# PLURIVERSE IN SCIENCE: DISCOURSES OF AMAZONIAN LAND-USE CHANGE AND SOCIO-ENVIRONMENTAL (IN)JUSTICE

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With 3 figures and 2 tables
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**Summary**: In the Brazilian Amazon region, social, economic, and political changing structures have increased the pressure on land, generating inequalities for the region's most vulnerable residents. Simultaneously, scientific knowledge production has increased and documented the region's different realities. This document presents a scientific discourse analysis of land-use change in the Amazonian region and its interaction with socio-environmental (in)justice, considering the pluriversal perspective. We respond to the main questions: Do hierarchies in scientific knowledge production contribute to silencing subaltern voices and hiding a pluriverse approach when writing about Amazonia land issues? And if so, how? A systematic literature review was conducted using the scientific dissemination platforms Scielo, Scopus, and WoS. The results show a disproportionate representation of some stakeholders, and some states are used as near-total representatives for the Amazonia region. Furthermore, consideration of pluriversal perspectives in the articles does not guarantee high sensibility for heterogeneity of local contexts or for making subaltern voices heard.

**Zusammenfassung**: In der brasilianischen Amazonasregion haben die sich verändernden sozialen, wirtschaftlichen und politischen Strukturen den Druck auf das Land erhöht und Ungleichheiten für die vulnerabelsten Bewohner*innen der Region geschaffen. Gleichzeitig hat die wissenschaftliche Wissensproduktion zugenommen und unterschiedlichste Realitäten in der Region dokumentiert. In diesem Dokument wird eine wissenschaftliche Diskursanalyse des Landnutzungswandels im Amazonasgebiet und seiner Wechselwirkung mit sozio-ökologischer (Un-)Gerechtigkeit unter Berücksichtigung einer pluriversalen Perspektive vorgestellt. Wir antworten auf die Fragen: Tragen Hierarchien in der wissenschaftlichen Wissensproduktion dazu bei, subalterne Stimmen zum Schweigen zu bringen und einen pluriversen Ansatz beim Schreiben über Landfragen in Amazonien zu verbergen? Und wenn ja, wie? Hierfür wurde eine systematische Literaturrecherche unter Verwendung der wissenschaftlichen Verbreitungsplattformen Scielo, Scopus und WoS durchgeführt. Die Ergebnisse zeigen eine überproportionale Repräsentation einiger Interessengruppen, und einzelne Staaten werden als nahezu vollständige Repräsentanten für die Region Amazonien verwendet. Darüber hinaus garantiert die Berücksichtigung pluraler Perspektiven in den Artikeln keine hohe Sensibilität für die Heterogenität lokaler Kontexte oder für die Berücksichtigung subalterner Stimmen.

**Keywords**: Discourse analysis, knowledge production, land-use, pluriverse, social geography, socio-ecological justice

## 1 Introduction: Pluriverse perspectives on Amazonian socio-environmental dynamics

Within dominant global political and scientific discourses on land-use change and climate change, Amazonia is described as (an untouched) native forest and 'green lung' of the world's climate. Consequently, there is a widespread call for the international community to safeguard this region. Land-use change and drivers for land-use dynamics have been analysed in a wide range of scientific articles by modelling physical and ecological factors and their interconnectedness with agriculture, cattle ranching and forestry (see examples: Oaigen et al. 2013, Laue & Arima 2016, Staal et al. 2020, de Sales Silva 2021). Among the scientific articles focused on the region, some use Integrated Assessment Models procured by international organisations, such as IPCC and IPBES, to try to estimate future scenarios and explain rationales of farmers in the Amazon region (Klatt et al. 2018, Smith et al. 2019). However, these models use economic and productivity dynamics, tending to leave behind aspects of historical embeddedness, social inequality, land tenure and power relations. Since the occupation and settlement of Amazonia by the Portuguese colonial power, processes of frontier expansion have accompanied Amazonian land conflicts, triggering land-use changes(Mueller et al. 1994, Simmons 2004). Marginalised and subaltern groups like indigenous peoples, *posseiros*, and *ribeirinhos,* among others, have been excluded from land

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rights, expelling them from the areas they have occupied before (Fraser 2018).

In an increasingly interconnected world, science is pivotal, guiding our understanding of natural and social phenomena and dynamics while presenting and driving decisions, innovation, and solutions to some of humanity's most pressing challenges (Robinson 1992, Andreotti et al. 2015, Ahenakew 2016). However, within the production of scientific knowledge, there has long existed a hegemony in which the Western perspective disproportionately dominates the discourse (Ahenakew 2016, Stein 2019). This dominance has led to a limited representation of diverse cultures, with far-reaching implications (Mignolo 2007, Querejazu 2016, Leff 2017). For instance, according to Petzold et al. (2020), there is a lack of internationally visible and recognised scientific studies that consider socio-environmental justice and indigenous or local knowledge in their results on socio-economic interrelations with climate change and future scenarios, respectively.

Against this background, this article challenges dominant scientific debates on land-use change in the Amazonian context. It searches whether these debates ignore socio-environmental conflicts by not considering plural voices when talking and writing about social and environmental dynamics and visions of possible and plausible futures in the context of climate change. In addition, it explores whether scientific debates and justice issues are mostly ignored or, at most, mentioned as a future duty to be worked on. We follow the current multi-epistemic (decolonial - pluriversal) debates on how to consider social and environmental justice issues, integrate and avoid silencing indigenous and local knowledge when assessing vulnerability to climate change (see examples on Kothari et al. (2019)).

This article explores the dominant scientific discourses on land-use change and socio-ecological justice in the Brazilian Amazonian region and the blind spots concerning subaltern visions of past, present and future. In order to identify the different scientific approaches and practices generated in and for the region and disseminated in the 'Western' and Latin-American scientific community, this article first explores power relations within peer-reviewed scientific knowledge production and concepts of decolonial pluriverse thinking. After a short introduction to relevant dynamics in the Amazon region and the presentation of the applied methodology, we perform a quantitative and qualitative analysis of scientific articles on Brazilian Amazonia, specifically on land and forest dynamics related to environmental (in)justice issues. Finally, we provide a qualitative analysis by identifying the scientific conceptualisations of socio-environmental conflicts in Amazonia and the relevance of the pluriverse approach focusing on (in)justice and subaltern voices.

## 2 Conceptual framework

Our objective is to answer the following questions: Do hierarchies in hegemonic scientific knowledge production contribute to silencing subaltern voices and hiding a pluriverse approach when writing about Amazonia land issues? And if so, How? For this, we: i) Examine the historical evolution and framework of scientific knowledge production and the prevailing scientific discourses regarding land-use changes in Amazonia. ii) Identify if other forms of knowledge and socio-environmental justice issues are addressed or overlooked. We link these observations to the concept of pluriversality because it offers a decolonial theoretical-conceptual basis for exploring the importance of debates about socio-environmental justice and marginalised epistemologies.

### 2.1 Dominance structures in scientific knowledge production

First, we consider scientific knowledge production as one of the crucial arenas where ontologies are negotiated. It is where the proliferation of knowledge starts and – sooner or later – becomes dominant in society, economy and politics. Although Western scientific knowledge represents only one of the diverse ways of knowing – e.g. social learning, everyday knowledge, religious doctrine, mythology, oral tradition, etc. – internationally, science (and its scientific method) is recognised as objective, analytical, logical, rational and compelling, thus as 'true'. Consequently, science became the most robust way of generating knowledge and accessing 'truth' under the universal episteme (Querejazu 2016). As it follows the ideas of the Enlightenment in Europe and its colonial expansion (Mignolo 2011), the universal scientific knowledge tradition – which, from now on in this article, we are going to call 'Western' – entails a system ordered by 'universal' rationality, or reality, promising epistemic authority, certainty, and predictability. Seeking technical and scientific solutions (Ahenakew 2016, Stein 2019), this

Eurocentric and Western system naturalises human supremacy over other beings, such as of white supremacy over indigenous, black and racialised communities (Ahenakew 2016, Andreotti et al. 2018, Daigle 2019, Stein 2019). Consequently, the knowledge produced by the 'universal world' neglects and works against the theoretical contributions of other perspectives, making invisible these other knowledges and causing more inequalities and injustice (Querejazu 2016, Leff 2017).

