A Proposal for an Anthropic Indicator Based on Amazon Community Analysis

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Abstract— *This work aims to produce indicators according to the perception of residents of communities and ecosystems of the Amazon biome, through the collection and analysis of the results of a form in which they express their impressions about events and practices of anthropization. The results found allowed the application of the analytical method of decision making (Analytic Hierarchy Process – AHP), to indicate the degree of anthropization of the people surveyed on a hierarchical scale, according to the syntagma of the three ordering axes of the themes of the form. The contribution allows the generation of correlation models, which help the understanding of the relationship between humans and the environment and the level of anthropic perception of those involved.*

I. INTRODUCTION

The economic, social and environmental indicators are important instruments to measure aspects of the society as they favor guidelines for quality of life and local development, helping participative administrations in the promotion of inclusive public policies. However, the vast majority of indicators are based on information produced by public or private institutions for the generation of their indexes – aggregate numeric value generated at a given moment, resulting from the application of indicators –, many times in limited temporal and spatial scales, according to the set of values and ideas that each institution has for the moment.

In the case of government institutions, the indicators can be manipulated according to the interests of the occupants of positions, as we see in the current Brazilian moment since 2020, with the socio-environmental problems in the Amazon, caused by the pandemic and a policy of benefiting the business community, with the consequent depreciation of traditional and local populations, implying as an effect the dismantling of protectionist environmental policies: the result is the increase in deforestation and fires, even though the government insists on saying that it maintains a protectionist policy.

This is why institutional indexes and indicators may be unable to represent more reliably the environmental, cultural, and socioeconomic diversity of the Amazon region. This is also why we propose the production of information from the inhabitants of the communities and ecosystems of the Amazon biome, through a form in which they manifest themselves according to their impressions of an event or a practice, based on references of vegetative (survival) and volitive (enterprise in space) anthropization.

Let's not forget that with about 610 million hectares, the vast Amazon region is home to different peoples and traditional populations, besides holding the greatest diversity of fauna and flora species on the planet. But the sheer size of the region's rivers and forests, allied to the mythological contours of the indigenous people, takes the focus off an even bigger problem, generated by exogenous socioenvironmental and cultural matrixes, translated into the low indexes attested by several indicators, such as the Human Development Index (HDI), the Social Progress Index (IPS, in Portuguese) or the Social Vulnerability Index (IVS, in Portuguese); the Basic Education Development Index (IDEB, in Portuguese) ranking; in addition to the deforestation rate Project for Monitoring Deforestation in the Legal Amazon by Satellite, of the National Institute for Space Research (PRODES/INPE, in Portuguese).

With such negative indices for human development, how can we understand the miraculous imaginary of wealth and pomp in the Amazon? This is what we propose with this study, from a perspective that allies exogenous indicators, based on income, well-being, education, and opportunities, with autochthonous indicators, sustained by the practices and values of the Amazonian peoples and communities (ethos and labor), so that we can understand that the Amazon is more than a naturalistic painting, because here there are people who think and work on a daily basis. "Humanizing" the region, understanding conflicts and agreements between peoples and local communities from their subjective impressions and measurements: we believe to be the greatest contribution of our proposal of indicators, even because an initiative of this size is not duly right in previous proposals for referencing the Amazon, propositions more concerned with socioeconomic and environmental data, little or nothing considering the heritage and values of local populations anthropized for millennia.

Fernandes & Fernandes (2018, p. 89) consider anthropization as the interaction between distinct groups that use the same territory and are directly affected by mutual transformations that affect environmental knowledge, ideologies, and identities. This relational perspective leads us to the construction of indicators that consider (inter)cultural translation as the priority method to achieve this relativism. Thus, the scientific relevance of the anthropic indicators lies in the dialogue of knowledges, from which derives its social relevance, since it is constituted from collaborative research of researchers and practitioners.

What we propose with the anthropic indicators, in addition to establishing references of vegetative (survival) and volitional (enterprise in space) anthropization, is the

production of information from the residents of the communities and ecosystems of the Amazon biome, through a form in which they manifest themselves according to their impressions of an event or a practice. In short, a proposal that aims to create indicators and indexes based on the experience and values of autochthonous communities, to provide answers to the following recurring problems in research on the Amazonian reality: a) the picturesque vision of foreigners about rivers and forests that has led to a conception of inexhaustibility of biodiversity in the region; and b) the eccentricity imposed on local populations, in consideration with the colonialist vision about Amazonians, which is at odds with the low indexes in social, economic and educational indicators of local populations.

1.1 Global and National Indicators and Indexes and the Amazonian Reality

The construction of development indicators and indexes in the societies of the Northern Hemisphere (United States, Canada, Western Europe, Japan) has its origin in the post-World War II period, when the Cold War and economic production as a vector for the growth of human societies were strengthened. Growth is understood as the capacity of these countries to accumulate capital and promote industrialized consumption, which would mean social welfare:

> This way of structuring the system presupposes, on the one hand, a regime of accumulation that is guided by Keynesian economic policy principles and, on the other hand, by institutional mechanisms of socioeconomic regulation that articulate classes and social groups within the Welfare State (Santagada, 2007, p. 114) (free translation).

