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# Tipping points in Amazonian socio-ecological systems: imagining alternative futures with rural youths in Acre State (Brazil) and Pando (Bolivia)

## *Pontos de inflexões em sistemas socioecológicos amazônicos: imaginando futuros alternativos com juventudes rurais do Acre (Brasil) e Pando (Bolívia)*

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**ABSTRACT**: Amazonian ecosystems have been put under pressure by deep transformations resulting from continuous extractivism expansion, which tends to form tipping points in their socio-ecological systems. This complex issue is closely linked to contemporary Western-Modern culture, which allows humans to dominate, extract and extinguish non-human lives by classifying them as objectified "existences" generically represented by the term "nature". The aim of the current study is to investigate these phenomena at local level, as well as possibilities of developing solutions in the cultural field, through educational interventions carried out with young students in two Amazonian rural schools: one in Acre State (Brazil) and the other in Pando department (Bolivia). This exploratory research was guided by a non-modern approach focused on finding the answer to the following question: What alternatives can Amazonian rural youth facing trends towards regional socio-ecological changes envision?". The adopted methodology comprised a seminar held in the form of participatory workshop in each school, as well as semi-structured interviews conducted with all participants.

The current findings present participants' perceptions about the quality of their places and life projects, as well as their thoughts about alternatives to the ongoing changes. They also point out likely explanations for differences observed in socio-ecological systems between Acre and Pando; participants' perceptions about solutions, antidotes and transition designs for the current socio-ecological tipping points in the Amazonian region; as well as opportunities for, and limitations of, non-modern educational interventions in this context.

*Keywords*: Amazon; Amazonian youth; tipping points; socio-ecological systems; extractivism.

**RESUMO**: Os ecossistemas na Amazônia têm sido pressionados por transformações profundas devido à expansão contínua dos *extractivisms* - o que tende a provocar pontos de inflexões nos seus sistemas socioecológicos. Esse problema complexo tem estrita relação com a cultura moderno-ocidental contemporânea, que, ao constituir as vidas não humanas como existências coisificadas, genericamente representadas pelo termo "natureza", permite aos seres humanos, implicitamente, dominá-las, extraí-las e extingui-las. A partir do interesse de conhecer melhor esses fenômenos em nível local e de encontrar possibilidades de elaboração de soluções no campo da cultura (por meio de intervenções educativas), foi conduzida uma pesquisa com jovens em duas escolas rurais amazônicas, uma no estado do Acre (Brasil) e outra em Pando (Bolívia). Junto com essas juventudes investigamos: "Que alternativas às tendências de mudanças socioecológicas regionais podem ser imaginadas por juventudes rurais amazônicas?". Tratou-se de um estudo exploratório, pautado em uma abordagem não moderna que envolveu a realização de um seminário em cada escola, configurado como oficina participativa, além da realização de entrevistas semiestruturadas com os participantes. Os resultados obtidos apresentam as percepções dos participantes a respeito das qualidades de seus lugares, de seus projetos de vida, bem como de suas imaginações sobre alternativas às mudanças em curso. As considerações finais apontam indícios de explicações sobre as diferenças de configurações dos sistemas socioecológicos no Acre e em Pando, percepções sobre soluções, antídotos e desenhos de transições diante da problemática atual dos pontos de inflexões socioecológicas na Amazônia e as oportunidades e as limitações de intervenções educativas de base não moderna a esse respeito.

*Palavras-chave*: Amazônia; jovens amazônicos; pontos de inflexões; sistemas socioecológicos; extrativismos.

## *1. Introduction*

Human society has been facing complex challenges in their relationship with both non-human life and the environment in contemporary times (Steffen *et al*., 2018). The so-called *sapiens* have been quickly developing their culture and technology, and it has significantly changed the structure of several ecosystems to the point that some of them are no longer capable of recovering their original configuration - this phenomenon is called socio-ecological tipping point (Cinner & Barnes, 2019).

This ongoing process has advanced in Amazonian regions presenting high biological and cultural diversity, and it promoted sudden changes that had negative impact on different life forms and on different ways of living in this region (Nobre *et al*., 2016). This type of changing trend at regional and local level is seen at larger scale and it contributes to reaching limits capable of irreversibly affecting Earth's socio-ecological systems (SESs) (Rockström *et al*., 2009; Xu *et al*., 2020), a fact that increases both the risks to, and uncertainties about, the planet's future.

This issue makes it necessary predicting tipping points, reducing deforestation in the Amazon Forest and, at equal relevance level, developing solutions to enable forest recovery (Lovejoy &

Nobre, 2018; 2019), by taking into consideration the cultural and social dimensions of these phenomena (Hoelle, 2015; Zycherman, 2016; Le Polain de Waroux *et al*., 2021; Kröger, 2022).

Different configurations of how social systems interact with non-human lives and the environment significantly depend on culture (Moser, 2005). Deforestation taking place in many parts of the Amazonian region is mainly linked to the ontology[1] established by Western societies to conceive their way of life, their relationship with non-human lives and their value attribution processes (Porto-Gonçalves, 1989; Leff, 2016; Kröger, 2022). Changes in ongoing trends inevitably demand implementing complex and diverse changes in the cultural systems of some local populations and of the broader societies they belong to (Leff, 2016).

Thus, it is important investigating and promoting ontological and epistemological alternatives[2] to the modern paradigm of relationships between humans and other beings living in the planet. These alternatives may give rise to designs for transitions into new social configurations (Escobar, 2016), which are innovative in their ability to increase resilience and to reverse trends towards socio-ecological tipping.

The MAP[3] zone is located in Southwestern Amazon region. It comprises political units in Acre State (Brazil), Madre de Dios region (Peru) and Pando department (Bolivia). This region[4] is featured by significantly high biodiversity and by a large ecological network. Although all three countries forming this region share the same prevalent land cover type, they present considerably different histories of social formation, public policies and socioeconomic development.

According to Southworth *et al*. (2011), deforestation rates differ across the MAP zone. More specifically, the highest deforestation rates were recorded in Acre State due to fast and extensive forest conversion into livestock farming (Souza *et al*., 2006). On the other hand, deforestation has been taking place in a slower pace and it is more irregularly distributed across the landscape in Madre de Dios region (Chavez, 2009), whereas minimal deforestation has been recorded in Pando department. Most changes in land cover observed in the MAP zone take place near urban centers and along the Brazilian border (Marsik *et al*., 2011).

[1] Ontology is a Philosophy-related term that can be interpreted in different ways from different analytical perspectives. The present study takes into consideration its general nature, as representing something that exists in a given cultural set, by taking into consideration its most general and essential qualities – based on which knowledge can be produced (Tonet, 2013; Moon & Blackman, 2017).

[2] Epistemology also derives from Philosophy and is often described as the study of knowledge. In the present study, it refers to how cultural subjects living in an ontological universe frame and structure relationships to produce knowledge about what is understood as existing (Moon & Blackman, 2017).

[3] The term 'MAP zone' emerges from a set of efforts to establish dialogue and integration of cross-border socio-environmental management within the scope of what is common to the territories of three Amazonian political units belonging to different countries, which share a wide area of similar ecological systems, problems and opportunities (Perz et al., 2022).

[4] Among all three areas, Acre State presents significantly higher population density (5.5 inhabitants/square kilometer; estimate as of 2021), whereas Peru and Bolivia have 1.7 and 2.4 inhabitants/square kilometer, respectively (estimate as of 2017 and 2020, respectively). Urbanization rates among them are also different: 72.56%, in Acre State; 59.5%, in Pando department; and 82.8%, in Madre de Dios region. These data point out that the populations living in rural areas that directly dependent on natural resources and environments, as well as on different forest use and occupation types, comprise 248,842 people, in Acre State; 24,264 people, in Madre de Dios region; and 62,532 people, in Pando department (IBGE, 2022; INEI, 2022; INE, 2022).

Regional trend towards increasing deforestation and changing land use has been observed since the 1990s due to public policies aimed at strengthening activities, such as livestock farming, agribusiness and mining (Müller & Montero, 2014).

Exploratory research involving students from two rural schools located in municipalities presenting territorial similarities – Epitaciolândia (Acre State, Brazil) and Porvenir (Pando department, Bolivia) – was carried out to investigate the dynamics of socio-ecological systems (SESs) in Acre State and Pando department, by taking into account their different trends towards the addressed topic. In addition to the exploratory perspective, the aim of the current study was to co-create knowledge, together with rural youth, about likely opportunities to change trends towards socio-ecological tipping in the MAP zone (Morelli, 2021) and to be led by them. Thus, the current study was guided by the following research questions' scheme:

Based on youth perceptions and expectations about life and the future, what explanatory evidence can be inferred about different SESs' trends in Pando department and Acre State?

What opportunities for solutions and transitions can be learned from youth perspectives and expectations?

What limitations and potentials can be perceived in non-modern educational interventions in socio-ecological transformations?

The herein adopted methodology was based on a research approach inspired by decoloniality (Ballestrin, 2013), transmodernity (Dussel, 2016) and Southern epistemologies (Santos, 2018), mainly due to the critical bias of these theoretical sets towards the hegemony of the "single world" of modern science as mediator of knowledge that can be useful to civilizational crises faced by human society (Escobar, 2021). Furthermore, it established "bridges" between modern and non-modern perspectives, both in and with its text, as well as acknowledged possibilities of knowledge ecologies among different ontologies (Santos, 2018).