As non-European, non-Western ways of knowing the world are marginalised and delegitimised simultaneously, the invention of the internet facilitated rapid knowledge exchange within the last decades. However, historically observed inequalities in the invisibility of non-Western scientific production are reproduced by unequal access to digital infrastructure – the so-called digital gap – and financial support by public and private research funding organisations (UNESCO 2015). Although expenditure on research and development sectors grew in low- and middle-income countries from PPP$ 230 billion in 2007 to PPP$ 450 billion in 2013, their share remains at 30 per cent of world expenditure (UNESCO 2015). This ratio almost exactly translates to the share of publications– registered in 2014 in Thomson Reuters' Web of Science Citation Index Expanded. Worldwide, North America and Europe alone were responsible for almost 70 per cent of all publications in the same year (UNESCO 2015). Furthermore, the gap between upper-middle-income, lower-middle-income, and low-income countries is relatively high, with research and development expenditure of PPP$ 156,4 per capita in the former and PPP$ 26,6 per capita or less in both latter categories (UNESCO 2015). These numbers show immense inequalities in scientific production and communication (Petitjean et al. 1992 p. 523, Alatas 2003, Weingart 2006). Brazil plays an exceptional role within the global south due to the fact that the first academic institutions were already founded in the 16$^{th}$ century by the Portuguese colonisers (Petitjean et al. 1992, Marini 1994). Nevertheless, at the end of the 19th century, Latin American scientists mainly linked their ideas to European classical authors and moved their perspectives to US-American authors in the 1920s and 1930s. Only in the 1960s – with the increasing exchange within the continent – did Latin American science emancipate, and since then, produce independent and self-reliant theoretical concepts and own scientific discourses (Petitjean et al. 1992, Marini 1994, Hountondji 2009).

### 2.2 Pluriverse thinking as a response to the 'universal world'

As a response and counter-reaction to the still existing dominance of Western science and ontologies, pluriverse thinking was born. It is a epistemology of the global south , specifically a Latin American one, which recognises the multiplicity of 'unique worlds' and their ontologies (Mignolo 2007). The explanation of the pluriverse is both a critique of the Western and/or Eurocentric 'universal' world assumption and an affirmation of the various ontologies and the meaning of those ontologies' political and ethical implications. Conway & Singh (2011) define the dominant 'universal world' as a unitary ontology that believes the universe is one that, within single modes of thinking, is knowable on a global scale and is therefore manageable and governable in those terms. In addition, the way knowledge is produced (Western scientific knowledge) differentiates what is accepted as existent and real and what is a product of fantasy, belief, dreams, etc. (Querejazu 2016). Thus, knowledge production/epistemologies are directly interlinked with ontologies (philosophical study of being) and affect rationales, action, and policy-making, among others (Ahenakew 2016). Consequently, in the context of Western scientific knowledge production, only things/processes/structures that are measurable can be proved and are therefore accepted as real. In contrast, Escobar (2004) characterises the inclusive logic of pluriversality and describes the pluriverse as: "a medium for one-worlders to make alternatives to one world plausible and connect with those other worlds that threaten the one-world story". Hence, the pluriverse does not want to replace any knowledge system but to establish a dialogue and an exchange among the existing epistemologies in the world (Zuckerhut 2017). It also recognises the presence of several dimensions that are somehow interconnected: the natural, the human, and the spiritual, for example. Therefore, to assume the pluriverse as an ontological starting point, it is necessary not only to tolerate diversity but also to understand the constituted existence of many universes, many types of worlds, many ontologies and epistemologies, and many ways of experiencing these many worlds (Querejazu 2016). Most recently, some non-Western concepts gained consideration even in Western scientific debates, for instance, the Andean concept '*Buen Vivir*', the '*Ubuntu*' concept of Southern Africa or the pluriverse thinking of the Zapatista movement. The fact that pluriverse concepts gain consideration in influential

scientific journals and debates may be a result of the move of several pluriverse and decolonial scholars to universities in the United States of America (USA)– Arturo Escobar, Walter Mignolo, Aníbal Quijano, Ramón Grossfoguel, Nelson Maldonado-Torres, Gloria Anzaldua, etc. – where access to globally dominant scientific discourses is eased. Nevertheless, as explained by Moosavi (2023), neither origin nor self-declaration frames decolonised and pluriversal scholars but rather the process of challenging the colonial Westernised knowledge production and procuring the pluralisation of knowledges and ontologies in and out of academia. Moreover, scholars of pluriverse and decolonial concepts like Donna Haraway, Julie Cruikshank, Sebastian Garbe, the Orangotango and Kartattack collectives, among others, try to decenter 'Western science'. They, for instance, interate into their texts perspectives of subaltern groups (integrating them as authors), try to understand concepts of non-scientific epistemologies (*Cuerpo-territorio, Sentipensar etc.*), and use research methods that undertake to capture other ways of knowing (creative, artistic methods). However, a continuous sruggle is the translation of non-scientific knowledge into scientific language while capturing the whole sense of meaning and nonetheless represents a post/colonial appropriation of knowledge (DeLoach 2023).

As the ideas of pluriversality derived from mostly non-academic contexts in Latin America (e.g. *Zapatista* movement, Andean *campesinos*, Afrocolumbian movements), the practices of people and conceptual discussions of scholars often refer to concrete socio-environmental conflicts and claims for environmental justice. By including the Latin-American points of view of other worlds, it not only includes the distribution of goods but '*el buen vivir*' ('live well'), the right to live well (Huanacuni 2010, Leff 2017). Within this context, it is essential to highlight the critical relationship between land, freedom and justice in local communities that depend on land in different ways (Perry 2020). Justice is therefore interrelated with the land, and multiple actors within these are heavily interconnected ,and reached from a bottom-up perspective (Moutinho et al. 2016).

## 3 Study area: Amazonia as an arena of struggles for socio-environmental justice

The Amazon region has been a field of conflict over natural resources since pre-colonial times. Indigenous communities transformed the Amazonian forest into an anthropogenic landscape through dynamic settlement, productive and extractive activities and exchange, alliances and solidarity, as well as inequalities, power relations and conflicts between and within these indigenous communities (Lehmann et al. 2003, Denevan 2005, Neuburger 2008, Plenderleith 2011, Hastik et al. 2013). Since the colonisation by the Portuguese, settlements changed, and the colonisers even changed the dynamics of indigenous communities. Moreover, since Brazilian independence from colonial rule, the Amazon forest has been treated politically in the name of 'national interest' as an inexhaustible source of resources (Teixeira & Fonseca 1998). Pressure on natural resources increased considerably during the golden age of mega-projects (1950s to 1970s) when the Brazilian Amazon agenda was based on economic growth through large-scale infrastructure projects (Nelson 2004). In these decades, the development agenda was dominated by projects such as highways, dams and power plants (Nelson 2004). Therefore, policies regarding investment in transport, electric energy infrastructure, and tax and credit incentives were introduced (Loureiro & Pinto 2005, IPAM 2006). Furthermore, Brazil and the Amazon forest have never seen a successful agrarian reform, leaving farmland under the quasi-colonial structure of landowners with considerable control over land-use (Ondetti 2008, Valente & Berry 2015). These historical and political conditions place Brazil and the Amazon region among the places with the most unequal land system in the world (Albuquerque Junior et al. 2019). Simultaneously, the military government (1964-1985) repressed all kinds of social mobilisations, including the ones seeking justice (Domask 1998). After the very violent decades of the 1970s and 1980s and – subsequently, the democratisation process – a slightly more peaceful phase emerged in the 1990s. Land conflicts have continued to increase due to growing pressure on the area by expanding the agrarian and extractive frontiers and responding to activities of landless movements like *Movimento dos Trabalhadores Sem Terra* (MST). Thus, conflicts to this day are not limited to territorial disputes over resource rights and access conditions. They also include struggles related to the ecological impacts of resource extraction and cultural ones caused by 'coloniser's models' on local people as well as contradictions between various forms of appropriation and the transformation of nature (Leff 2017). Throughout history, these created power dynamics that led to the marginalisation of local groups and communities, for instance, groups such as indigenous and traditional communities and Afro-Brazilian *'quilombolas'*, among

others (Da Silva & Bampi 2019). These groups face profound systematic and structural injustices as they struggle with ecological impacts, land dispossession and natural resource exploitation(Coy & Neuburger 2009). Despite possessing a rich cultural heritage and valuable regional knowledge, these communities often find themselves voiceless and marginalised in decision-making processes (Hess et al. 2016, Jacarandá & Matzembacher 2018, Hendlin 2019).