In this model of contractual and redistributive society of capital accumulation, it was necessary to build economic indicators so that there would be equity in identifying the actors who would need more social assistance and who could participate in anti-poverty programs; however, these data, being produced by the State and favorable to numbers that justified the model of cumulative and consumerist society, masked the antagonism of social classes. An example of this markedly economic view of indicators is the Gross Domestic Product (GDP), which is the sum of all goods and services produced in a country or state over a given period (usually a year), measured in accordance with the prices that reach the consumer. However, the GDP does not actually measure the wealth of a country or of the people in that country, but rather the flow of money resulting from

buying and selling transactions, which certainly does not qualify the social condition of each consumer.

It was only after the 1960s that the economic view of the national indexes gained social meaning with the appearance of the expression social indicators through the work of Raymond Bauer Social Indicators, which, like so many other studies in this line, sought to analyze the social conflicts arising from the concentration of wealth, which widened the gap between the top of the social pyramid and the base composed of a large majority of impoverished people. But the growing gap between social classes would be amplified with the advent of neoliberalism in the 1980s, which decreed the destatization of production, the loosening of economic regulation, and the loss of labor guarantees and social welfare. On the other hand, the pre- and post-neoliberal scenario, with growing human and social inequality touched by private property and enrichment, favored organizations such as the United Nations and its associated bodies to elaborate supranational reports starting in the 1970s, to "serve as a tool for government planning, as well as to overcome strictly economic analyses. Social conditions are now part of the list of concerns not only of specialists, but also of governments" (idem, p. 121), which led the concept of welfare and quality of life to compose with economic factors what should be considered as a country's development.

In the wake of this socioeconomic consideration, and with the accentuation of neoliberal policies mainly in emerging countries, in the 1990s there was a resumption of the importance of social indicators, being elaborated and monitored by international organizations, such as the UN, and by non-governmental entities. The issue is that most of the data that make up the indicators are fed by government agencies or linked to nation-states, which projects a myopic view of the real social conditions. On the other hand, the construction of indicators and their indexes, such as the Human Development Index (HDI), produced by the United Nations Development Program (UNDP), implies the use of paradigms still referred to the consumerist model of a largely Eurocentric society. Let's look at this global index.

Comprised of three variables – life expectancy at birth, access to knowledge, and standard of living – this index ends up creating a false idea that human development is tied to the accumulation of capital and unsustainable production. For example, the country that ranks first in the HDI/UNDP/UN, according to the 2020 report (UNDP, 2020), is Norway, with an overall index of 0.957, on a scale that goes up to 1.000. Brazil occupies the median position of 84th and the last place goes to the African Niger (189th place). It is quite symptomatic that

this ranking reverberates the hegemonic process, with the colonizer-imperialist in first place, the colonized nation in second, and the imperialized nation in third. Norway reaches excellent levels in quality of human development when it presents 35 hospital beds and 29.2 doctors per 10 thousand inhabitants, while Brazil has only 21 beds and 21.6 doctors for the same population; even worse is Niger with 0.4 doctors and 4 hospital beds. In education, the HDI takes into account the Programme for International Student Assessment (PISA), of the Organization for Economic Cooperation and Development (OECD), which is intergovernmental and Eurocentric. According to this evaluation, Norway shows 499 in Reading, 501 in Mathematics, and 490 in Science; Brazil 413 in Reading, 384 in Mathematics, and 404 in Science; and Niger does not even present data on these educational indicators. It is worth remembering that the top twenty countries in education have scores above 475.

PISA, as a system for evaluating education, relates the years of schooling as a measure of the acquis acquired by students during this time, thus being a model derived from economics, when using factors of production (input) to produce a product (output) (Villani; Oliveira, 2018). According to these authors, the Basic Education Development Index (IDEB, in Portuguese), implemented by the Anísio Teixeira National Institute for Educational Studies and Research of the Brazilian Ministry of Education (INEP/MEC, in Portuguese), reproduces the principles of PISA, since the former considers the bases of the latter as to the comparative monitoring between countries and/or regions based on the assessment of students' skills to solve real problems, reflecting, consequently, the students' level of knowledge and experience; but in this process, a standardized and universalistic assessment instrument is favored, which largely favors the more economically developed countries.