Based on this philosophy, the current study focused on modeling a participatory research intervention (Moretti & Adams, 2011) to address socio-ecological change processes taking place in the MAP zone, with emphasis on awareness and problematization, as well as on challenging "single", preconceived and homogenized ideas, such as "deforestation", "nature" and value-based classifications of what exists as "life", among others (Freire, 1987). In order to do so, semi-structured interviews (Boni & Quaresma, 2005), and a seminar called "Youth Ideas about Alternative Futures", were conducted with local students, in partnership with schools.

The seminar addressed transformations taking place in SESs, as well as tipping points, by considering all life forms as "existences" (Kröger, 2022). It avoided using conventional modern concepts, such as species, biodiversity, forests and natural resources, among others. Furthermore, the adopted methodology has followed an epistemology based on sensations, emotions and affections (González-Rey & Martínez, 2017) rather than on structures of ideas forged by modern rationality and produced by its scientific tradition, such as natural resources, global warming, climate change, sustainable development and biodiversity loss, among others.

Next, sections 2 and 3 provide a brief theoretical framework. Section 4 describes the adopted methodology. Section 5 presents the results and addresses young people's perceptions about places and

the future, their understanding about their regions' past in the context of what existed before them, their reactions to political expressions of locally extinct "existences", and the alternative futures they see in relation to current trends (considering the inclusion of locally extinct "existences"). Finally, Section 6 presents the final considerations covering all 3 research questions.

## *2. Socio-ecological systems and tipping points in the Amazonian context*

Fossil fuel using and changes in land cover have exponentially increased since the beginning of the industrial era, around 1800 AD (Steffen et al., 2011). Mechanization and technology enabled populations to grow fast, and this process was followed by increased human life and well-being expectancy and, consequently, by increased consumption of natural resources. Currently, it is possible assuming that the human mark on Earth is so significant that one can speak of a new geological epoch, namely: Anthropocene (Steffen *et al*., 2011).

This period is featured by complex humans/natural environment interactions that challenge landscapes, ecosystems and resources' management processes (Rockström et al., 2009), besides generating financial instability and inequalities (Steffen *et al*., 2011). Thus, it is extremely necessary integrating the social and biophysical components of systems at regional scales to help overcoming these challenges (Dearing *et al*., 2015). The concept of Socio-Ecological Systems (SESs) addresses these components as connected; thus, it is a powerful theoretical approach to be adopted at the time to deal with challenges arising from the complexity of interactions between people and the environment in the Anthropocene (Steffen *et al*., 2011).

According to Cinner & Barnes (2019), people and nature are closely interconnected in a given SES. On the one hand, human activities change and shape ecosystems' functions and structure. On the other hand, ecosystems (which humans are an integral part of) provide goods and services that play key role in populations' health and well-being. Thus, societies should efficiently use resources to generate good ecological conditions to enable sustainable ecosystem services' provision. These interdependent relationships and feedbacks between ecosystems and people can reach dynamic equilibrium over time and make SESs resilient to some extent.

Resilience describes "the capacity [of a system] to tolerate, absorb, cope with and adjust to changing social or environmental conditions while retaining key elements of structure, function and identity" (Cinner & Barnes, 2019, p. 51). Thus, this concept describes how people are affected by, and respond to, changes. A given society can respond to changes through adaptation (resilience) or transformation processes. Transformation focuses on fundamental reorganization processes, such as systemic reforms. It is essential responding to changes through resilience because, once a given threshold caused by disturbances and/or different social or environmental conditions is crossed, the system moves to a structurally different stable state (Cinner & Barnes, 2019). Returning to the original equilibrium state can be hard, or even impossible, from this point on.

Although tipping points in SESs take place in the social system, they are connected to changes in their ecological system due to cause-and-effect

relationships. These changes are often caused or boosted by social events (Milkoreit *et al*., 2018). According to Milkoreit *et al*. (2018, p. 9):

> a social tipping point can be defined as a point within an SES at which a small quantitative change inevitably triggers a non-linear change in the social component of the SES, driven by self-reinforcing positive feedback mechanisms that inevitably and often irreversibly lead to a qualitatively different state of the social system. Due to the interconnectedness between social and ecological system components, crossing a social (or ecological) tipping point leads to a qualitatively different SES, which is characterized by a different set of stabilizing positive and negative feedbacks.

SESs, mostly those in the Amazonian region, are threatened by several factors capable of leading them to tipping points (Lovejoy & Nobre, 2018). Despite its global importance, the Amazonian region is increasingly threatened by significant deforestation (mainly driven by agriculture and livestock farming expansion), by forest degradation activities (fragmentation, logging, hunting and fire events) (Bullock *et al.*, 2020), as well as by inequality and poverty issues (Valentim & Garrett, 2015).

## *3. Extractivism of "existences" as culture, education and design of transitions*

Fast transformations observed in Amazonian SESs can be analytically mediated by the concept of extractivism, which is useful insofar as it is flexible and broad enough to describe the increasing damage to, and destruction of, both resources and lives, together with changes in land use (forests' transformation into pastures and monocultures, roads, dams and railways, among others), besides cultural aspects and the economic logic of capitalist accumulation. According to Chagnon *et al.* (2022, p. 763), extractivism refers to:

> a complex of self-reinforcing practices, mentalities, and power differentials underwriting and rationalizing socio-ecologically destructive modes of organizing life through subjugation, depletion, and non-reciprocity. Extractivism depends on processes of centralization and monopolization, is premised on capital accumulation, and includes diverse sector-specific development and resistance dynamics.

The cultural dimension of extractivism mainly derives from the formation of modern Western societies. In addition, it is based on a specific ontology, according to which, non-human life forms exist as significantly separate, objects, non-existent, and as things generically represented by the idea of nature (Porto-Gonçalves, 1989). This configuration allowed humans to exercise high degree of superiority and power over other life forms by controlling and dominating them through violence (Ceceña, 2012; Leff, 2016). *Sapiens* often decide - unilaterally - whether to trade, extinguish (through deforestation, for example) or redistribute them by removing a population of "existences" from a given territory and by inserting a few other species, such as grass and cattle or monocultures, in it (Kröger, 2022).

This modern ontology also formed the basis to build Western knowledge (Santos, 2018) by implicitly guiding the orders and meanings of Western societies' colonial expansion over the diversity of cosmologically different territories, such as the Amazonian ones (Porto-Gonçalves, 2015). Although concepts, such as species, nature, forest,

biodiversity, ecosystem, landscape, natural resource and bioeconomy, among others, are useful constructions to help better understanding SESs, they can carry, within themselves, part of the modern issue associated with the colonial pattern imprinted on the Western culture (Kröger, 2022).

Kröger (2021; 2022) proposed a drastic change in how to see and signify what exists at the time to think about a post-extractivist 'world'. Based on the relational cosmologies of pre-modern peoples, the aforementioned author suggested using the idea of "existences" from a broad perspective, by replacing modern forms that group together a wide diversity of forms and configurations of life as objects. Based on this approach, each individual and its relational web are unique and must be approached in this quality of existence. Thus, seeing the modern uninhabited void as filled by "existences" can promote important ontological changes and contribute to the construction of new relational epistemologies capable of acting as antidotes to extractivism.

Thus, if the problem of tipping points in the Amazonian region significantly derives from societies' cultural configuration, addressing this crisis, which has civilizing nature (Escobar, 2021), requires deep and paradigmatic innovations, mainly in our ontological dimension. In short, non-human lives and their communities must have other properties for us, humans (Kröger, 2022). Alternatives are also necessary in science, and it is important reestablishing our relationship with the community of life by promoting a less anthropocentric plan in our theoretical-methodological constructions, based on these new herein referred to properties (Kröger, 2021; 2022).

The challenge faced by this ontological redesign process (Escobar, 2016) requires generating new ontological and epistemological perspectives, as well as developing an associated institutional-methodological instrument to promote paradigmatic changes in the sociocultural dimension, based on which the co-creation of knowledge could be promoted at local level (Morelli, 2021). Thus, it is important emphasizing that formal education and its institutions should not be disregarded. On the contrary, the transformative potential of rural schools in the Amazonian region, which is almost often ignored, should be explored.

Education can be a transformative and liberating practice for individuals living under unjust and unequal cultural patterns, both at societal level and in connections between societies and other life forms (Freire, 1987; Gadotti, 2005). Including young people, their problems and scenarios in reflective pedagogical processes can promote changes in cultural patterns in the generational succession of local populations and enable the emergence of innovations capable of promoting positive dynamic balances in regions where SESs tend to undergo tipping processes.

Western educational interventions often use modern reasoning to formulate socio-ecological issues, as well as their arguments and methods. Although this form is valid, it has limited potential to produce knowledge for resilience purposes, because it ignores other dimensions concerning human integrality, such as spirituality and affections (Santos, 2018; Porto, 2019; Porto, 2020).