The modernisation of the Amazon region continues to carry with it intrinsic injustices (In Chapter 4.1, we deepen into the concept of justice), verified by the proliferation of land disputes affecting all kinds of actors (Da Silva & Bampi 2019). These development cycles have interfered with social structures, altering and unravelling populations, devastating cultures and engendering conflicts (Fernandes 2008). However, these cycles and socio-environmental conflicts have turned international attention to the Amazon – for instance, the Rubber Tappers Council (CNS) and Chico Mendez's fight against agrarian frontier expansion and subsequent deforestation. In the last decades, as a reaction to political pressure from international and national environmental NGOs and in the quest to avoid these socio-environmental conflicts, the Brazilian government implemented some policies with significant impact on the environmental and social justice movement - such as the National Policy for the Sustainable Development of Traditional Peoples and Communities (Decree 6.040), implemented in 2007, or the New Forest Code (Law 12.651) of 2012. However, despite these policies that offer protection against social and environmental insecurities and uncertainties as well as the triggering of land conflicts, the occupation of the Amazon and dynamics of injustice keep taking place.

Through the period of socio-environmental conflicts, development and sustainability discourses, Amazonia became a point of interest in climate change discussions (Neuburger 2008, Ometto et al. 2014, Ciappelloni 2019). Therefore, the number of scientific articles has increased correspondingly. These articles deal with land-use changes like deforestation, agricultural expansion, hydropower stations, and mining activities (Salazar et al. 2015, Tucker Lima et al. 2017). When it comes to solutions to the identified problems, sustainability, nature conservation, and protection of indigenous territories are dominant ideas for the future of Amazonia (Simmons 2004, Soares-Filho & Rajão 2018, Herrera et al. 2019, ASLP 2020). Yet, despite this boom in the scientific literature on the Amazon, it remains unclear how the myriad and diverse ways of knowing and thinking about the dynamics of land use in the Amazon and possible pathways to a more just and livable future are considered in scientific debates (Tlostanova 2009).

## 4 Methodology

### 4.1 Definitions

For this analysis, the following definitions are contemplated:

(1) The Brazilian Amazon region is geographically located in the 'Legal Amazon Region'. It is politically distributed into the states of Acre, Pará, Amazonas, Roraima, Rondônia, Amapá and Mato Grosso as well as the regions located north of parallel 13º S, in the states of Tocantins and Goiás, and west of the 44º W meridian, in the state of Maranhão as status in the article 3rd of the 12.651 National Law (see Fig. 1) (Presidência da República 2012).

(2) We follow the Land definition of Medina-Sansón et al. (2014: 56).: "Land can be recognised as the terrestrial ecosystems or the portion thereof, recognised by individuals and communities, under very diverse cultural and socio-economic circumstances; furthermore, as the physical environment or substrate for the development of any form of life. Thus, social conceptual constructions of land with ontological scope, ecosystemic implications, religious-magical implications, or both."

(3) Therefore, we defined the Amazon forest as the vast biodiversity within 71 million hectares of Amazonian Land, and circa 25 million inhabitants, its tradition, culture, cosmovision, and the socio-environmental and political dynamics (Vieira et al. 2008, Eichman Jakob 2014).

(4) We identify the concept of justice as a flexible, pluralistic term for many different realities. As Schlosberg (2007a: 167) describes, justice must be understood in different forms and terms, as well as in different times, places and contexts, addressing the discourses of distribution, recognition, capabilities and/or participation. It is critical not to ignore various perspectives or conceptions of justice, nor to impose a single solution, but rather to develop a specific concept for each situation by combining diverse ideas into a broad, inclusive, and practical understanding of socio-environmental and ecological justice.

### 4.2 The systematic search

To analyse the scientific knowledge production on the social and environmental dynamics of land-use in the Brazilian Amazon region and their interaction with social and environmental (in)justice, a systematic literature review was conducted using the Western dominant scientific dissemination database Web of Science (WoS) and Scopus and the Latin-American database Scielo. Search engines are used to distribute scientific knowledge and search for literature efficiently. WoS and Scielo are the most frequently used databases in different scientific fields (Vieira & Gomes 2009) by European and Western universities (Chadegani et al. 2013). The systematic literature review covered the period from January 1970 to February 2022. Table 1 shows the query string applied to select the scientific articles. The query words were selected based on our objective, the definitions established for this article (see Chapter 4.1), and the search specifications required by each search engine.

The systematic search was carried out as follows:

(1) We used the following words and their translations to Portuguese for the search query;
   a. Amazon* and Brazil, to define the geographical region of the analysis; and
   b. Just* or/and Injust*; to identify the relevant articles working with the (in)justice concept.
(2) We follow the specifications according to the search engines;
   a. When using the asterisk after a word (*), we increase the spectrum of the search with that word (e.g. Amazon* can be interpreted as Amazonia, Amazon, etc.).
   b. We used the conjunction AND to use two or more terms in the same search query (e.g. (Amazon*) AND (Brazil*))
   c. We used the conjunction OR to use one orthe other terms in the same search query (e.g. (Just* OR Injust*)
(3) We conducted the research using different scientific collections offered by the search engines (see Tab. 1);
   a. The first search was conducted with WOS All Databases, using the 'Topic' option for all the words in the search query.
   b. The second search was conducted in Scopus, using the 'Article Title, Abstract, Keywords' option.
   c. The third search was conducted in Scielo, using the 'All indexes' option.

### 4.3 Exclusion and inclusion parameters

In the second step, the titles and abstracts of the retrieved articles were screened for the first time to identify relevant articles which refer to the query


**Fig.1: Brazilian Legal Amazon**

**Tab. 1: Search terms to identify relevant articles for (in)justice in the Brazilian Amazonia region****

| String query | Database | Language | Articles retrieved | Articles selected |
|---|---|---|---|---|
| EN: (Amazon*) AND (Brazil*) AND (Just* OR Injust*) | Web of Sciences | EN | 640 | 25 |
| | | PT | 111 | 5 |
| | Scopus | EN | 355 | 20 |
| | | PT | 37 | 2 |
| PT: (Amaz*) AND (Brasil*) AND (Just* OR Injust*) | Scielo | EN | 123 | 6 |
| | | PT | 123 | 3 |
| | Total | | 1389 retrieved, 893 non-repeated titles | 61 selected, 36 non-repeated titles |

*See subtitle 4.2 (2). **EN: English PT: Portuguese.

string applied. We follow the next rules to retrieve, double-check or exclude the articles for analysis:

(1) The articles were classified as 'NO' ((this means excluded) for not meeting the specific parameters (n=830)); The document exclusion parameters were:
   a. when reading the title, keywords, abstract, and body, the article was not related to the topic.
   b. the articles were not peer-reviewed literature.
   c. the articles were missing words or a word from the query string.
   d. the word Just* was selected in the query as a relevant word when referring as an adjective (e.g. "to be just") and as an exclusion parameter when referring to an adverb (e.g. "that is just what I need"). This last parameter excluded a high percentage of articles (~85 per cent).
(2) The articles were selected as 'YES' (this means to be analysed);
   a. when the article was directly related to the string query, and in addition to land or forest use, tenure, and/or management topic when reading the title, keywords, abstract, and body(n=14).
(3) Some articles were identified as 'PERHAPS' (this means to be double screened) (n=56). These articles were not conclusive in our first screening. Therefore, they were screened a second time. At this time, the body of the article was read:
   a. the articles were classified as 'NO' when the article body was not related to the topic when reading the title, keywords, abstract, and body (n=34).
   b. the articles were selected as 'YES' when the article was directly related to the query string and topic when reading the title, keywords, abstract, and body (n=22).

After the first and second screening, 36 peer-reviewed articles were selected. The next chapter presents how the articles were codified and classified.

### 4.4 The codification

Finally, a coding plan was developed in MaxQDA (VERBI Program 2022) to classify the selected articles. First of all, we explored the visibility of knowledge production on Amazonian issues:

(1) We analysed the structural inequalities in the scientific knowledge production
   a. by codifying the languages used in the articles themselves and references type used per article as indicators for recognition of Brazilian or Latin American knowledge production when writing about Brazilian Amazonia, and
   b. by analysing authorships and author teams and the location of their institutional affiliation as indicators for integration of local or national knowledge production.