However, Norway's high human development rates plummet when it comes to environmental sustainability. In 2018, each Norwegian emitted 8.7 tons of carbon dioxide, compared to 2.2 tons for Brazilians and 0.1 ton for each inhabitant of Niger. In Norway in 2017, per capita household material consumption was 21.8 tons, compared to 17.4 tons in Brazil and 3.4 tons in Niger. But even with high rates of potential environmental pollution, in the assessed year 2015 Norway did not have a single percentage of its territory degraded, unlike Brazil which had 27% and Niger with 7%. But how to explain this? It seems that the high human development index of the Nordic country and its European counterparts is achieved at the expense of the environment, which is often not their own, but that of peripheral countries that produce the raw materials for the comfort of the Nordic countries. In an

interview to the newspaper El País, Pedro Conceição, director of the UNDP office in Brazil, stated that "there is currently a gap between achieving high human development and low pressure on the planet", because a country's very high prosperity has implied great environmental impacts.

With this contradictory reality at a global level, what to consider as human development? It seems that one of the alternatives is to include a socio-environmental bias in the social indicators, particularly after the Stockholm Conference, in 1972, and the emblematic United Nations Conference Eco-92, held in the city of Rio de Janeiro, 20 years after the first one: both were milestones in global discussions about the environment and sustainability. With this, not only the environmental variants in social indicators are now considered, but the indicators are also given a more local and less global accent. Hence the emergence of national versions of the HDI, such as the one developed by the UNDP office in Brazil, in conjunction with the Institute for Applied Economic Research (IPEA, in Portuguese) and the João Pinheiro Foundation (FJP, in Portuguese). In the same sense, there is the Social Vulnerability Index (IVS, in Portuguese), also produced by the IPEA with the purpose of highlighting situations indicative of social exclusion and vulnerability in Brazil. We can still highlight other indicators created around the world, such as the Ecological Footprint, which quantifies the surface of productive land or water that an individual, city, country or population uses to produce what they consume and to absorb the waste generated in this process; the Gini Coefficient, which calculates inequality in income production; the PER Index, which indicates the state of nature in the face of human impacts, with pressure on biodiversity, the state of nature and societies' responses to such impacts; Material Sobriety, which refers to the production and consumption of energy used in the generation of material goods, implying a radical reconfiguration in the relationship between individuals and their consumption habits, particularly regarding acquisition, possession, and moderate and not excessive use. These are some examples of indicators and indexes that have emerged with the fourth wave of revitalization of social indicators allied to the sense of biodiversity and sustainability of human societies (Santagada, 2007).

Regarding the Amazon, we can highlight two indicators, the IPS and the Project for Monitoring Deforestation in the Legal Amazon by Satellites (PRODES, in Portuguese), even though there are others related to the loss of vegetation, such as the Deforestation Detection System in Real Time (DETER, in Portuguese), which is the deforestation alert system, and the System for Estimating Emissions and Removals of Greenhouse Gases

(SEEG), an initiative that reports on greenhouse gas emissions (GHG). PRODES measures the annual rate of deforestation in the region, producing an inventory of primary forest loss by means of clear-cut mapping, using images from Landsat class satellites; this work is carried out by the National Institute for Space Research (INPE, in Portuguese). Another indicator is the IPS, which emerged in 2014 through the Social Progress Imperative, a global non-profit organization based in Washington (DC/USA), which provides data to governments and citizens in general about social and environmental health, with a view to social progress. This organization is formed, in large part, by researchers from the Massachusetts Institute of Technology (MIT), Harvard University (USA), and Oxford University (UK).

In Brazil, this index gained an edition for the Amazon (IPS, 2018) and that had as national partner the Institute of Man and Environment of the Amazon (Imazon, in Portuguese). To construct the IPS, social and environmental variables are considered, excluding those of an economic nature; the following fundamental questions are posed: 1) Are the most essential needs of the population being met?; 2) Are structures in place to ensure that individuals and communities improve or maintain their well-being? 3) Are there opportunities for all individuals to reach their full potential? These questions are answered through three dimensions: 1) Basic Human Needs; 2) Foundations for Well-Being; and 3) Opportunities. It is these dimensions that comprise the indicators.

In a brief reading of the IPS, we can state that between the years 2014 and 2018 the general index was unfavorable to our region, since there was a drop of 0.79 point while in the country the drop was 0.52. The most relevant is to observe that Basic Human Needs, such as water, sanitation and housing are neglected, since while Brazil in general has a score of 73.52 the Amazon presents 59.2. This condition is reflected even in the Municipal HDI, when the municipality with the worst national index is Melgaço (5565th place), on Marajó Island (State of Pará), precisely because it has the worst income distribution in Brazil (index 0.454, when the national average is 0.739, in the year 2010), with a discrepancy of 0.285; In education, according to the Municipal HDI, this distance is even greater, with the Marajoara municipality reaching an index of 0.207 against the national index of 0.637, an absurd difference of 0.430.