It is known that sensations, emotions and affections have great potential to influence knowledge and the meaning formed by human subjects at the time to approach a given social and environmental configuration (González-Rey & Martínez, 2017). This factor should be taken into consideration at

the time to investigate and develop interventions aimed at significantly changing the cultural dimension in social systems. Thus, the development of educational interventions based on disruptive theoretical-methodological approaches associated with the modern way of seeing non-human lives is clearly a great opportunity in this context (Pereira *et al*., 2019).

## *4. Methodology*

### *4.1. Places, schools and contexts*

The current study was conducted in Epitaciolândia (Acre State, Brazil) and Porvenir (Pando department, Bolivia) municipalities, in the aforementioned schools. These schools were selected because they present similar contexts, namely: they are rural educational units located in areas with high anthropization degree in their immediate surroundings, present relatively similar proximity to medium-sized urban centers, besides being served by the main roads of their regions and close to the border between Pando department (Bolivia) and Acre State (Brazil). Furthermore, they are located near important protected areas in their regions, where traditional populations live in. The school in Epitaciolândia is close to Chico Mendes Extractive Reserve, which houses 8,220 inhabitants (Acre, 2010), whereas the school in Porvenir is close to Manuripi Amazonian National Wildlife Reserve, where approximately 1,691 people live in (SERNAP, 2011). Figure 1 shows the location of the aforementioned schools and a basic contextualization of their surroundings:

#### *4.1.1. Epitaciolândia municipality (Acre State) and Luiz Gonzaga Rocha State School (EELGR - Escola Estadual Luiz Gonzaga Rocha)*

Epitaciolândia municipality has estimated population of 18,979 inhabitants (IBGE, 2022). It is the fifth municipality in the ranking of the largest total deforested area in Acre State - 53.60% accumulated until 2020 (INPE, 2022). Moreover, it is part of Upper Acre microregion, which is an agricultural expansion area developed from the BR-317 highway (mainly in the last four decades), where 26.27% of forests have already been deforested (INPE, 2022). Although Epitaciolândia and, to a certain extent, Upper Acre region have rubber tappers (which are considered a traditional population[5] in Brazil) at the basis of their social formation process, their population was forged through a modernization process with successive migratory additions that have significantly distanced the cosmological perspectives of indigenous populations native to this region (Hoelle, 2015; Castelo, 2015). According to the Agricultural Census carried out in 2017, 39.19% of the total area of this municipality was declared as pastureland, and it corresponded to increase by 36% in pastureland in comparison

[5] Since Decree n. 6040 - from February 7th, 2007 - was issued in Brazil, traditional populations are classified as culturally different groups that acknowledge themselves as such, that have their own social organization forms, and that occupy and use territories and natural resources as condition for their cultural, social, religious, ancestral and economic reproduction, based on using knowledge, innovations and practices generated and transmitted by tradition. This broad term can include several traditional population categories, such as extractivists, riverside dwellers and native peoples, among others (BRASIL, 2007).

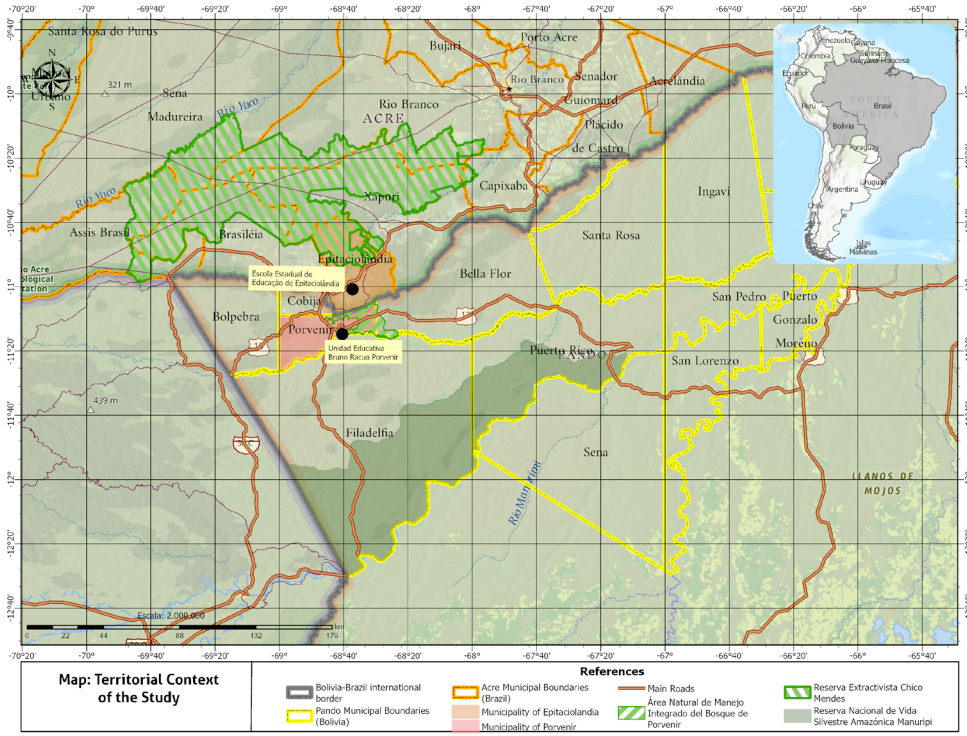


FIGURE 1 – Map showing the location of schools included in the current study.
SOURCE: Elaborated by the author.

to the census carried out approximately ten years earlier, in 2006 (IBGE, 2022). Luiz Gonzaga Rocha State School (EELGR) is located close to the urban area of this municipality, approximately 10 kilometers away from it. It was built between two agrarian reform settlement hubs, where agricultural lots' size range from 1 ha to 5.5 ha. Approximately 50 families live there, and they often live on small-scale family agricultural production and on income generated from working in urban centers and in rural surroundings.

### *4.1.2. Porvenir municipality and Bruno Racua Educational Unit (UEBR - Unidad Educativa Bruno Racua)*

Porvenir municipality is located in Nicolás Suárez province, Pando department, Bolivia. It has the third largest population in Pardo department – 8,160 inhabitants (INE, 2022). According to data from the last census carried out in Bolivia, this municipality experienced annual population growth by 6.79% over 10 years (2001-2012). Its main economic activities lie on chestnut harvesting, *açaí* berries' collection, logging, livestock farming and fishing.

Currently, it has only one municipal protected area called "Porvenir-Woods Integrated-Management Natural Area", which encompasses approximately 32,000 hectares. Bruno Racua Educational Unit is located in the urban area of Porvenir municipality and it serves children and young students from the early, primary and secondary education levels, who live in Porvenir, as well as in the rural and indigenous communities near this zone. This municipality, which is accessed through paved road, is 31 kilometers away from Cobija, capital of Pando department, where approximately 78,500 inhabitants lived in, in 2019 (INE, 2022).

### *4.2. Participants*

The following profile was established for participants based on the aim of the current study: young people living in rural areas located at the intersection of zones with high deforestation degree near protected areas and medium-sized urban areas in comparison to their political-regional units (Pando department and Acre State). In addition, interviewees should be attending High School or Secondary School[6], within the conventional age range set for these educational cycles. The schools and locations mentioned in the previous section were selected based on these criteria.

Participants were selected by the investigated schools, which were asked to prepare one of their classes, from any grade of the aforementioned educational cycles, for the seminar. In total, 13 students from Epitaciolândia and 21 students from Porvenir[7] participated in all research stages.

### *4.3. Seminar*

The seminar was the main instrument used for knowledge production purposes. It was configured as educational intervention in the format of participatory workshop. Based on its methodological design, two phases of it should be carried out on the same day. Phase 1 aimed at making participants familiar with the research scenario by engaging them in the discussion about tipping points in SESs, based on the approach to "existences" (Kröger, 2022). Phase 2, in its turn, aimed at generating collaborative knowledge about the possibilities of alternative futures to current trends locally extinct "existences" could be "invited to reintegrate"[8] themselves to and to establish new relationships with current inhabitants.

Two seminars were held. The first seminar took place at Luiz Gonzaga da Rocha State School, Epitaciolândia municipality, Acre State, Brazil. The second one took place at Bruno Racua Educational Unit, Porvenir municipality, Pando department, Bolivia.

### *4.4. Interviews*

Semi-structured individual interviews were simultaneously conducted with seminar participants

[6] It is the last educational level before Higher Education; it generally aims at young students in the age group 17-18 years.

[7] In Porvenir, in the morning, more than 30 students (two classes) participated in phase 1, at the school's request. In phase 2, held in the afternoon, only the group designated for the research continued participating, totaling the number of 21 participants informed in the text. These students were the interviewees and authors of the phase 2 products, analyzed in the text.

[8] Text written in figurative language (based on the alternative communication process and approach proposed for the seminars).

who were available during the periods set for group work, after prior consultation. Eight participants were interviewed in Epitaciolândia and eleven, in Porvenir. Conversations were guided by two questions: "How do young people perceive the place where they live in?" (focusing on what they like and dislike about their experiences of living in these places) and "How do they imagine their future?". These questions were formulated to help broadening knowledge about young participants' context, as well as their perceptions about their lives, territories and life projects, which were aspects inherent to the current research questions. Interviews were recorded on video.