In the second step, we characterise the issue of the article and describe problems and solutions identified by the authors of each article:

(2) We analyse the framing of conflicts and dynamics in the Brazilian Amazon by answering the following questions:
   a. What is the main issue of the article?
   b. What is defined as problem, and which reasons are identified?
   c. What are the solutions – if so – considered?

The subsequent coding plan was developed to characterise the visibility of pluriverse approaches in the articles and within the scientific community. For this, we

(3) analyse explicit and implicit integration of dimensions of pluriversal concepts

a. by identifying geographical areas and the spatial level (local, regional, national) referred to in the articles as indicators for homogenisation of local-regional diversity and/or consideration of heterogeneity,
b. by identifying methodological approaches as indicator for potential silencing or hearing subaltern voices, and
c. by analysing stakeholders and their role (active-passive, homogenous-heterogenous etc.) in the described socio-environmental dynamics as indicators for consideration of active roles of local and indigenous actors.

In the following chapter, we will present the results of every step of the coding for, eventually, discussing the visibility of pluriverse approaches and identifying research gaps in the way of decolonising international scientific discourses on Amazonia.

## 5 Results

### 5.1 Amazonian socio-ecological justice as a topic of international scientific knowledge production: Whose scientific voices are heard?

The results section commences by demonstrating the growth of scientific articles associated with (in) justice issues in the Brazilian Amazon from the 1970s to 2022. The visualisation in Figure 2 shows a substantial rise in articles, particularly from the 2000s onwards. This dynamic may link to political circumstances in Latin American countries with Amazonian areas: In the late 1980s, the democratisation process in several Latin American countries provided more access to the Amazon region for international researchers and development agencies. Furthermore, settlement and deforestation dynamics attracted international attention, so scientific knowledge production increased by the 1990s. In the 2000s, global discourses on climate change and the importance of tropical rainforests for climate mitigation significantly broadened research funding opportunities and, consequently, generated scientific output.

In total, the search query in English and Portuguese retrieved a total of 1389 articles. Of those, 496 were found published in more than one search engine. Therefore, 893 articles were screened, and after being analysed, 36 peer-reviewed articles were used in the analysis (see methodology). The selected articles that meet all our inclusion criteria were published between 1995 and 2022.

Of the 36 articles, 25 articles were found in WoS, 20 in Scopus, and six in Scielo. Eleven articles were found in both Scopus and WoS, and four in Scielo and WoS. None were found published in Scopus and Scielo at the same time. Of the 36 articles, 29 were initially published in English, six in Portuguese and one in French. None of them was published in Spanish, which is not surprising due to our focus on Brazilian Amazonia - but it showcases the historically low rate of research cooperation between Latin American countries. The language of the articles is highly linked with the number of citations, showing higher visibility in the international scientific community for English-language articles. These inequalities are reinforced by looking at the levels of H-index of the articles' respective journals. Furthermore, we found that Brazilian authors published mainly –six out of twelve main Brazilian authors – in Brazilian journals with a lower H-index (see Tab. 2). This confirms the observation of Ramírez-Castañeda (2020) that English has become the dominant language of Western science, causing a gap in visibility between research of native speakers and non-natives, and broadening the gap in science knowledge dissemination between non-English speaking stakeholders. However, English-language articles may improve dissemination of Amazonian Land and forest issues at international level. Nevertheless, local actors and social movements seldom have access to these scientific papers due to language skills or social distance. In addition, the scientific fieldwork by Brazilian researchers is currently threatened by financial and political factors (de Area Leão Pereira et al. 2019), widening the gap between science and the people who could benefit from it.

In the second step, we search for the institutional affiliation of the articles' authors (see Tab. 2). It was found that of all 106 involved researchers, 26 were affiliated with universities and institutions outside Brazil and Latin America, and 52 were affiliated with Brazilian institutions – research or governmental agencies, NGOs, or universities. Researchers affiliated with non-Brazilian and non-Latin American universities and institutes participated in 25 articles (~ 70 per cent), while being main authors of 23 articles. Despite the emerging interest in the struggles of poorer communities for environmental justice (see below analysis of papers' content), it seems that local voices are silenced, at least by authorship, because the bulk of the literature tends to concentrate on authors of the Global North (USA, Norway, United Kingdom). Affiliated main authors from the USA, and European countries (EU) execute strong influ-

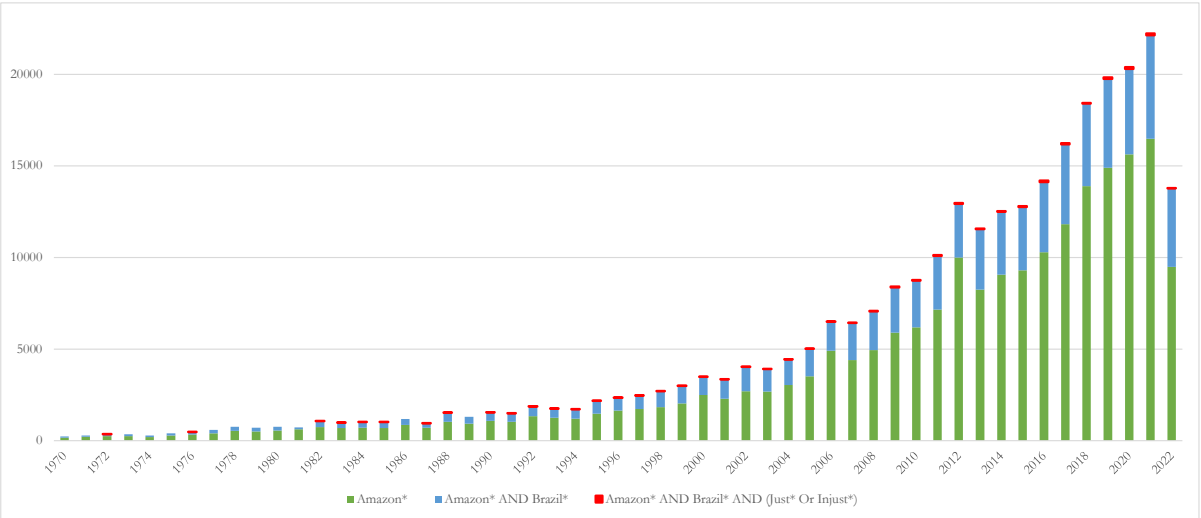


**Fig. 2: Number of articles per year and topic in Scielo, Scopus and WOS search engines.**
Displays of the search query conducted in Scielo, Scopus and WOS search engines, only in the English language in February 2022. A total of 204,696 articles were retrieved with the word Amazon*, 77,073 with Amazon* AND Brazil*, and 1,118 with Amazon* AND Brazil* AND (Just* OR Injust*).

ence on research on Amazonian issues and prefer to associate with institutions of the Global North for collaboration and writing. There, access to resources and research facilities, the degree of social relationships with highly ranked researchers, and the influence over others' activities play a role in scientific community involvement. This leads to self-reinforcing hierarchies and status within science, similar to other social structures (Nielsen & Andersen 2021), affecting the production and reproduction of powerful discourses that may create inequity. For instance, according to Newell (2007), the global visibility of the debates surrounding the definition of environmental justice in the United States has significantly impacted activists and scholars from Brazil and Latin America.