Therefore, both the IPS and HDI models are unanimous in saying that in income distribution and school education the Melgacenses are infinitely inferior to the Nordic Europeans. But what would be the model of transmission of knowledge and of symbolic and venal

exchanges in the distant Melgaço, a Brazilian homonym of a city of the Portuguese colonizer? In order to find these autochthonous models of human needs, of wellbeing, and of localized human development, we need to listen to the impressions and valuations of the natives, because they are the ones who, in their ancestral process of anthropization, should be heard so that there are public policies in which they are the major stakeholders, the success of which is in the proportion that we include their daily practices and values in dealing with the ecosystem in which they live. This is the starting point for the construction of our anthropic indicators.

II.   MATERIAL AND METHODS

The objective of this article is to produce indicators of anthropization from human, heritage and environmental factors related to various conceptions of sustainability and "well-being" of Amazonian peoples and communities. To achieve this objective, it is necessary to understand anthropization as the human intervention in natural elements, being these biotic or abiotic elements not built by the human species in its genesis. This intervention can cause destructive actions, when the "anthropized spaces, frequently, are the spaces in which human action has destroyed the original biota, particularly in function of a predatory model of survival, which ignores any possibility of sustainability" (FERNANDES; RAMOS, 2020, p. 30).

Another, less usual, conception of the term anthropization refers to "constructive human action when, in a given territory, a certain human group takes possession, builds the conditions for survival and manages them, in order to have control and production of the means to do so" (idem, ibidem). Therefore, human action, as a rule, promotes transformations in natural space and thereby generates environmental impacts, which can be negative anthropization or positive anthropization, according to the view of sociocultural groups considered in the research: the first may lead to reduction, simplification or loss of biodiversity, or even replacement or destruction of ecosystems; the second implies protection and resilience of environments, resulting from actions of preservation or conservation, touched by the state, or by individuals and communities.

In any case, there will always be greater or lesser impacts resulting from human action on the environment and in accordance with the practices and values of the anthropized groups. Immediately, this environment corresponds to biomes and ecosystems. In our research the biome means the Amazon, marked by a certain homogeneity in the biocoenosis and in the biotope, resulting from the vegetation cover of tropical rainforest, warm and humid climate, high rainfall with average

precipitation above 2,300 mm/year, relief of large alluvial plains, sandy soil pedology with humus layer, immense watershed with flow in the Amazon estuary of 200 million liters of fresh water per second. The Amazon biome, even despite a certain homogeneity in its configuration, presents ecosystems due to different conformations in the biocenosis and biotope. Thus, it is that the environmental impacts of anthropization are felt, according to their origin, differently by each ecosystem. Therefore, our equation for the construction of the object was:

BIOME $\longrightarrow$ ECOSYSTEM $\longrightarrow$ ANTHROPIZATION $\longrightarrow$ COMMUNITIES = POSITIVE ANTHROPIZATION OR NEGATIVE ANTHROPIZATION

We conclude, preliminarily, that the environmental impact will be recognized as a degenerative decompensation in the human-environment relationship dependent on the affected ecosystem and the anthropized group, that practices or suffers the event, which leads us to consider the anthropic profile as the first step to be considered in understanding indicators; in other words, the impact is derived from traits of behavior and productive skills, the first ones being the "qualities of the character in action in the environment, touching on the space of existence – biocenosis/biotope and human economic practices in the environment – and the forms of sociability in dealing with the environment" (FERNANDES; FERNANDES, 2018, p. 99) and the second concerning the techniques of economic production in the used territory.

Therefore, identifying the anthropic subject as the object of research was the initial step of constructing the method of indicators. This subject must favor our instrument according to: validity (adequacy to measure the phenomenon), reliability (trustworthiness to the event), and representativeness (coverage achieved of the event). In the case of indicators that refer to human actions on the environment, whether constructive or destructive actions in relation to the preservation or conservation of the original biotic and abiotic environments, the validity of the indicators lies in the extent to which one seeks to delineate the human reasons for the transformation of environments, spaces, and landscapes and to configure the scenario of the resulting environmental consequences, establishing correlations between causes and effects. By understanding the sociocultural reasons that trigger environmental impacts, it is understood that we will be better able to indicate paths to sustainability and good living: these are the axes of the questionnaire produced, with questions aimed at the inhabitant of the ecosystems chosen in the research, which seems to us to be the appropriate instrument, since it seeks the reasons in the impressions and speeches of the ecosystem user himself.

The **reliability** of the indicators selected here refers to the data collected, since their production occurs from individuals representative of traditional peoples and communities, through the application of a quali-quantitative questionnaire. And why should data collection occur primarily among subjects from traditional peoples and communities? Because they are groups culturally differentiated by their: self-recognition of their identity; parental and kinship-based social organization, hence more communitarian; use of knowledge, practices and innovations based on oral tradition; and mainly by their strict bond with territory for the production and reproduction of their existence, this (territory) being configured as a broad and complex ecosystem of knowledge based on experience. Particularly, the reliability comes when there is the prioritization of the research locus of traditional communities living in sustainable use units, indigenous lands and quilombola territories, since the focus of this project is the traditional peoples and communities of the Brazilian Amazon. Thus, we will be in line with article 7, of Law 9985/2000, which established the National System of Nature Conservation Units.