### *4.5. Documentary*

A documentary lasting 16 minutes and 13 seconds, called *Young People Imagining Futures in the Amazon*, was produced based on recorded interviews and on the seminars. It is available at <https://youtu.be/XVZl3A6YjKM?si=c6tn81uRrtl2-Ajv>. It was done to provide feedback on research results to participants and to record the methodological process of this investigation. The script followed the research flow, and it was based on the guiding questions used in procedures shown in Table 1.

### *4.6. Products and data analysis*

Individual interviews with participants were systematized to organize qualities inherent to the guiding questions into information types, mainly regarding recurrence (Alves & Silva, 1992) – results will be presented in subsection 5.1. The interviews, together with long-term observation of regional dynamics carried out by locally based researchers belonging to our research team - one from Federal Institute of Acre State (*Instituto Federal do Acre*) and the other one from Amazonian University of Pando (*Universidad Amazónica de Pando*) -, helped better understanding local youth contexts and provided support to products' analysis and to seminars' dynamics.

The products generated in the seminars are listed in the third column of Table 1 (timeline, drawings and tables). They were analyzed from Barbosa & Teodoro da Cunha's (2006) visual anthropology perspective. Thus, the drawings were 'looked at' as objects to be interpreted from researchers' perspective, in a 'crossing' among visual products, our 'worlds' as researchers, the research questions and the youth 'voices' emerged in the presentations. The iconographic signs in the drawings, as well as their recurrences and features, were treated as clues and indicators that allowed describing those groups' features, worldviews and perspective about tendentious and potential attitudes towards the research guiding questions. Audio recordings of the group work presentation on the timeline, committees and individual drawings were systematized according to the video-recorded interviews (Alves & Silva, 1992). Results of the seminars will be presented in subsection 5.2.

## *5. Results and discussion*

This section presents and discusses the current results by following the research procedural order, based on the guiding questions presented in the first column of Table 1.

TABLE 1 – Summary of data and knowledge generation flow in the study.

| Instrument / Guiding questions | Educational intervention / Pedagogical goals | Products generated for the research |
|---|---|---|
| Semi-structured individual interviews / How do young people perceive the place where they live in? How do they imagine their future? | - | Audiovisual recorded interviews. |
| Seminar - Phase 1 / What was in this place? | 1. Timeline (group work) / Creating a research scenario framed by the intuitive understanding of other life forms by approaching them as "existences" (Kröger, 2022); Promoting the reading of the place's past based on an approach, according to which, changes mediated by the human species led to the extinction of other "existences". | Timeline of "existences" that lived in the territories where participants' communities are currently located in. |
| Seminar - Phase 1 / With respect to extinctions, what would the extinct "existences" of this place tell us if they could? | 2. Trail of "existences" (experience with the whole class)<br>3. Conversation circle (with the whole class). Promoting sensation-emotion-affection-mediated interpretations of the problem. Playfully promoting the translation of what political expressions[9] of "existences", which were and are being extinguished in the place, into human cultural language/perspective. | Audio-recorded conversation circle focused on participants' perceptions about the extinction of local "existences" that took place in the past. |
| Seminar - Phase 2 / What alternative future could we imagine if extinct "existences" were "invited" to come back and live with us here? | 4. Drawing workshop 'Imagining alternative futures' (individual) / Promoting participants' imagination about the place in the future, by taking into consideration the reintegration of extinct and endangered "existences", based on a different ontology. | Individual drawings representing alternative future locations. |
| Seminar - Phase 2 /<br>What existences could we invite to live with us again? What would our relationships be like? What can we do to make our imagined future come true? | 5. Committees (for inviting new residents; for happy relationships; and for actions) (group work) /<br>Promoting ideas on how to produce imagined alternative futures. | Tables of 'existences invited' to live with humans in the territories, of 'happy relationships', and of 'actions' to make the imagined futures come true. |

SOURCE: Elaborated by the author.

[9] "Political expressions of existences" was used as instrument in the methodology aimed at representing "existences" that were extinguished by human actions in the territories currently occupied by the young participants and their families. The "existences" used in the "trail of existences" phase mainly comprised indigenous peoples and entities alluding to animals and plants that lived in those territories in the past. These entities presented their political complaints about what happened to them, through mediators' artistic representations, and questioned participants about their initiative towards what is happening in the contemporary world (pointed out as similar). In this political complaint, these entities asked to be reintegrated to the territories by the young people and claimed their right to re-exist and to coexist with humans again.

### *5.1. Youth perceptions about life and future scenarios*

#### *5.1.1. The 'quality of living' in Epitaciolândia and Porvenir*

When young Epitaciolândia students were asked about what they like about the place where they live in, they mentioned "tranquility", "calmness", "nature", "fresh air", "clear water", the "possibility of performing activities like fishing" and the "pleasant habitat". They also talked about how they feel "safer in comparison to the city" and about feeling lower level of "difficulties" than they would feel if they lived in cities. Only one interviewee said that he did not like living there, because it was a small place and that he preferred the "big city". Overall, participants expressed positive feelings about living in that region, which were always compared to what is perceived to exist out of it (in the cities).

Likewise, young participants living in Porvenir valued local environmental elements by describing the "beautiful" environment, the "tropical climate", the presence of "lots of nature", "the landscapes", "the sky", "the greenery", and "fresh air" as positive aspects. They also mentioned elements of local culture, social relationships, and activities and places that young individuals enjoy, such as "the fish festival, which takes place in October, when one can eat very good fish". "Canoeing on the river", "going to tourist attractions", "the local culture", people "who know how to live in community", the river and "how one can swim and enjoy nature" were also highlighted by participants.

Overall, young participants from both investigated municipalities valued the natural and environmental aspects of the places they live in. Furthermore, participants from Porvenir described a broader and more prominent set of elements of local culture as positive aspects, namely: festivals, the quality of social relationships, the value of tourist attractions and social spaces like squares. The diversity and intensity of reports about their experiences with nature stood out; thus, it is important taking into consideration that Porvenir holds a larger number of preserved forests than Epitaciolândia.

With respect to those who do not like their municipality, young participants from Epitaciolândia have mentioned "lack of study opportunities"; the existing crimes, although they acknowledged they took place to a lesser extent than in other places/regions; "impaired transportation when it rains"; being a small place with little entertainment in comparison to the city; corruption; and low-quality public management.

Likewise, young participants from Porvenir have mentioned lack of "opportunities", "job" and "resources"; lack of attention by the "authorities" to the cleanliness and care of public spaces; low-quality streets, which "are not good and get very muddy"; and lack of spaces like "recreational parks for children and teenagers". Crime did not appear in young Porvenir participants' reports. One element in this locality stood out: five of the young participants (≈45%) have mentioned the bites of insects living near the river as negative aspect.

Overall, young participants from both countries perceived their places in a positive way and wanted similar elements to be improved, namely:

a) opportunities that seem positive and viable to support the imagination of desirable futures;

b) higher quality and participation in public governance;

c) more leisure and recreational possibilities;

d) better quality of public spaces, such as streets and squares, among others.

### *5.1.2. The future imagined by young participants for themselves*

"Leaving" and "going to college" were future-related constants that emerged in young Epitaciolândia participants' statements. They mentioned careers, such as Nursing, Architecture, Medicine and Law, as well as professions related to typical State institutions, such as "federal highway police officer" and "military service", which have local headquarters and importance, as well as high status in the region.

It is noteworthy that no training courses directly linked to the rural world emerged in the statements of some participants. This factor can be partly explained by lack of positive narrative about training in the agricultural field as likely to achieve a good life in the region (or reference cases in these terms).

In addition, the typical career as rural entrepreneur in family farming, who combines technique, technology and specific educational training to develop his/her rural business, did not emerge as possible choice in young participants' narrative. Overall, individuals who graduate in a profession with above-average salaried remuneration and some social prestige prevailed as examples of success. The following quote exemplifies the most recurrent structure of ideas observed in the interviews:

> *I have plans to finish the third year here and go to college. I want to study Nursing and, then, I want to study Architecture. Oh, I plan to do other things when my life is better structured… I think about studying in other places because the city I live in offers few opportunities and there are more opportunities out there than in here* (Participant from Epitaciolândia).

It was possible seeing that the future perspective in rural activity is linked to the size of the land one owns. On the one hand, those who have plenty of land can breed cattle and have social prestige as "small farmers". Thus, the future scenario of "success" involves continuous land acquisition and increasing the number of "cattle heads" (which tends to result in deforestation). On the other hand, those who have small land are small rural producers without the potential to live on livestock and on the capitalization enabled by it. In the last case, there is no future scenario of success elaborated or proposed for young individuals - to keep them as family farmers. Thus, the future often "arrives" by chance, without planning or training focused on individuals' place (the 'project' turns into city-related things like "college", "job"/"salary", among others).

Although participants from Epitaciolândia have shown relative satisfaction with life, this municipality lacks local elements that could be used to give meaning to desirable futures (Bai *et al.*, 2016) that seem viable to young individuals, since there seems to be a crisis of "opportunities" and satisfaction scenarios in the local rural area. Accordingly, studying in other places and training in professions that are not typically rural seems to be the narrative available to give meaning to life projects. Moreover, young participants have shown high stress associated with their future from this perspective. The idea of going to college is also a constant element in young Porvenir participants' imagination about the

future. They mentioned careers in fields like Civil Engineering, Forest Engineering, Medicine, Nursing, Biochemistry and Systems Engineering, among others. However, the one that appeared most often (three occurrences) was the Teaching career - this profession did not emerge in young Epitaciolândia participants' statements. Although they reported to be forced to pursue professional training out of Porvenir – they almost always referred to Cobija (capital of Pando department) –, they were lesser stressed about "leaving" and "going to college" than participants from Epitaciolândia.