Majee and Ress (2020) found that regardless of all forms of colonial resistance in Brazil's extensive public and private universities, Euro-American models often undermine educational models. USA-affiliated authors are listed as the main authors in nine articles, while fourteen are led by European authors and one more is led by an Australian author. Despite the high number of authors from the Global North, Brazilian authors are listed in twelve articles as primary authors, which could indicate the importance of local voices in scientific discourses. However, focussing with more detail on the involvement of Brazilian researchers, we found that the majority of them (n=7) are affiliated with entities localised in metropolis outside the Amazonian region (São Paulo, Rio de Janeiro, Brasília, among others). The Amazonian Universities involved in authorship are the Federal Universities of Pará (Belém) and Rondônia (Porto Velho) and research institutions in Acre, Amazonas, Mato Grosso and Tocantins. The dominance of institutions in central metropolitan areas in Brazil already indicates inequalities within scientific structures in Brazil. In addition, hierarchies between academia and non-academics can be exhibited by the non-inclusion of authors of Amazonian movements or social movements in general, like MST, Associations of small-holders, movements of rubber tappers, quilombolas or communities affected by dams. This information already disinvolves some insights into the production of science and its intrinsic relation to scientific subaltern voices. This leads to the conclusion that Brazilian-affiliated scientists reproduce Western scientific hierarchies in knowledge production. Nonetheless, as mentioned in Chapter 2.2, there is a large scene of researchers working on post- and decolonial perspectives (often in the context of action research). However, many Brazilian post- and decolonial scholars – for instance, Alfredo Wagner Berno de Almeida, Sheila Borges Dourado, and Carolina Bertolini (Nova Cartografia Social da Amazonia), among others – do not have or do not want to publish in high-ranking journals but prefer to publish in local/regional scientific journals or even produce non-scientific papers to make results accessible for the movements they participate in. To further assess how local perspectives were incorporated into the articles' analysis, additional research would be needed to determine the degree of involve-

**Tab. 2: Articles' bibliometrics**

| Author | Journal | Language | Times Cited | Journal H-Index | Authors affiliation |
|---|---|---|---|---|---|
| Cummings 1995 | Geo Journal | | 26 | 72 | |
| Hendlin 2019 | Local Environment | | 9 | 67 | |
| Mayer et al. 2021 | Energy Research and Social Science | | 76 | 16 | |
| Randell & Klein 2021 | Society and Natural Resources | | 3 | 91 | |
| Salm et al. 2021 | Contemporary Justice Review | | 1 | 16 | |
| Simmons et al. 2010 | World Development | | 86 | 192 | |
| Simmons 2004 | Annals of the Association Geographers | | 121 | 156 | |
| Valente & Berry 2015 | Geographical Review | | 10 | 47 | |
| Zanotti 2015 | Politics, Groups and Identities | | 29 | n.a. | |
| Agustsson et al. 2014 | The International Forestry Review | | 10 | 52 | |
| Alves-Pinto et al. 2018 | Ecological Economics | | 18 | 220 | |
| Atkins 2020 | Political Geography | | 12 | 120 | |
| Cammelli & Angelsen 2019 | Ecological Economics | | 26 | 220 | |
| Carmenta et al. 2021 | World Development | | 5 | 192 | |
| Couto Pereira 2010 | The Journal of Environment & Development | | 84 | 45 | |
| Fraser 2018 | Transactions of the Institute of British Geographers | | 24 | 114 | |
| Garrett et al. 2021 | Annueal Revies of Environment and Resources | | 124 | 27 | |
| Gauché 2011 | *Annales de géographie* | | 0 | 17 | |
| Hess et al. 2016 | *Desenvolvimento e Meio Ambiente* | | 18 | 5 | |
| Ioris 2018 | Geographical Review | | 15 | 44 | |
| Kleinschmit et al. 2021 | Frontiers in Forests and Global Change | | 4 | 18 | |
| Normann 2022 | Journal of Social Issues | | 4 | 130 | |
| Weißermel & Azevedo Chaves 2020 | *Die Erde* | | 8 | 25 | |
| Bargas & Cardoso 2015 | *Boletim do museu paraense Emílio Goeldi ciências humanas* | | 26 | 5 | |
| Castro et al. 2017 | *Sustentabilidade em Debate* | | 0 | 4 | |
| Jacarandá & Matzembacher 2018 | *Revista. direito e práxis* | | 2 | 4 | |
| Litre et al. 2020 | *Agrociencia Uruguay* | | 1 | n.a. | |
| Moutinho et al. 2016 | Elementa: Science of the Anthropocene | | 110 | 40 | |
| Porro & Porro 2022 | Land Use Policy | | 110 | 40 | |
| Procópio 2009 | *Revista Brasileira de Política Internacional* | | 0 | 125 | |
| Schmidt et al. 2019 | Plant Biology | | 2 | 18 | |
| Sieben & Cleps Junior 2012 | *Sociedade & Natureza* | | 80 | 92 | |
| Da Silva & Bampi 2019 | *Cuadernos de Geografia* | | 14 | 8 | |
| Spínola et al. 2020 | Journal of Applied Ecology | | 12 | 4 | |
| Villas-Bôas et al. 2018 | *Desenvolvimento e Meio Ambient* e | | 9 | 192 | |
| Urzedo & Chatterjee 2021 | Journal of Genocide Research | | 18 | 29 | |

| % of Articles' sources | | | | | | | |
|---|---|---|---|---|---|---|---|
| Amount of sources | Brazilian | | | | Non-Brazilian | | |
| | News | Official documents | Private companies | Scientific sources | Europe | USA | Other countries |
| 33 | 12.1 | 6.1 | 15.2 | 27.3 | 12.1 | 27.3 | 0.0 |
| 75 | 1.3 | 1.3 | 0.0 | 20.0 | 20.0 | 48.0 | 9.3 |
| 88 | 0.0 | 0.0 | 0.0 | 11.4 | 30.7 | 43.2 | 14.8 |
| 52 | 0.0 | 1.9 | 7.7 | 26.9 | 15.4 | 38.5 | 9.6 |
| 21 | 0.0 | 0.0 | 0.0 | 4.8 | 33.3 | 52.4 | 9.5 |
| 87 | 0.0 | 13.8 | 0.0 | 33.3 | 5.7 | 43.7 | 3.4 |
| 172 | 2.9 | 5.8 | 0.0 | 24.4 | 12.2 | 52.3 | 2.3 |
| 85 | 1.2 | 8.2 | 0.0 | 48.2 | 4.7 | 35.3 | 2.4 |
| 42 | 0.0 | 0.0 | 0.0 | 11.9 | 11.9 | 64.3 | 11.9 |
| 34 | 0.0 | 5.9 | 0.0 | 23.5 | 47.1 | 17.6 | 5.9 |
| 82 | 0.0 | 12.2 | 0.0 | 29.3 | 28.0 | 22.0 | 8.5 |
| 111 | 4.5 | 7.2 | 9.9 | 21.6 | 29.7 | 18.9 | 8.1 |
| 91 | 0.0 | 0.0 | 0.0 | 33.0 | 31.9 | 28.6 | 6.6 |
| 126 | 0.8 | 2.4 | 0.0 | 7.9 | 42.1 | 24.6 | 22.2 |
| 58 | 1.7 | 1.7 | 0.0 | 13.8 | 32.8 | 32.8 | 17.2 |
| 54 | 0.0 | 1.9 | 0.0 | 13.0 | 38.9 | 42.6 | 3.7 |
| 153 | 1.3 | 5.9 | 3.3 | 35.3 | 22.9 | 27.5 | 3.9 |
| 56 | 0.0 | 0.0 | 0.0 | 37.5 | 48.2 | 3.6 | 10.7 |
| 22 | 0.0 | 9.1 | 13.6 | 31.8 | 31.8 | 13.6 | 0.0 |
| 53 | 3.8 | 0.0 | 0.0 | 32.1 | 35.8 | 13.2 | 15.1 |
| 78 | 2.6 | 5.1 | 3.8 | 29.5 | 25.6 | 21.8 | 11.5 |
| 91 | 1.1 | 0.0 | 0.0 | 4.4 | 52.7 | 26.4 | 15.4 |
| 54 | 0.0 | 7.4 | 7.4 | 42.6 | 13.0 | 18.5 | 11.1 |
| 49 | 0.0 | 4.1 | 0.0 | 69.4 | 22.4 | 4.1 | 0.0 |
| 23 | 0.0 | 4.3 | 0.0 | 82.6 | 4.3 | 8.7 | 0.0 |
| 60 | 1.7 | 18.3 | 0.0 | 56.7 | 6.7 | 16.7 | 0.0 |
| 52 | 0.0 | 1.9 | 0.0 | 32.7 | 17.3 | 30.8 | 17.3 |
| 91 | 0.0 | 17.6 | 0.0 | 50.5 | 8.8 | 20.9 | 2.2 |
| 134 | 1.5 | 13.4 | 0.0 | 38.1 | 19.4 | 20.9 | 6.7 |
| 21 | 0.0 | 0.0 | 0.0 | 42.9 | 38.1 | 14.3 | 4.8 |
| 60 | 0.0 | 8.3 | 0.0 | 58.3 | 13.3 | 11.7 | 8.3 |
| 35 | 5.7 | 28.6 | 0.0 | 62.9 | 0.0 | 2.9 | 0.0 |
| 32 | 0.0 | 31.3 | 0.0 | 46.9 | 18.8 | 0.0 | 3.1 |
| 27 | 0.0 | 3.7 | 0.0 | 44.4 | 33.3 | 14.8 | 3.7 |
| 36 | 0.0 | 19.4 | 0.0 | 63.9 | 5.6 | 11.1 | 0.0 |
| 116 | 0.9 | 6.0 | 3.4 | 27.6 | 21.6 | 27.6 | 12.9 |