Finally, **representativeness** refers to the spaces of occurrence of the events, which for the purposes of this project can be considered as biome or ecosystem. Immediately, the anthropic indicators are representative of the Amazon biome as a geographic region in which a certain biotic and abiotic unity exists, with similar vegetation as well as climate and geology patterns, as in the case of the Amazon, in which its equatorial location implies a great incidence of solar energy that makes the climate hot and humid, with high precipitation that generates high unity and favors enormous biodiversity and forest vegetation mass, as well as water volume that floods vast plains and is thrown into the ocean, transforming the Amazon coast into a fishing production powerhouse. But, beyond the geographic and encompassing unity of the Amazon biome, it must be emphasized that the indicators, in order to be representative of the diversity of the biome, must focus more particularly on the ecosystems, these being functional units of the biome, in which biotic factors, which include all types of living beings, interact with abiotic factors, forming food chains, terrestrial and aquatic, with a hierarchy among producers, consumers, and decomposers. The ecosystems of the Amazon biome can vary, mainly due to anthropization. In the Amazon there are at least nine ecosystems: terra firme forests, igapó forests, floodable fields, saline fields, foodplains, savannas, mangroves and restingas, beaches, and mountains. Because of this diversity and considering that it is at the ecosystem level where economic production and

work are organized, as well as where Amazonian population communities are settled, the indicators must be representative of these particularities of the biome, or ecosystem communities.

2.1 The informants

As a general organizational category of these ecosystem communities, one can consider "people" as the collective bond of Amazonian territoriality, marked by common language, history, customs, interests and traditions; in short, an identification of a more regional spectrum, a characterization that is more appropriate to the concept of traditional Amazonian people. The hypothesis is that the category traditional people is more related to the consideration of the Good Living and the search for the sustainability of ecosystems. The Good Living is understood as the harmonious relationship between humans and nature, with a more communitarian lifestyle of shared responsibilities and collective production. In this lifestyle, the distribution of wealth takes place according to the needs of the community members (ACOSTA, 2016). It should be considered that the community style only makes sense, in a contemporary world of networked relations, when intercommunity networks are established, as an urban-rural continuum, of exercising intercultural practices. One must also consider that in Decree 6040/2007, which established in Brazil the National Policy for Sustainable Development of Traditional Peoples and Communities (PNPCT, in Portuguese), the term that became established was traditional peoples and communities, instead of traditional populations. This is how the Decree discriminates them, in its article 3, item I:

> Traditional Peoples and Communities: culturally differentiated groups that recognize themselves as such, that have their own forms of social organization, that occupy and use territories and natural resources as a condition for their cultural, social, religious, ancestral and economic reproduction, using knowledge, innovations and practices generated and transmitted by tradition (BRASIL, Decree 6.040/2007) (free translate).

The corpus of the initial research was determined based on the various ecosystems of the Amazon biome, particularly ecosystems where human groups of traditional communities/conservation units occur. In order to better control the universe of informants, the concept of mesoregion (geopolitical and economic cutout) was considered to delimit the concept of ecosystem. In this first stage of the project, which took place in 2019 and 2020,

the ecosystems addressed were: a) mangrove, floodplain, terra firme forest and secondary forests, in the State of Pará; and b) floodplain and terra firme forest, in the State of Amazonas, with the application of a questionnaire to 23 (twenty-three) informants, chosen at random, but considering their interest in participating in the research. The field research was conducted by the Graduate Programs in Anthropic Studies in Amazonia (PPGEAA/UFPA, in Portuguese) and Interdisciplinary in Human Sciences (PPGICH/UEA[1] , in Portuguese).

In general, the corpus had/should have the following profile:

a) informants should live and work in the same ecosystem;

b) the research units should be the households, that is, living spaces in which there is an individual or group of individuals with financial autonomy and economic sustainability and parental/grandparental identification of the informants. The households must be located in communities, which are understood as a group of individuals organized in society, under the same ethical and behavioral norms, obedient to a leadership marked by one or more individuals with historical and social hegemony, and who establishes for the others, the identity and identification with the same historical and cultural legacy. In this sense, the community corresponds to the nation, as "a society that occupies a given territory and includes a sense of identity, history, and common destiny" (JOHNSON, 1997, p. 157). The community considered here can also be the biocenosis, that is, from the point of view of ecology it is the set of living organisms that share the same ecosystem and live in relatively close proximity, constituting small villages or hamlets with dwellings that communicate with each other almost daily;

c) the percentage should be of up to 10% of ecosystem users in each community to be surveyed, which may also be the territory of conservation units. This percentage refers to households, in which the users are residents. The preferred territories for collection were the conservation units or territories used and inhabited by traditional peoples and communities with a view to sustainability. There may be one or more interviewees in the survey, but there will be only one questionnaire per household. The interviewees had a minimum age of 18 (legal age of civil capacity);

d) consider gender equity in the corpus of informants, without absolute prevalence of one gender over the other;

e) to have lived in the community for at least five (5) years, as we consider that even the non-native inhabitants may have already adapted to the practices and values of the community during this period, in such a way as to have property about the local reality as extractivists from the region under investigation.