Participants from Porvenir made their formulations about their futures based on a strong idea of "traveling", knowing what is "out there" and living in "other places", but they almost always expressed their plan to go back to Porvenir. Similar to Epitaciolândia, most imaginations about participants' personal future did not imply associating local rural elements with a desirable future. Nevertheless, the life mode narrative was entirely crossed by activities associated with local biodiversity, such as going out to pick up chestnuts or açaí fruits, river bath and fishing, among others - which is an opportunity to promote different futures in these terms. A young participant said that he thought about studying Forest Engineering: *I am going to study Forest Engineering. I like this field and we must like what we are going to study. I like nature, so I am going to study Forest Engineering.* (Participant from Porvenir, our translation)

Both Epitaciolândia and Porvenir participants have mentioned elements associated with the topics addressed in the seminar when they were asked about the future, and it pointed out the internalization of discussions held at the event or fostered by other subjects' experiences, as shown in the following excerpts:

> *I think about a future when we can see more trees, because people are dying due to deforestation, to wildfire events taking place in several places, the air... the smoke kills* (Participant from Epitaciolândia).

> *Well, if people were more aware and planted more trees for future generations, I imagine a very good future... If everyone were as aware as I am...* (Participant from Epitaciolândia).

> *We must respect nature. Do not destroy the trees. I have experience, because I fish and I go pick up chestnuts. I know how beautiful nature is and we should not destroy it* (Participant from Porvenir, our translation).

> *I would like the authorities to show a little more interest in preserving what we have here, in Pando, Porvenir's nature* (Participant from Porvenir, our translation).

## *5.2. Imagining alternative futures*

### *5.2.1. The past of places and locally extinct "existences"*

The first seminar activity aimed at recovering the history of the place, by promoting the imagination of what "existences" lived where the involved communities currently live in. In order to do so, participants were split into working groups and asked to elaborate a timeline mediated by the following guiding question: "What was in this place?" Each group was supported by a moderator from the research team, who encouraged discussions based on the following sub-question scheme: "What was in this place before you?", "What was the relationship

between these 'existences' like?", "Why did they cease to exist?".

The two working groups in Epitaciolândia presented a perspective of the past based on significant amount of information deriving from school content. Expressions like "beginning of the universe", "Big Bang and the emergence of humans", "dinosaurs" and "giant peach palm" were examples of it, as shown in Figure 2:

There was slight tension between interpretations of the past based on Christian myths and the scientific narrative. Expressions, such as "emergence/creation", were examples of it and of how participants resolved the conflict by mixing the two versions. They were encouraged to think about the relationship between humans and other life forms in the past and presented a positive view through expressions, such as "greater connection with nature" and "lesser diseases".

Young Epitaciolândia participants had a significantly hard time describing the transformations of the last century and how the social formation they are part of was configured in this context. Elements, such as rubber tapper and indigenous people, emerged, but they were not articulated in a well-defined historical narrative. There was difficulty, for example, in describing how the indigenous peoples that - in participants' imagination - were the human populations occupying that place before them had "disappeared". The explanation for some of them was "they left", "they modernized themselves", among others. Indigenous peoples' massacres in / expulsions from that region only emerged as consensus in one of the groups after a long mediated discussion.

The issue of local "existences" extinction emerged in a version that combined general narratives of modern Western societies about the environmental agenda to arguments justifying the association between deforestation and local social needs. Terms like "destroying to evolve", "generating wealth" and "better conditions" represent this narrative, as shown in Figure 3:


FIGURE 2 – Initial part of the timeline set by one of Epitaciolândia groups.
SOURCE: "Youth Imaginaries of Alternative Futures" Seminar held in Epitaciolândia (2022).

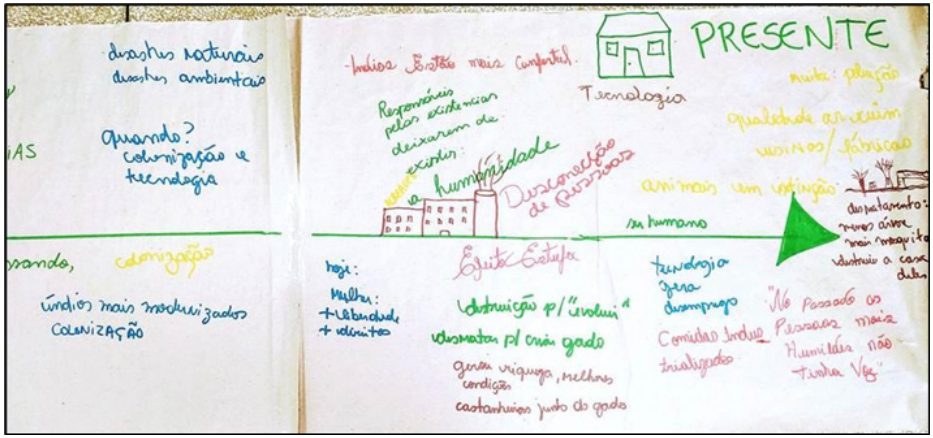


FIGURE 3 – Final part of the timeline set by one of Epitaciolândia groups.
SOURCE: "Youth Imaginaries of Alternative Futures" Seminar held in Epitaciolândia (2022).

Four working groups were formed in Porvenir due to the larger number of participants. The research team understood that using the word "beginning" as time zero marker in the timeline could have induced association with theories about the beginning of the universe, among other elements of this nature. Therefore, participants were allowed to work with the term "past".

Based on their timelines, there was great harmony between groups in associating the past with a given time zero, when there were "woods", "animals" and "virgin jungles" where "no people lived" in. Interestingly, "forest" and "animals" were not only mentioned at general level (as observed in Epitaciolândia), they were also mentioned by their typological names, such as "jaguar", "monkey", "*onça*", "macaws", "tapirs", as well as plants, such as "fishbone fern", "*mara*", "English oak", "cocoa tree", among others.

The beginning of human settlement in this region can be represented by the following sentence: "then the first indigenous people lived there". Participants in two of the four groups have mentioned several indigenous communities living in Porvenir region by their names, namely: "Tacana", "Kavineño", "Esse Ejja", "Yaminawa", "Machineri", unlike participants from Epitaciolândia, who only used the general term "indigenous" to refer to these communities.

Participants also mentioned migrations: "soon, more and more people arrived to settle" and "their houses were built out of clay and walking palm, and their roofs were made of *jatata* leaves". They also mentioned jobs of that time: "abundant chestnut pickers, rubber tappers". Houses' shapes and materials were mentioned in three of the four groups; and it showed that these elements were still clear in participants' memory. According to these young individuals, the past of the place can be well represented by Figure 4:

There was fast transition from past to present, as well strong contrast between them, in all four groups. The past was featured by plants, animals, rubber tappers and indigenous peoples, whereas

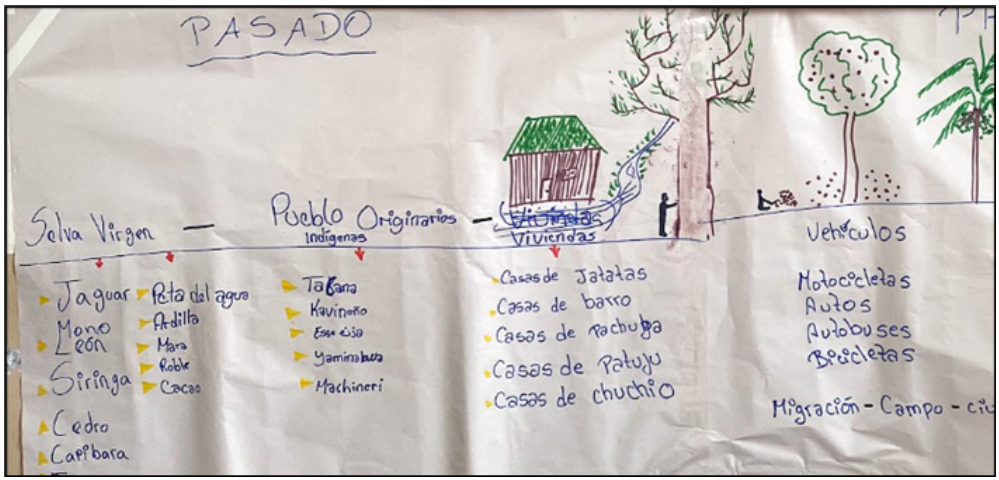


FIGURE 4 – Initial part of the timeline set by one of Porvenir groups.
SOURCE: "Youth Imaginaries of Alternative Futures" Seminar held in Epitaciolândia (2022).

the present was featured by urbanization and migratory movements to the investigated place. The present was represented by elements expressed with significant positivity. Although participants have mentioned the smaller number of "forests", "animals" and "indigenous people", they also presented a positive general perspective about development and improvements in quality of life that affect city aspects, its services and infrastructures. At the same time, they acknowledged chestnut companies and lumberyards linked to the forest. Interestingly, transportation elements were highlighted in all groups. The imaginary associated with the present is shown in Figure 5:

Both young Brazilians from Epitaciolândia and Bolivians from Porvenir described the past with high anthropocentrism degree. Participants from Epitaciolândia had an even harder time describing the past of the place and the other "existences" that had lived there (plants, animals, indigenous peoples), with emphasis on cultural aspects and on the effects of Acre State's social formation process. Although many of these young individuals identified themselves as descendants of rubber tappers who migrated from Northeastern Brazil and of indigenous peoples native to this region, there were no identifiable expressions, such as intergenerationally transmitted memories, through which elements of indigenous cultures or local traditional cultures like that of rubber tappers can be perceived in the representation of non-human lives. Actually, school and media contents related to environmental discussions stood out, instead.