Legend

- English
- Portuguesse
- French
- Main author USA institutional affiliation
- Co-author USA institutional affiliation
- Main author EU country institutional affiliation
- Co-author EU country institutional affiliation
- Main author Brazilian Amazonia region institutional affiliation
- Co-author Brazilian Amazonia region institutional affiliation
- Main author with metropolitan Brazilian institutional affiliation
- Co-author central Brazilian institutional affiliation
- Main author other north-western country institutional affiliation
- Co-author other north-western country institutional affiliation
- Source's percentage
- Predominant percentage of sources

ment of researchers, local actors and regional actors in both the fieldwork and writing process.

In the third step, we explore the visualisation and silencing of local and regional perspectives in the articles through their use of references (see Tab. 2). The authors mostly cited peer-reviewed articles, then books, followed by governmental and NGOs sources, news from Brazilian newspapers and articles developed by private companies. All authors included Brazilian voices or sources in the argument of their articles. Nevertheless, the representation of Brazilian voices in each article is quite different. In most cases, non-Brazilian authors quoted other non-Brazilian authors much more frequently than Brazilians for their assessments. In contrast, Brazilians cited more Brazilian sources. Mixed author teams were found to tend to cite more authors related to the institutional affiliation of the main author. A pattern was found in which authors from the USA cited more authors from the USA, while EU and Brazilian authors cited more authors from their respective institutional affiliation nationality.

In addition, our analysis indicates that perspectives of Brazilian scientific authors and Amazonian local and regional actors are less visible in international scientific discourses when considering Amazonian Land and forest issues linked with socio-ecological justice concerns. Article and journal language are highly linked to citation indices, marginalising authors of Brazilian institutions and Amazonian entities. The knowledge gap, communication, and exchange are reinforced by scientific circles that are constituted by (self)referencing the scientific results of their 'own' community. However, mixed author teams indicate the Global North's researchers' effort to integrate Brazilian voices into their studies. To give some insights into how this integration worked and how pluriverse thinking is considered, we will go deeper into the content analysis in the following chapters.

### 5.2 Discourses on land and forest issues in the Amazon context: What topics, reasons, and solutions?

Several focuses were identified within the studies. A common focus lies on the Amazon region as a whole but more specifically on the state of Pará. Articles about forest issues – mostly integrated into studies on climate change adaptation and mitigation as well as on forest fires – concentrate on the states of Amazonas and Pará or on the whole Amazon region. Papers on land issues have a broader perspective on several other states. Dam construction articles are related to land (re)distribution issues and are mainly based on the state of Pará. Many of these articles cite sources from private hydroelectric companies. These observations indicate not only the omnipresent relevance of land issues in the Amazon region but also the preference of international researchers who often cooperate with research institutions in the respective states. The high number of studies about Pará is a result of the high concentration of national and international NGOs, private investments, research institutions and universities, a high number of researchers present in the state capital Belém and consequently of broad funding opportunities. Resulting in a high output level of scientific knowledge production (see Fig. 3).

Nineteen articles, eight led by Brazilian authors, study land conflicts and rights issues. Land tenure and land rights are the main topics discussed by the authors. The most common problems expressed by the authors were land conflicts in different contexts: conflicts around extractive reserves and indigenous protection areas, agrarian frontier dynamics, land reform issues involving landless people and their movements, human rights and legal and formal and informal property rights on land. The topics are not new, as these dynamics have been known since the 1970s. However, approaching these dynamics with a socio-ecological justice lens reveals new identity, recognition, and agency aspects. We found the consideration of these new perspectives in seven articles, some of them written by Brazilian authors. Furthermore, dam construction-related issues were the basis of seven articles. Though, only one article was led by a Brazilian-affiliated author.

To identify global discourse connections to the local level we analysed – as Dryzek (2005) suggests – the 'global' programs of nature conservation and development in the Amazon region as a reflection of the interests of developed countries. In the 36 articles of our analysis, we found that nineteen articles used the global term 'climate change', which was primarily used in papers related to conservation and environmental impacts and authored by persons affiliated with European institutions. In seven articles, climate change was directly related to economic mitigation strategies for deforestation as payment for ecosystem services, and one more with fire mitigation strategies. The rest were related to land dispute issues, sustainable development goals and energy policies. Of these 36 articles, eleven were

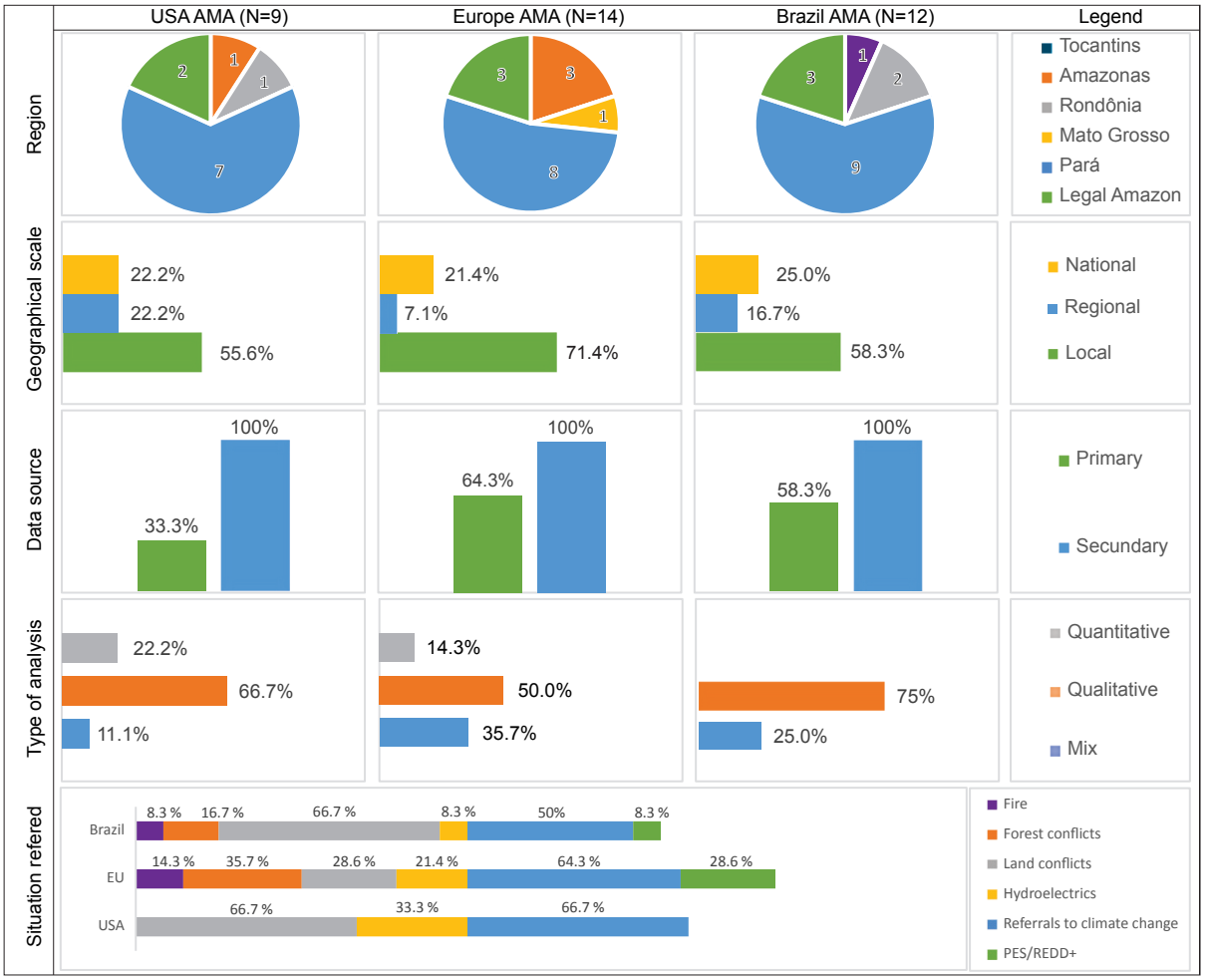


**Fig. 3: Articles' scope, data and methods used.**
AMA stands for Affiliated Main Author. Articles can fall into more than one category. Therefore, some percentages might add more than 100%. The figure does not present the information of the Australian institutional affiliation authors Urzedo & Chatterjee (2021), as it was the only article without Brazilian, USA and EU affiliation.

assessments with a focus on the local level. While climate change is a relevant topic worldwide, it was less invoked by Brazilian authors, possibly due to their sensitivity to the relevance of conflicts and dynamics in the Amazon region not directly linked to climate change.