2.1 The form

After delimiting the corpus of informants, we will deal with the instrument for collecting the native peoples' impressions about the ecosystems. The applied form[2] is composed of 180 questions, which were divided into the following main questions, with 60 questions per axis:

1) Axis 1 – HUMAN REASONS, referring to the questioning: "what are the human needs (basic or "invented") for us to have a balanced living between human and environment and between different social groups users of the same ecosystem?"

2) Axis 2 – ENVIRONMENTAL CONSEQUENCES, related to the question: "what are the impacts on the environment and social inequalities among groups in contact within the same territory (biome and ecosystem) that meeting these human needs may provoke?"

3) Axis 3 – SUSTAINABILITY AND GOOD LIVING, referring to the question: "what initiatives (we) promote to balance human differences (social and cultural) and minimize the environmental imbalances resulting from these contacts?"

These axes reproduce the sequence of a narrative syntagma, which is the logical path for the fulfillment of the desire (and its object of desire as a search for the fulfillment of its needs) by a subject, since

> the narrative (...) must be considered as an algorithm, that is, as a succession of statements whose predicate-functions linguistically simulate a set of goal-oriented behaviors (...): the behaviors presented therein maintain between them relations of anteriority and posterity (Greimas, 1973, p. 63) (free translate).

This algorithmic character of the narrative, present in our syntagmatic axes of the questionnaire, can

[2] We use this concept because the instrument is marked by pre-established questions with closed answers on a scale of values, unlike the questionnaire that implies closed questions, but open answers. Also in the form, the interview is face-to-face, with direct dialogue between researcher and interviewee.

be observed in the following example. Regarding the theme "Community", from Axis 1 – Human Reasons, it can be stated that in the question "Is your community well taken care of?" there is a relation of posterity with the question "Are there trees in your community older than 30 years?", from the theme Bioindicators, from Axis 2 – Environmental Consequences. This occurs because the actions of Axis 1 depict behaviors of anteriority, of the interviewee and his community, which imply consequences a posteriori, because how the interviewee takes care of his community may result in the existence of older trees and in full productivity, such as the bacuri tree (Platonia insignis), an Amazonian fruit that begins its productivity no earlier than 12 years. In short, the Anthropic Indicators are structured in a narrative temporal dimension, in which functions (the informant's character) and actions (what the informant saw and produced) build a syntactic logic based on the informant's discourse (point of view), which is why the informant values the event, condition, or practice from 0.0 to 4.0 points, according to his/her impression and experience.

Each axis has the following specific themes, as unfolding:

1) AXIS 1 – HUMAN REASONS: 1) Education; 2) Safety and Tolerance; 3) Health and Food; 4) Community; 5) Work/Occupation and Income/Consumption; 6) Communication and Social Interaction;

2) AXIS 2 – ENVIRONMENTAL CONSEQUENCES: 1) Bioindicators; 2) Geoindicators; 3) Body Semiotics; 4) Environmental Semiotics; 5) Economic Activity; 6) Citizenship and Power Relations;

3) AXIS 3 – SUSTAINABILITY AND GOOD LIVING: 1) Housing Quality; 2) Environmental and Patrimonial Management; 3) Circular Economy; 4) Local Development; 5) Innovation and Use of Heritage; 6) Good Living.

The informant's evaluation is on a scale of 0 to 4 points, relative to each question disposed in the theme referring to the axis. In total, there are 5 options/points in the answer scale (Likert scale), since this variety of options provides better precision and amplitude as to the respondent's opinion, and each point is relative to the following condition of OCCURRENCE and FREQUENCY, arranged according to Table 1.

Table 1 Informant Assessment

A – OCCURRENCE
informant's impression regarding the occurrence or non-occurrence of the condition, practice or event.

DO NOT EXIST: 0.0 NEVER (no occurrence; no information; unknown)		EXISTS: 1.0 to 4.0 approximate number of times the phenomena occur	
B – FREQUENCY the informant's impression of the intensity of occurrence of the condition, practice, or event in the approximate 5-year cycle.			
1.0 – ALMOST NEVER (25% of the time)	2.0 – MORE OR LESS (50% of the time)	3.0 – ALMOST ALWAYS (75% of the time)	4.0 – ALWAYS (100% of the time)

The two spatial-temporal magnitudes – occurrence and frequency – are consequential, since the value zero implies that the condition, practice or event has never occurred or there is no information that it has already occurred. From score 1.0 to 4.0 the phenomena have already occurred, but at different intensities of occurrence, depending on the informant's impression.