Information about Porvenir's past – indigenous peoples[10], animals and plants that had existed in that place –, as well as about how people lived

[10] Assumingly, the current educational system in Bolivia has influenced this item, since its programs include information about the indigenous peoples who lived in that place.

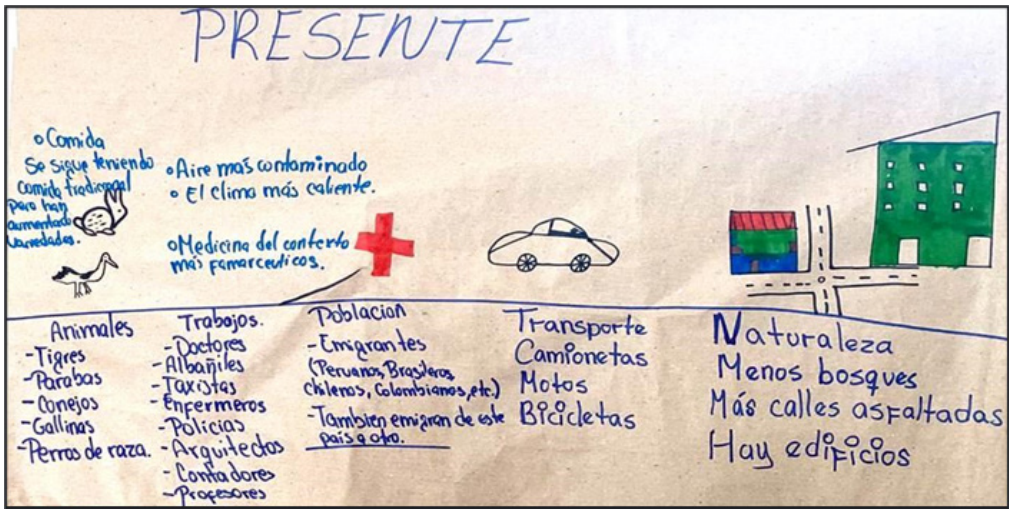


FIGURE 5 – Final part of the timeline set by one of Porvenir groups.
SOURCE: "Youth Imaginaries of Alternative Futures" Seminar held in Epitaciolândia (2022).

there, were naturally conveyed. This finding has evidenced that oral memory transmission in social formation and generational succession processes took place in a way that enabled greater wealth of knowledge and relationships with a wide diversity of non-human "existences", a fact that, in this case, helped increasing local socio-ecological resilience.

### *5.2.2. Political expressions of extinct "existences"*

The second activity aimed at promoting a non-modern educational intervention mediated by sensation-emotion-affection, in which locally extinct non-human existences politically expressed to young participants - through simulation - how they feel about our species and local extinction processes. An adapted "trail of nature"-type route was created at this point - it was named "trail of existences". It was a path, guided by a string, in a selected area around the school (we looked for some vegetation, for shade and sensory ambiance purposes). Blindfolded participants walked along it, one by one.

The trail was prepared so that participants could feel different textures and alternating touch (mud, leaves, vines, sand and water) and taste (in this case, grapes) sensations. In addition, flower-scented water was sprayed at certain points along the trail and thrown in a rainfall-like manner. Simultaneously, researchers playing indeterminate characters analogous to what would be non-human and indigenous "existences" approached each participant as they walked along the trail, in three different moments: in the first one, they said some improvised sentence like "I give you food to quench your hunger. Open your mouth and eat it!". At this point, a piece of fruit was placed in each participant's mouth. In the second moment (about the

rain), a researcher said something like "I give you water to quench your thirst." In the third moment (about the perfume), the researcher said "I give you the perfume of flowers. Smell it!". Each participant who completed the trail remained sitting and blindfolded, in silence, in a covered area, until everyone had completed the trail.

A sound - emitted by an electronic device - representing nature was played in the background. Two researchers introduced an artistic sound expression that represented extinct "existences" in that place, based on the following features: *maraca*[11] sound played in circles around sitting participants in analogy to indigenous "existences". Subsequently, researchers introduced political-nature speeches representing extinct "existences" to express how they felt about their extinction from that place (in the past and in ongoing processes). They asked for changes so that this generation can build relationships with other "existences" in life once again, in a "positive" way. After this process was over, young participants removed their blindfolds and the following sentence was read to them so they could reflect about it during lunch: "The future started to be written in the past, but, now, the present is the one holding the pen. Who is the present?"

Participants were fully focused on the activity during the trail in Epitaciolândia. Their reports and the conversation circle based on this experience led to results that were consistent with intervention-planning expectations, such as evidence of positive impacts on the inclusion of non-human "existences" in individuals' subjective configuration (González-Rey & Martínez, 2017). Some excerpts from the dialogues, cited below, represent participants' perceptions:

> Dialogue 1:
> *It was a unique experience... At least, I... I had never stopped like this to listen to the birds singing... Right?! And, there was that little sound... the waterfall... Right?! It sounded like a waterfall... I had never stopped to listen to it. It was amazing!* (Participant 4 from Epitaciolândia)
>
> Dialogue 2:
> ***— Seeing things is one thing. Then... with your eyes closed... Oh my God... It is terrifying****. Right?* (Participant 1 from Epitaciolândia).
> *— But what did you feel with your eyes blindfolded? About the textures...* (Moderator).
> *— I felt like I was on the indigenous' trail* (Participant 2 from Epitaciolândia).
> *— On the indigenous' trail?* (Moderator).
> *— Yeah!* (Participant 2 from Epitaciolândia).
> *— A peaceful feeling* (Non-identified participant from Epitaciolândia).
> *— A peaceful feeling?* (Moderator).
> *— Yes. If we stop to listen and feel, we feel very calm* (Participant 3 from Epitaciolândia).
> *— Why do we feel calm?* (Moderator).
> *— Because we feel nature, right?* (Participant 3 from Epitaciolândia).
> *— **Because, at that moment, we feel it with our hearts**. Because just by looking at it we do not fully connect with it, but with our eyes blindfolded we were connecting with nature* (Participant 2 from Epitaciolândia, our emphasis)

The activity carried out in Porvenir initially counted on more than 30 participants[12], which was almost three times the initially planned number; this factor required researchers to adapt the planning. Thus, participants were split into three groups;

[11] Indigenous percussion instrument.

[12] As described in footnote n. 8.

each group walked the trail, in turns. In addition, the space near the sports court, which did not have trees or vegetation that could lead to differential acclimation, was an element that, from our perception, somewhat hindered the experience. On the other hand, the wooded and vegetated space in Epitaciolândia provided a more suitable environment to set up the intervention, and the planned number of participants enabled having an experience closer to what was intended. As a lesson learned, given this context, it is recommended primarily checking the location's conditions and looking for a place whose ambience - preferably a forest - qualifies the intervention to be carried out. In addition, it is recommended forming small groups (from 10 to 15 participants) to provide the best experience.

Although there was some additional dispersion in the intervention carried out in Porvenir in comparison to that carried out in Epitaciolândia, the current study achieved positive results in what was expected, as shown in the following statements from participants:

> Dialogue 1:
> — *What did you feel in this last exercise?* (Moderator 1)
> — *Fear* (Participant 1 from Porvenir, our translation)
> — *What else?* (Moderator 2)
> — *Confusion* (Participant 1 from Porvenir, our translation)
> — *Excitement* (Participant 3 from Porvenir, our translation)
> — *Tranquility* (Participant 4 from Porvenir, our translation)
> — *One by one…* (Moderator 2)
> — *I felt like I was walking through the forest, to the sound of birds* (Participant 5 from Porvenir, our translation) (noise).
> — *I liked the tranquility of listening to the water, to the animals… of feeling nature…* (Participant 6 from Porvenir, our translation)
>
> Dialogue 2:
> *I felt like I was walking through the forest... Well, I felt like it because I always go wherever there are chestnuts and pick them up. If we compare them, we can feel the difference here.* (Participant 7 from Porvenir, our translation)

### *5.2.3. Imagining alternative futures*

As for the third activity, participants were encouraged to imagine the future of the place and to represent it in a drawing. During the mediation process, participants were encouraged to reflect about the possibility of inviting extinct "existences" to come back to live in the place, in the future, and to coexist with them, their children and future generations. This moment was set up as an opportunity for participants to respond to "existences'" political expressions introduced in the first part of the activity, in that morning.

