Sanago, G. A. & Thorsell, S. (2022a). Recognising the contributions of Indigenous Peoples in global climate action. An analysis of the IPCC report on Impacts, Adaptation and Vulnerability. IWGIA Briefing Paper, March 2022.

Carmona, R., MacDonald, J. P., Dorough, D. S., Rai, T. B., Sanago, G. A. & Thorsell, S. (2022b). A new paradigm of climate partnership with Indigenous Peoples. An analysis of the recognition of Indigenous Peoples in the IPCC report on mitigation. IWGIA Briefing Paper, June 2022.

Chambers, J. M., Wyborn, C. & Ryan, M. E. *et al.* (2021). Six modes of co-production for sustainability. *Nat Sustain*, 4, 983–996. DOI: 10.1038/s41893-021-00755-x.

Cointe, B. (2023). Scenarios. In Pryck, K. and Hulme, M. (orgs.), *A Critical Assessment of the Intergovernmental Panel on Climate Change* (137–147). Cambridge & New York: Cambridge University Press.

Deloria Jr., V. (1969). *Custer Died For Your Sins; An Indian Manifesto*. New York: The Macmillan Company.

Edwards, P. (2010). *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming*. Cambridge: MIT Press.

Ferdinand, M. (2019). *Une écologie décoloniale. Penser l'écologie depuis le monde caribéen*. Paris: Seuil.

Funtowicz, S. & Ravetz, J. (1993). Science for the post-normal age. *Futures*, 25(7), 739–755.

Giddens, A. (1990). *The Consequences of Modernity*. Stanford: Stanford University Press.

Guáqueta-Solórzano, V-E. & Postigo, J.C. (2022). Indigenous perceptions and adaptive responses to the impacts of climate variability in the Sierra Nevada de Santa Marta, Colombia. *Frontiers in Climate*, 4. DOI: 10.3389/fclim.2022.910294.

Guarani, J. (2022). *Becoming Savage*. *Futuress*, April 22, 2022. Available at: <https://futuress.org/stories/becoming-savage/>.

Guillemot, H. (2023). *Climate Models*. In K. Pryck & M. Hulme (Orgs.), *A Critical Assessment of the Intergovernmental Panel on Climate Change* (126–136). Cambridge & New York: Cambridge University Press.

ICC (2022). Inuit Circumpolar Council, first Indigenous Peoples Organization to formally participate as an Observer at the IPCC. Press release, March 1, 2022. Available at: <https://www.inuitcircumpolar.com/news/inuit-circumpolar-council-first-indigenous-peoples-organization-to-formally-participate-as-an-observer-at-the-ipcc/>; accessed on February 16, 2023.

262 IPBES (2019). *Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Bonn: IPBES Secretariat.

IPCC (2019). *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate*. Cambridge & New York: Cambridge University Press. DOI: 10.1017/9781009157964.

IPCC (2022). *Summary for Policymakers*. In *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge & New York: Cambridge University Press, 3-33. DOI: 10.1017/9781009325844.001.

Klein, J. T. (1990). *Interdisciplinarity: History, Theory, and Practice*. Detroit: Wayne State University Press.

Kopenawa, D. & Albert, B. (2013). *The Falling Sky: Words of a Yanomami Shaman*. Cambridge: Harvard University Press.

Krenak, A. (2021). *Ideas to Postpone the End of the World*. Toronto: House of Anansi Press Inc.

Latour, B (1993). *We Have Never Been Modern*. Cambridge: Harvard University Press.

Latour, B. (2009). *Politics of Nature: How to Bring the Sciences into Democracy*. Cambridge: Harvard University Press.

- Latour, B. (2017). *Facing Gaia: Eight Lectures on the New Climatic Regime*. Malden: Polity Press.
- Latour, B. & Woolgar, S. (1979). *Laboratory Life: The Construction of Scientific Facts*. Princeton: Princeton University Press
- Miguel, J. C. H., Taddei, R. & Figueiredo, F. S. (2021). Coronavirus, infrastructures and the sociotechnical (dis)entanglements in Brazil. *Social Sciences & Humanities Open*, 4, p. 100146.
- Miller, R. C. (1982). Varieties of interdisciplinary approaches in the social sciences: A 1981 overview. *Issues in Integrative Studies*, 1, 1–37.
- Nissani, M. (1995). Fruits, salads, and smoothies: A working definition of interdisciplinarity. *The Journal of Educational Thought (JET)*, 29(2), 121–128.
- Reyes-García, V., Tofighi-Niaki, A., Austin, B. J., Benyei, P., Danielsen, F., Fernández-Llamazares, Á., Sharma, A., Soleymani-Fard, R. & Tengö, Ma. (2022). Data sovereignty in community-based environmental monitoring: Toward equitable environmental data governance. *BioScience*, biac048. DOI: 10.1093/biosci/biac048.
- Reyes-García, V., Álvarez-Fernández, S., Benyei, P., García-del-Amo, D., Junqueira, A. B. & Labeyrie, V. *et al.* (2023). Local indicators of climate change impacts described by indigenous peoples and local communities: Study protocol. *PLoS ONE*, 18(1), e0279847. DOI: 10.1371/journal.pone.0279847.
- Standring, A. (2023). Participant diversity. In K. Pryck & M. Hulme (Orgs.), *A Critical Assessment of the Intergovernmental Panel on Climate Change (61-70)*. Cambridge & New York: Cambridge University Press.
- Stengers, I. (2015). In *Catastrophic Times: Resisting the Coming Barbarism*. Open Humanities Press.
- Taddei, R. (2017). *Meteorologistas e Profetas da Chuva: Conhecimentos, Práticas e Políticas da Atmosfera*. São Paulo: Terceiro Nome.
- Taddei, R. (2020). Anthropology and the pragmatics of climate knowledge in Brazil. *American Anthropologist*, 122, 944–947.
- Taddei, R. (2023). Kopenawa and the environmental sciences in the Amazon. In N. Bubandt & T. S. Wentzer (Eds.), *Philosophy on Fieldwork: Case Studies in Anthropological Analysis (353-372)*. London: Routledge.
- Taddei, R., Shiratori, K. & Bulamah, R. C. (2022). Decolonizing the Anthropocene. In H. Callan & S. Coleman (Orgs.), *The International Encyclopedia of Anthropology*, 1, 1-12. London: Wiley.

Van Bavel, B., MacDonald, J. P. & Dorrough, D. S. (2023). Indigenous Knowledge Systems In K. Pryck & M. Hulme (Orgs.), *A Critical Assessment of the Intergovernmental Panel on Climate Change* (116–125). Cambridge & New York: Cambridge University Press.

Vienni-Baptista, B. (2023). Disentangling Interdisciplinarity and Transdisciplinarity: The Beauty of Differing Definitions. In O. Pombo, K. Gärtner & J. Jesuíno (Eds.), *Theory and Practice in the Interdisciplinary Production and Reproduction of Scientific Knowledge. Logic, Argumentation & Reasoning*, 31. DOI: 10.1007/978-3-031-20405-0_2.

Vienni-Baptista, B. I., Fletcher, C. Lyall & Pohl, C. (2022). Embracing heterogeneity: Why plural understandings strengthen interdisciplinarity and transdisciplinarity. *Science and Public Policy*, 49, 865–877. DOI: 10.1093/scipol/scac034.

Viveiros de Castro, E. (2014). *Cannibal Metaphysics*. Minneapolis: University of Minnesota Press.