The increasing quantitative numbering (1-4) refers to the lesser (1.0) or greater (4.0) anthropization arising from human interventions to transform the environment, whether constructive or destructive, according to The increasing quantitative numbering (1-4) refers to the lesser (1.0) or greater (4.0) anthropization arising from human interventions to transform the environment, whether constructive or destructive, according to the values attributed by the informants according to their experience and impression. Therefore, the closer to the maximum value the greater will be the record of human intervention to ensure survival. Inversely, the closer to zero, the greater the absence of the human factor of transformation, whether due to the inexistence of the transforming event or the informant's lack of knowledge that it occurs. The valuation is in relation to the total number of times that the informant observed the occurrence of the event, condition or practice in his experience as a resident and/or user of the ecosystem, in a certain period of time of his free choice and attribution.

2.1 The AHP (Analytic Hierarchy Process) method

A multicriteria decision problem, as is the case of the extensive form of anthropic indicators, consists of a situation in which there are at least two alternative choices, and this choice is conducted to meet several criteria, often conflicting among themselves. The multicriteria approach has as a characteristic several actors involved, as in our applied research, who must define the relevant aspects characteristic of a complex decision process with each

actor having their own value judgment and recognizing the limits of objectivity, considering their subjectivities (Gomes, 2000). To build the decision model that will represent the decision problem to be addressed, multicriteria decision support models are used (Vasconcelos, 2013), as they are fundamental in the analysis and structuring of multicriteria decision problems.

AHP is a methodology focused on the solution of choice problems, applied to several situations in which complex decision structures exist (Saaty, 1990). It is widely applied in several areas, such as, evaluation of urban renewal proposals (Lee and Chan, 208), analysis of areas and communities for Sustainable Ecotourism (economic, social and environmental) (Asadpourian, 2020), analysis of the company and employee's relationship (Serrano-Cinca, 2021), Industry 4.0 (Çalik, 2021), among others.

The differential of the AHP method is to enable the expert or user to intuitively assign relative weights to multiple criteria or multiple alternatives for a given criterion, while performing a pairwise comparison between them. This allows that even when two variables are incomparable with the knowledge and experience of experts in the field, one can recognize which of the criteria is more important (Saaty, 1991). For more detailed information on other decision-making models, we recommend reading the works (Massam, 1988), (Zeleny, 2012).

For the choice of the AHP we started from the general systems theory (GST), as an epistemology that provides two aspects that justify the choice: first, it is in accordance with our interdisciplinary perspective in the construction and application of anthropic indicators and, second, it provides the vision of an open system, since the indicators treated here are a set of variables shaped according to the application objectives for each proposal or project that uses them. This is because we propose with our indicators a modeling that aims to discriminate the intensity of anthropization of the environments (ecosystems) from the valuation given by users/inhabitants, with this objective disposing the

functions of the elements of the system – in this case the axes and themes related to each axis – glimpsing the circumstantial behavior of this system.

In our particular system is the set of indicators, which is configured as open because it starts from an interdisciplinary principle: like the functional syntax of the narrative (area of Letters), already seen as an algorithm (or algorithm) and bearer of "a logical sequence of nuclei, united among themselves by a relation of solidarity" (BARTHES, 1973, p. 39), we seek to ally this principle to the conception of open system of TGS (Computing area), since in both there are the characteristics of the systemic paradigm – entropy, feedback, causality, equifinality (Bertalanffy, 1986) –, in which the stimulus from the outside environment, seen as the variety of informants in our indicators can cause the adjustment and recurrent stability of the system, in conformation to be defined in the cutout of the object (see cutout of indicators in Table 2) to be applied the AHP, since this is a procedural method used to identify the relevance of the indicators and the degree of anthropization of the community, according to the general opinion of the informants.

III. RESULTS AND DISCUSSION

The results were obtained by cutting out the corpus, since analyzing all 180 answers from 23 informants would not fit the purpose of this initial study. Therefore, for the results and discussion, presented here, we opted for a cut in the three axes – Human Reasons, Environmental Consequences and Sustainability and Good Living – considering three themes, one per axis, namely: Education (Axis 1), Bioindicators (Axis 2) and Territorial and Heritage Management (Axis 3). The results are shown in Table 2.