Thirteen (13) drawings were produced in Epitaciolândia and 21[13], in Porvenir. Seven (≈54%) drawings produced in Epitaciolândia presented a paved road (BR 317), as shown in Figure 6. Although the school is close to this road and the community dynamics includes it in its everyday life, this feature can suugest certain importance attributed to the urban scene in individuals' imagination about the future. Although the road in Porvenir is close to the school and presents configuration similar to that of the school in Epitaciolândia, it was not observed in any of the drawings made by Porvenir participants:

[13] There were fewer participants in Porvenir during the afternoon; only the group initially selected by the school participated in the event.

FIGURE 6 – Drawing about the imaginary future of the place, produced in Epitaciolândia.

SOURCE: "Youth Imaginaries of Alternative Futures" Seminar held in Epitaciolândia (2022).

FIGURE 7 – Drawing about the imaginary future of the place, produced in Porvenir.

SOURCE: "Youth Imaginaries of Alternative Futures" Seminar held in Epitaciolândia (2022).

Drawings produced in Porvenir presented quite similar features. A house was the core element in every single one of them. Thus, they represent a rural family unit, where the main element (the house) is surrounded by trees, plants, fruit trees and animals. This factor framed a rural setting where no urban element appeared in any of the 21 drawings. This finding points out, among other things, that, although young participants talked about higher education and several professions as their future desires during the interviews, their imaginary is full of local elements of a traditional rural-forestry way of life. Figure 7 represents this feature:

On the other hand, drawings produced in Epitaciolândia presented greater diversity. Only three (≈23%) of them presented a house in the foreground. In addition to the road, the represented scenes mainly depicted natural environments mixed to representations of urban elements, such as buildings and urban services, as shown in Figure 8. This factor may have been motivated by the greater vigor and influence of the urban center in Epitaciolândia in comparison to the small urban center in Porvenir. However, it also pointed out how young individuals imagined a scenario where rural and urban elements, as well as their logics, featured an integrated system with dense flows (and for the culture produced during Acre State formation process). This integration seems to take place with natural elements in Porvenir:

FIGURE 8 – Drawing about the imaginary future of the place, produced in Epitaciolândia.

SOURCE: "Youth Imaginaries of Alternative Futures" Seminar held in Epitaciolândia (2022).

Another element drawing attention in Epitaciolândia lied on the representation of villages in six (≈46%) drawings, although the closest village is approximately 200 kilometers away from it, as shown in Figure 9. Assumingly, this factor was associated with the discussion held by that group about what had happened to the local indigenous people, in the first part of the activity, when they were framed as extinct "existences". Then, during the drawing workshop, it was possible seeing participants' concern with how to include the indigenous people in the future, again.

FIGURE 9 – Drawing about the imaginary future of the place, produced in Epitaciolândia.

SOURCE: "Youth Imaginaries of Alternative Futures" Seminar held in Epitaciolândia (2022).

This result suggests that young individuals are opened to establish connections and dialogue with elements deriving from other cultures. Moreover, it indicates the potential of educational interventions to incorporate elements in subjective configurations that, without them, would not exist. The "indigenous" element in Porvenir did not emerge in any drawing due to the likelihood of having higher indigenous populations' continuity, with lower miscegenation and cultural erasure degree than that observed in Upper Acre region.

In total, six (≈46%) drawings in Epitaciolândia depicted some fruit tree, whereas 57% of drawings in Porvenir depicted them. However, there was significant difference in one aspect: 14 (≈67%) tree drawings produced in Porvenir enabled recognizing the species based on plant and fruit morphology (chestnut trees, açaí palms, among other palm trees), as shown in Figures 10 and 11. This factor was not observed in Epitaciolândia, where trees and their fruits were represented by generic and widely used drawing structures. Drawings produced in Porvenir presented higher incidence of animal, domestic and wild elements. This finding suggests Porvenir participants' higher knowledge level about the region's native flora and fauna. Participants' presentations during the workshop enabled seeing these societies' strong relationship with their ecological systems.

FIGURE 10 – Drawing about the imaginary future of the place, produced in Porvenir.

SOURCE: "Youth Imaginaries of Alternative Futures" Seminar held in Epitaciolândia (2022).

### *5.2.4. Including locally extinct "existences"*

In the fourth and final activity, participants were encouraged to think about how to make the imagined future come true, as well as to assess the

FIGURE 11 – Drawing about the imaginary future of the place, produced in Porvenir.

SOURCE: "Youth Imaginaries of Alternative Futures" Seminar held in Epitaciolândia (2022).

likelihood of having extinct "existences" reintegrated to that place, in the future. In order to do so, participants were split into three working groups, which were subjected to rotation in compliance with the "World Café"[14] technique.

Each group was featured as a committee. The first was the "New Residents' Invitation Committee", whose task lied on thinking about the "existences", among the extinct ones, to be invited to live in the place again, with them. The second one was the "Happy Relationship Committee", whose task lied on thinking about the relationship between each new resident ("existence" invited by the first committee) and current residents in order to guarantee everyone's well-being (both human and non-humans). The third one was the "Action Committee", whose task lied on thinking about what this generation of young individuals could do to materialize a future capable of reintegrating extinct "existences".

Participants from Epitaciolândia had a hard time determining what extinct local species could live with them again. Generic terms, such as "birds" and "tropical forest", have evidenced young participants' lack of knowledge about the local plant and animal species that lived there in the past and about likely relationships with them, as shown in Figure 12. Terms, such as "whales" and "eucalyptus" (exotic species) completed this aspect. Only two native species were mentioned, namely: "chestnut tree" and "*ipê*". These participants also had a hard time imagining what relationships between humans and these new residents could be like.

On the other hand, participants from Porvenir presented abundant examples of "existences" that could be invited, as well as showed clear ideas of what types of relationships humans would have with them. This group decided to invite 18 "existences" (all native). It was clear to them what native species they could invite and what kind of relationships they would have with them. In addition, ethical aspects embedded in the relationship between humans and other "existences" could be noticed in terms like "not hunting it", "taking care of it so it bears fruit", letting it "reproduce", "reducing consumption", "knowing it better, so as not to cut it", "not wasting it", among others. This configuration, besides pointing out greater resilience, is an opportunity to support the development of future options for youth projects that can act as antidotes to extractivism and to the extinction of different "existences"

[14] This free-access methodology was developed by Juanita Brown and David Isaacs and is available to all people. It is a creative process aimed at generating and fostering dialogues between individuals to create a living network of collaborative dialogue that has access to, and uses, collective intelligence to answer questions of great relevance to organizations and communities (Brown, Homer, & Isaacs, 2007).

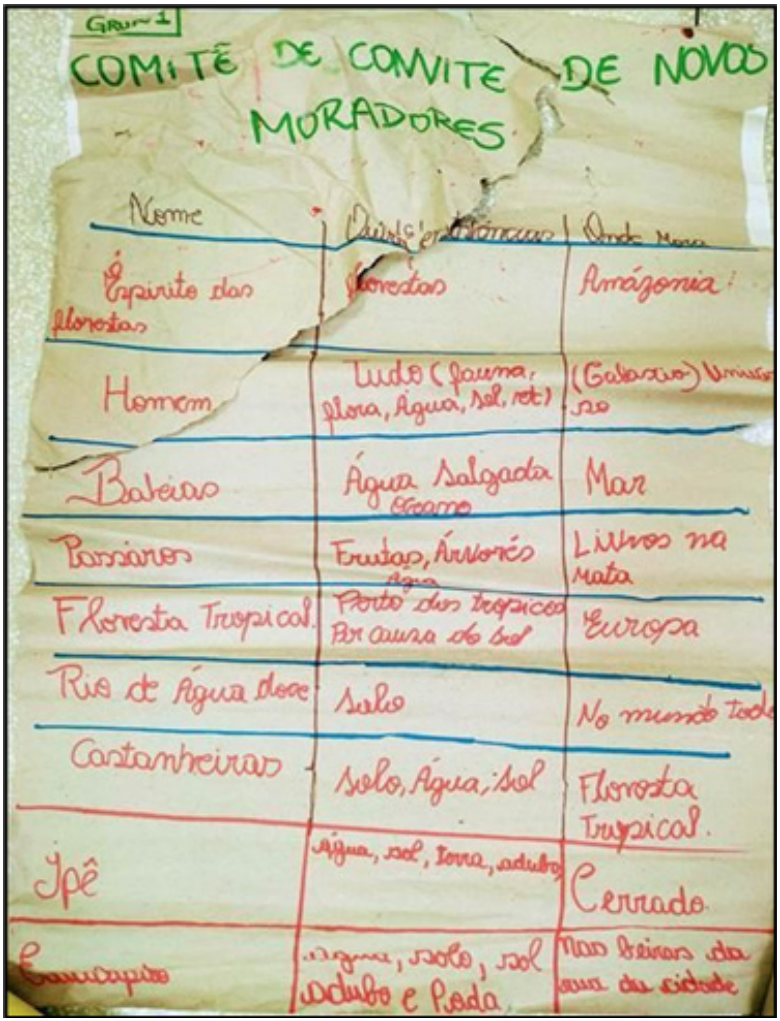


FIGURE 12 – Result of the New Residents' Invitation Committee produced in Epitaciolândia.
SOURCE: "Youth Imaginaries of Alternative Futures" Seminar held in Epitaciolândia (2022).