This observation applies even more to the issues on forests, which include seven articles by our coding. Five of seven articles assessed the topic of adaptation and mitigation strategies. Four articles discuss and analyse policies following concepts as payment for ecosystem services (PES). The remaining article discusses community-based solutions to restore forests, as the main problem identified by the authors was climate change and deforestation. The internationally most considered solution for deforestation dynamics is linked to PES, which is seen as an adequate way to eliminate poverty and foster social injustice. This goes hand in hand with the analysis of adaptation strategies by studying functionality, problems and success of the REDD+ program and other governmental policies. PES and REDD+ are concepts created by international development agencies and within discourses of the Global North and are criticised by activist movements due to the implicit or explicit commodification of nature. The majority of articles that see these concepts as a solution for deforestation and poverty are – consequently – mainly authored by non-Brazilians.

In addition, theoretical movements have positioned the concept of justice at the centre of a new pluralist statecraft (Escobar 2004, Mignolo 2009, Mignolo 2011). The movements are founded on an inequity critique in the allocation of socio-environ-

mental issues and emphasise the importance of recognition and engagement in a holistic understanding of justice (Schlosberg 2007b). Hence, a search for the terms pluriverse and justice was conducted in the 36 articles. The review found that Procópio (2009), Fraser (2018), and Hendlin (2019), used the term pluriverse. These articles were found to be theoretical and not on applied issues. Cummings (1995), Bargas & Cardoso (2015), Hess et al. (2016), Castro et al. (2017), Ioris (2018), Jacarandá & Matzembacher (2018), Villas-Bôas et al. (2018), Schmidt et al. (2019), Atkins (2020), Weissermel & Azevedo Chaves (2020), Carmenta et al. (2021), Randell & Klein (2021), Salm et al. (2021), Normann (2022), and Porro & Porro (2022), described a pluriversal approach without mentioning the terminology. Even though pluriversal thinking mostly comes from theorists based in the USA, pluriversal approaches were found more frequently in Brazilian and EU-affiliated articles. Subsequently, the justice concept search found that social justice is the most frequent search term and is present in all of the articles. Also, other types of justice were mentioned: distributive, procedural, rural, and spatial. Of the 36 articles, only the non-Brazilian authors Fraser (2018) and Hendlin (2019) included a justice definition. However, this analysis found that none of the articles used or developed a heterogenic definition of justice or included concepts and imaginations of justice of stakeholders. Yet, taking local perspectives seriously and acknowledging them as relevant to global issues is a cornerstone pluriversal thinking.

### 5.3 Spaces seen and stakeholders heard: Using a pluriversal lens to observe socio-environmental processes in the Amazon region

#### 5.3.1 Geographical scales, methods used and data produced

Research in the Amazon is growing year by year (see Fig. 2). Some places and situations are more often studied than others due to various factors. Therefore, we identified the geographical scale and distribution of the articles to present a geographical overview of the research conducted. Regarding geographical distribution, the articles were primarily coded by geographical area. Five of the nine states belonging to the Legal Amazon were individually mentioned in the articles. The state of Pará was the most assessed and subject of twenty-four articles. The states of Acré, Amapá, Maranhão and Goias did not enter into an individual assessment. Furthermore, when the articles assessed all nine states collectively, they were classified as assessments of the Legal Amazon. Thus, eight of these assessments were conducted for the Legal Amazon (see Fig. 3). We have previously explained some reasons why Pará might be the state with the most conducted research (see chapter 5.2). Nevertheless, it is essential to recognise that the lack of assessment in other Amazonian states may present a blurry reality of the region. To point out this last statement, a search in WOS was conducted using the CC 'All Fields' selection from January 1970 to February 2022. The search query used was: Amazon* AND Brazil AND the name of each nine states part of the legal Amazon. The results show a clear hierarchy in numbers: The state of Pará had 11.872 articles, Mato Grosso 3.090 articles, Rondônia 2.067 articles, Acre 1,507 articles, Amapá 1.435 articles, Maranhão 1.181 articles, Roraima 1.032 articles, Amazonas 965 articles, and Tocantins 876 articles. This result clarifies that the states of Pará and Mato Grosso receive the closest attention in internationally considered scientific production. Remarkably, we could not find any correlation between the article's geographical scale and regional focus with authorship or a pluriversal approach. This may indicate that some Amazonian states are being used to represent the whole Amazonia region in scientific knowledge production.

We observe that from the 36 articles, nineteen used primary data. The remaining seventeen articles used secondary data. The type of secondary data most frequently used by the authors was demographic data (n=24), socio-economic data (n=12), and data from surveys (n=6). The demographic and socio-economic data was mainly extracted from Brazilian Institutional and Governmental sources, and survey data from institutional and governmental sources or primary data. Also, when quantitative and qualitative methods were used, the authors often used more diverse data types. Furthermore, twenty-five articles were based on qualitative analysis, whereas the other eight chose qualitative and quantitative approaches. The methods most frequently used by the authors were literature examination, description, and statistical analysis. When the previously mentioned methods were used, these were combined with secondary data in the articles (n=11). Whereas when the data was primary, the methods used were participatory approaches and/or surveys at local and regional levels. All assessments conducted at national level used data compilation, description, and statistical analysis methods.

Using exclusively secondary data means that the authors do not necessarily personally know the region or any stakeholder. Consequently, understanding regional dynamics and local people's rationales may be limited. The same may apply to quantitative data analysis when conducting exclusively statistical correlations without process understanding. With this in mind, the papers of Sieben & Cleps Junior (2012), and Castro et al. (2017), would have the best chance to give insights into pluriverse perspectives. The articles by Simmons et al. (2010), and Cammelli & Angelsen (2019) are, considering the methodological approach and heterogeneity in data acquisition, the most likely to give a complete picture. However, to assess the authors' personal knowledge and the sensitivity to heterogeneity in the region and the stakeholders' rationales, it would be necessary to analyse the scientific biographies of each person. Nevertheless, we observe that most of the main authors with EU institutional affiliation tend to use participatory approaches, selecting primary data, while there were fewer participatory approaches by affiliated Brazilian authors. Six out of nine USA main authors used secondary data. Possible reasons for these national differences may lie in different dominant methodological discourses in European, Brazilian and US-American scientific communities, funding opportunities available for travelling to the regions of interest, or even language issues relevant to empirical social research. Pluriversal perspectives here seem to not be relevant when it comes to choosing methodological approaches.

### 5.3.2 Hearing and seeing stakeholders

Following within our study, the pluriverse as an ontological starting point involves highlighting diversity and comprehending that reality is made up of many kinds of worlds (Querejazu 2016), with many realities and involving many people. Each reality is separate from the other but connected in the Amazon forest. Consequently, in an interconnected world, a way to assume the pluriverse is by recognising each of its constituent parts (Querejazu 2016), such as the people and their individualities. According to the Brazilian Institute of Geography and Statistics (IBGE 2010), around 23 million persons inhabit the Legal Amazon. Among these, traditional communities, indigenous, migrants, farmers, miners, and landowners are sharing, coexisting, competing and living; and are recognised as stakeholders by the authors. Thus, we use the number of stakeholders mentioned in the article as an indicator for considering heterogeneity. In total, we identified 36 groups of stakeholders mentioned by the authors. The authors who identified the highest number of stakeholders in their articles were Simmons (2004) (n = 14), Castro et al. (2017)(n = 12), Procópio (2009) (n = 12), and Sieben & Cleps Junior (2012)(n = 10).