(Kröger, 2022). Figure 13, which depicts the work done by the Happy Relationships Committee, is an example of it:

Students from both schools had a hard time thinking about actions to materialize the imagined future. Sometimes, ideas associated with what is overall done in local societies or with what one learns through communication means - like "re-foresting", "recycling the garbage", "recovering water springs" - emerged. Thus, they had difficulty in thinking about how to act in this regard.

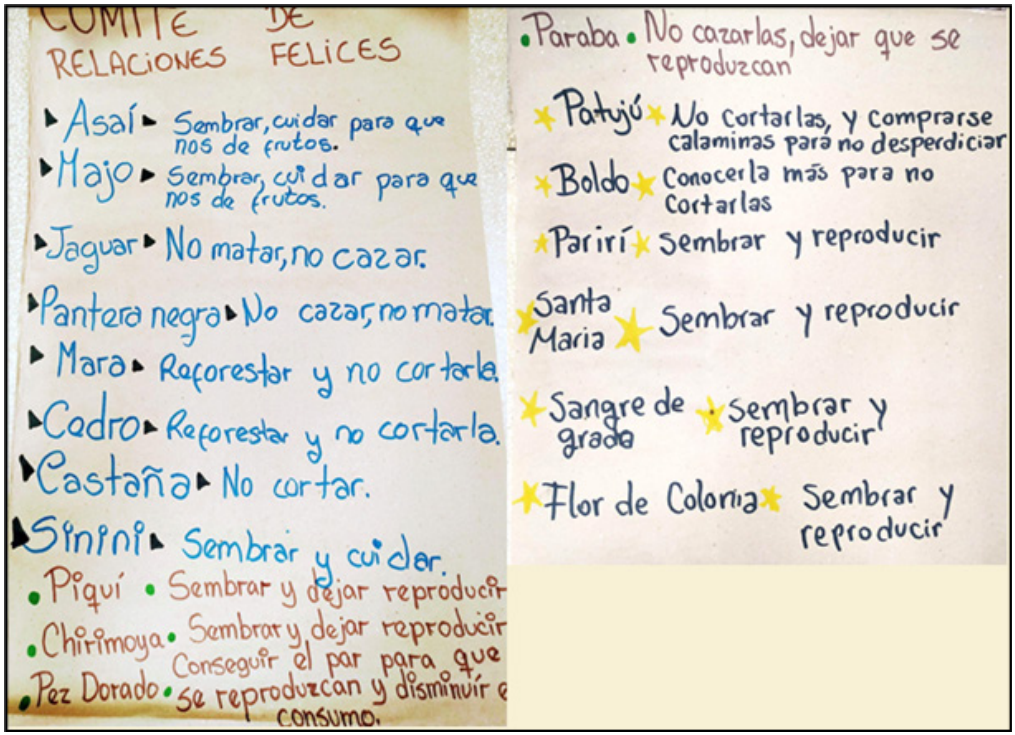


FIGURE 13 – Result of the Happy Relationships Committee produced in Porvenir.
SOURCE: "Youth Imaginaries of Alternative Futures" Seminar held in Epitaciolândia (2022).

## *6. Final considerations*

Option was made for presenting the final considerations in a segmented manner, based on the three research questions that guided the current study, as follows:

### *6.1. Associations between youth perceptions and trends in socio-ecological systems in Pando department and Acre State*

Seminar results, in combination to the interviews and the experience of two researchers based in the investigated region, enabled understanding that the features of the local society-formation process remain perceivable, both in Epitaciolândia and in Upper Acre region. Although many young individuals in this region reported to be descendents of rubber tappers and indigenous people, the prevalence of modern cultural traits to the detriment of these traditional cultures was the factor standing out in their statements. The impression is that events that have significantly changed SESs in Acre region in the last century, based on migration/colonization and on extractivism expansion, still have strong cultural influence on the form of dynamics/movement featuring a socio-ecological system that, in its turn,

has not yet reached a new dynamic balance, a state that could enable long-lasting coexistence between its human populations and non-human lives.

The apparent low transmission of collective memory from generation to generation, and the lower diversity degree of local elements seen as value, also suggest lower social cohesion level in Epitaciolândia than in Porvenir. Although young participants from Epitaciolândia did not express interest in expanding deforestation, despite living in previously deforested small farms, studies have evidenced that rural youth from Upper Acre region, mainly from Chico Mendes Extractive Reserve, who lack desirable options of elements to formulate local life projects, tend to increase deforestation to follow the livestock trend (Silva *et al.*, 2019). Thus, the propensity to develop tipping points is a constant feature in Upper Acre region, and it suggests lower resilience.

Porvenir presented higher resilience, social cohesion and stability levels in SESs. Despite the advance of livestock in Acre State, as well as of mining in Madre de Dios region, pressures on, and risks to, rural and forest populations in Pando department can increase in the near future. Therefore, it is important taking into consideration and answering questions raised by young participants from Porvenir, and it includes supporting the generation of alternatives for young people's life projects to help strengthening capacities and opportunities for local resilience, amid a future full of uncertainty that points towards increased pressure in the MAP region.

### *6.2. Opportunities of Antidotes and Transition Projects*

The valorization of local natural elements by young participants from the two investigated regions suggests opportunities to include greater diversity of non-human lives in degraded areas and to enable more relational ways of life. In other words, it is possible recovering forests and biodiversity.

Young participants have shown appreciation for their places of origin and seemed to be willing to grow roots in them. However, they lacked access to narratives and examples of achievable possibilities to help them shape scenarios of desirable futures in their places. This 'void' can be an opportunity to co-produce transitions to innovative social configurations that, in their turn, can act as antidotes to the culture and structure of social systems that perpetuate trends to tipping points, mainly in Acre State. At cultural scope, it could trigger a cycle of feedbacks capable of changing key qualities of the culture associated with tipping points in this region, as well as establish new standards to promote rebalances in SESs, which, in their turn, would be featured by their capacity to provide a 'good life' for all "existence" forms (Acosta, 2016; Quijano, 2011).

Antidotes must take into consideration the specific socio-cultural and contextual configuration of each location. Young Porvenir participants' high knowledge about, and relationship with, the diversity of non-human lives and webs of life, the appreciation of local culture and tourism, as well as the striking presence of cultural elements deriving from traditional ways of life in that region, can support the formulation of opportunities to allow these

individuals to "dream" about their life projects in order to remain resilient towards increasing risks. It was possible seeing young participants' openness to welcome alternative futures, even in Epitaciolândia, which seems to present cultural aspects associated with the expansion of colonization that formed Upper Acre populations; however, it is a challenge to their elaboration and promotion processes.

### *6.3. Opportunities for, and limitations of, non-modern educational interventions focused on socio-ecological changes and tipping points*

Contents that are often addressed in school were perceived on several occasions throughout the group activities. This factor suggests that educational interventions are an opportunity to generate knowledge, and it proves that the school has the potential to significantly contribute to solve the issue of socio-ecological tipping points.

Although the adopted methodological set was not originally developed to assess the impact of the seminar, it was possible seeing that an epistemology capable of integrating sensations, emotions, affections and non-modern meaning forms, such as "existences", seems to be welcome by young individuals. This welcoming factor could be seen in their willingness to embrace the new and to establish connections with diversity. An example of it lies on the interest shown by participants from both countries in knowing their peers in the neighboring country. Moreover, participants from Epitaciolândia have shown remarkable opening to welcome the indigenous element on their future horizon, among other aspects. It is important reporting some limitations of, and learned lessons provided by, the current study:

a) A punctual intervention with six-hour workload, as the herein conducted one, does not seem to be enough to promote significant changes in social systems. Therefore, it is necessary formulating an educational policy specifically modeled for this purpose;

b) It would be interesting developing these interventions since the early education stages, when individuals still lack a modern perspective consolidated as the only possible one;

c) Education interventions aimed at responding to challenges posed by trends to tipping points must be dense and continuous, integrated to several aspects of the educational process in school and in individuals' lives, associated with experiences connected to alternative ways of life in the investigated region (such as rubber tappers and indigenous peoples), besides presenting strong practical application and perspective of life project and future scenario. In order to do so, it is necessary changing the conventional rural school in the Amazonian region (Silva & Da Silva, 2022; 2023a; 2023b).

Moreover:

a) It is important promoting respect for the diversity of spiritual representations, since lack of compliance with this principle can lead to barriers and conflicts; it was identified as likely risk in the case of evangelical Christian participants from Epitaciolândia;

b) Better results can be achieved if both the research and the interventions promote greater participants' leadership, reflection and horizontality in comparison to what was done in the current intervention, thus, adopting a postcolonial and

co-creation approach (Morelli, 2021; Schönenberg *et al*., 2022);

c) It is recommended avoiding prejudice towards the origin of non-modern and alternative ideas. Accordingly, it is possible incorporating approaches that emerged from populations born in modernity, such as proposals by scientists or popular European urban movements (Escobar, 2016), Kröger's (2022) perspective of "existences", as well as the use of cosmologies deriving from Amerindian cultures, among other possibilities. Assumingly, the ontological and epistemological enrichment of social systems can be an opportunity to generate innovative solutions for current socio-ecological tipping points observed in the Amazonian region.

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