Following pluriversal perspectives, studies should let marginalised and subaltern people speak for themselves, showing their agency (Ehrnström-Fuentes 2016). That means studies based on pluriversal ideas should avoid a discursive production of marginalised groups as victims of or as passive and lethargic actors in exclusion dynamics and unequal power relations and/or as mere recipients of help and support provided by other (more powerful) actors (Procópio 2009, Hendlin 2019).

Analysing the articles in this way, we found out that the most frequently mentioned stakeholder was the Brazilian Federal Government, named in twenty-eight articles. While twenty-six governmental institutions were described as active actors, only eight articles specified institutional settings avoiding homogenisation of the government by referring to individual Ministries such as Agriculture, Development, Education, Environment and Justice and describing environmental and developmental programs (Procópio 2009, Sieben & Cleps Junior 2012, Valente & Berry 2015, Alves-Pinto et al. 2018, Ioris 2018, Jacarandá & Matzembacher 2018, Villas-Bôas et al. 2018, Schmidt et al. 2019). Looking at the role of the government, most articles describe it as one of the most relevant actors with power and agency and having means to control the described processes. Interestingly, many articles with implicit or explicit pluriversal approaches, and all with Brazilian first authorship, consider governmental institutions as actors with negative impacts on local/regional/national processes towards sustainability, justice and environmental or climate protection (Procópio 2009, Sieben & Cleps Junior 2012, Castro et al. 2017, Jacarandá & Matzembacher 2018, Villas-Bôas et al. 2018).

When we focused our analysis on the marginalised groups, we found that indigenous group(s) were mentioned with the highest frequency in fifteen articles. In five articles, the heterogeneity of indigenous people was recognised by naming specific indigenous communities (*Marawatsede, Macuxi*, etc.) or individual members of these communities (Procópio 2009, Agustsson et al. 2014, Fraser 2018, Villas-Bôas et al. 2018, Hendlin 2019). As another important stakeholder in the Amazon region, tradi-

tional/rural communities were mentioned in twelve articles. But in only half of them, their heterogeneity was recognised in the same way as indigenous people (Gauché 2011, Agustsson et al. 2014, Castro et al. 2017, Alves-Pinto et al. 2018, Fraser 2018, Weissermel & Azevedo Chaves 2020). All articles with pluriversal approaches mention one or both of these marginalised groups. However, eight articles did not mention them. This goes in hand with our observation that indigenous and traditional communities are generally seen as having a positive impact on socio-environmental dynamics, though mainly in a passive role as victims, uninformed and in need of help. However, Procópio (2009) discusses the positive and negative connotations and affirmations towards indigenous groups. Correspondingly, Fraser (2018) debates the power that indigenous groups and traditional communities have gained because of their relationship with the international media and NGOs. Consequently, only these two articles consider heterogeneity and contradictions within subaltern groups.

These different roles ascribed to government and marginalised actors and groups are primarily complementary and interlinked. For instance, as Cammelli & Angelsen (2019) described, indigenous and traditional groups are lacking technical and scientific knowledge towards forest fires and climatic events, the government and big/large landowners, in contrast, are frequently mentioned as the offenders and powerful groups with impairing roles towards sustainability and justice (Cammelli & Angelsen 2019). Interestingly, in these cases and mostly by articles with pluriversal approaches, governmental actors are homogenised without differentiating between specific institutions, ministries or public agencies. For instance, Fraser (2018) expresses that small farmers and indigenous groups lack rights and recognition and defines them as historically oppressed by the government. Ioris (2018) sees the government as responsible for acts of oppression towards vulnerable groups, facilitating policies for big/large landowners to extend the agribusiness frontier.

Based on our analysis of methodology, spatial scale and stakeholder description used, we could state that the authors' affiliation and pluriversal perspectives are irrelevant when choosing a method and spatial scale. Yet, when going into detail on how authors position stakeholders in the topic or see their role in socio-environmental dynamics, pluriversal thinking authors recognise the most frequently mentioned subaltern groups, indigenous and traditional people, as actors with (positive) agency and valuable knowledge in developing solutions on their own. For instance, Cummings (1995) Hess et al. (2016) Fraser (2018) Hendlin (2019) Schmidt et al. (2019) homogenised governmental actors and tended to romanticise subaltern groups by ascribing a positive role to the latter. Thereby these authors somehow run into the danger of reproducing dichotomies that pluriversal concepts reject.

## 6 Conclusion

This paper analyses the scientific knowledge production on social and environmental dynamics of land-use change in the Brazilian Amazon region and their interaction with socio-environmental (in) justice. We demonstrate how science is obtained, produced, and reproduced in this context by focussing on two Western scientific hegemonic search engine frameworks and one Latin American. Although the (Brazilian) Amazonian region and their land and forest issues have been important topics of the international scientific discourse since the 1970s, perspectives on socio-environmental justice have only been considered since the 2000s, even though local/marginalised actors have been advocating for it for decades. Furthermore, our analysis of 36 selected articles gives insight into citation practices and politics. The affiliation of (first) authors corresponds very much to the literature cited in the papers by (self) referencing the scientific results of the 'own' scientific community. This may be because review processes of international journals often stay within their own scientific community, and authors maintain (self) referencing practices to increase their citation grade and lower the risk of their article being rejected. Even though authorship teams of mixed affiliation increase the diversity of perspectives in scientific knowledge production, citation politics reproduce power relations as English literature is significantly higher ranked in citation and h-index as non-English papers. With this, we understand that there are more scientific knowledge sources, but due to socio-economic, cultural, epistemic and ontological, among other conditions, these are segregated from the dominant international scientific debates.

Going deeper into methods, topics and stakeholders considered in the analysed articles, we observe that issues and spatial scales do not correlate with author affiliations. Nonetheless, Brazilian authors rarely link land and forest issues to climate change, while US-American and European authors focus on these interrelations using mostly analytical and management concepts of transnational in-

stitutions (REDD+, PES, etc.). In contrast, many Brazilian and EU authors integrate implicitly or explicitly pluriversal approaches in their work. Having citation rankings in mind means that the pluriverse concept is significantly less recognised in global scientific discussions. The application of participatory methods, mainly by European authors, may counteract this marginalising effect on pluriverse sensible scientific discourses - even though all US-American authors exclusively use secondary data with low potential to show subaltern perspectives. This goes hand in hand with our analysis of stakeholder description, showing that Brazilian authors have an explicitly critical view of the Brazilian government. Almost all articles – independent of authorship, language and pluriversal approach – mention indigenous and/or traditional communities as relevant social groups in the Amazon region, however, with a tendency to romanticise and victimise their role in socio-ecological dynamics.

To conclude, as shown in our analysis, power relations in the Amazon are not fixed but constantly renegotiated (Simmons 2004), then displayed and replicated based on the authors' scientific position (language, affiliation, privilege). In this context, articles ranked higher in the Western scientific world may influence future climate change, justice, political approaches or visions. Nonetheless, life is made of an infinitive number of truths, and not only of the Western scientific one (Orlans 1971). The portrayal of stakeholders and issues can be viewed from numerous angles, but the reality can only be comprehended if the different narratives are heard and/or replicated. This avoids the monopoly of truths and romanticising (Procópio 2009), or demonising individuals and their actions.

Generally speaking, when it comes to Western scientific knowledge production, it is necessary to emphasise the relevance of higher education approaches, which are frequently at risk of producing and reproducing instrumental and ethnocentric imaginaries of justice (Andreotti et al. 2018, Whyte 2019). These imaginaries tend to maintain the unequal distribution of power and justice, denying marginalised communities the opportunities to create and recreate their own visions of development and social transformation (Spivak 2004, Donald 2012). In this way, epistemic hierarchies favour Western science and technology in the Global North (Ahenakew 2016). Eventually, dominant Western scientific knowledge produces "a monoculture of the mind as space for local alternatives disappears, much like an imported plant variety. Monocultures that contribute to the displacement and degradation of local diversity" (Shiva 1995 p.7). This article stands for and with Querejazu (2016) and Leff (2017) and other post-colonial and decolonial authors' proposal for a 'pluri-universal' episteme, in which they recognise the segregated ontologies, without leaving aside the important contribution of Western knowledge production.

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## List of articles analysed

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