Table 2 Demonstrative of questions by axes and themes: Human Reasons, Environmental Consequences, and Sustainability and the Good Living

AXIS 1: HUMAN REASONS					
SCORE	0	1	2	3	4
THEME: EDUCATION					
Does what is taught at school serve the community?	6	1	6	2	8
	26.1%	4.35%	26.1%	8.70%	34.80%

Does the school take advantage of the community's knowledge?	7	1	2	5	8
	30.45%	4.35%	8.70%	21.70%	34.80%
Are technological resources and the Internet used in the classes?	6	5	7	3	2
	26.10%	21.75%	30.45%	13.05%	8.70%

AXIS 2: ENVIRONMENTAL CONSEQUENCES					
SCORE	0	1	2	3	4
THEME: BIOINDICATORS					
Are there trees older than 30 years in the community?	0	0	0	3	20
	0%	0%	0%	13.00%	87.00%
Is the quality and quantity of the fish stable?	3	4	4	3	9
	13.00%	17.40%	17.40%	13.10%	39.10%
Are the flocks of birds disappearing lately?	3	3	5	4	8
	13.05%	13.05%	21.70%	17.40%	34.80%

AXIS 3: SUSTAINABILITY AND GOOD LIVING					
SCORE	0	1	2	3	4
THEME: ENVIRONMENTAL AND PATRIMONIAL MANAGEMENT					
Does the community respect the places where use and circulation are prohibited?	3	1	2	2	15
	13.05%	4.35%	8.70%	8.70%	65.25%
Is there supervision of the environmental and patrimonial impacts by the community?	11	6	1	3	2
	47.80%	26.10%	4.35%	13.05%	8.70%
Does the community plan the use of its territory?	10	0	6	6	1
	43.50	0%	26.10%	26.10%	4.35%

Observing Table 2, we clarify that the second row of each Axis deals with the score from 0.0 to 4.0 points, which correspond to the informant's impression; following the fourth row, referring to the questions, there are the absolute numbers of respondents (23 informants) of each score assigned, above, and just below the corresponding percentage (the sum should be 100% or close to it) to this absolute number, for each score.

In this cut, identified above, we obtained 9 answers for each of the 23 informants, totaling 201 answers, which are shown in Table 3.

Table 3 Total answers obtained

Score	Total Answers	Percentage (%)
0	**43**	21.50
1	**21**	10.50
2	**33**	16.50
3	**31**	15.50
4	**73**	36.00

The first result of the analysis of the material points out that there is some equity between the lowest and the highest anthropization – 0 points with 21.50% of the answers and 4 points with 36.0% of the answers – the first of these being understood as greater conservation and preservation of the environment and the second implying greater environmental impact resulting from human activities.

Because of this more general result of our investigation, we will dwell on the second result, which is the most thorough analysis of the corpus. This implies that

in the analysis of the narrative algorithm, as a succession of statements that simulate behaviors oriented towards an end, we can correlate the Axes and Themes in order of anteriority and posteriority. Thus, in relation to the Themes Education (Axis 1) and Bioindicators (Axis 2) there is the following correlation:

a) The question "Does what is taught at school serve the community?" presents 56.55% of answers that indicate the failure of school curricula by not reflecting the immediate needs of the community, since this percentage corresponds to the answers in the range of NEVER – ALMOST NEVER – MORE OR LESS. As a possible result of this fact, a large part of the answers for "Is the quality and quantity of fish stable?" presents a worrying percentage of 47.80% of answers in the same 0–2-point range. Since we are dealing with traditional peoples and communities, whose food is also based on fishing, the decrease in fish stocks implies the impoverished survival of native communities, which should be immediately warned in school during the basic training of the community members, as a way of raising awareness and making decisions for better public policies;

b) The question "Does the school take advantage of the community's knowledge?" shows a balance between the lowest level of anthropization – 30.40% for NEVER – and the highest level of anthropization – 34.80% for ALWAYS – and in the intermediate ranges of 34.75%, which represents a certain balance in thirds regarding the presence of local knowledge in school curricula. However, the question "Are there trees older than 30 years in the community?" points to the need to expand the presence of local knowledge, phenomena, and events, since 87.00% of the answers pointed to the existence of old trees ALWAYS. Now, knowing the inflection point of the communities investigated, it is urgent that the local reality be a constant in school approaches;

c) The question "Are technological resources and the Internet used in the classes?" obtained almost half (47.85%) of the answers in the range NEVER – ALMOST NEVER, which means that the students are disconnected from scientific information that can help them understand what happens as a result of the question "Are the flocks of birds disappearing lately?" 52.20% of the respondents claimed that birds ALMOST ALWAYS – ALWAYS have disappeared. This is because there is a website specialized in monitoring migratory and wading birds, BirdLife, which works in conjunction with Save Brasil, and both are responsible for research and conservation actions for these animals. Besides, when there is access to technological resources, it seems to be limited, since 30.45% of the respondents alleged that there is MORE or LESS availability of these resources: maybe due to limited

equipment and Internet access, maybe due to managerial incompetence for the use of the resources, maybe due to lack of knowledge of the network's potential.

We observed that as a logical derivation of the previous Axes, Axis 3 – SUSTAINABILITY AND GOOD LIVING, in the theme Environmental and Patrimonial Management, presented the following:

d) In the question "Is there supervision of the environmental and patrimonial impacts by the community?" close to half of the informants (47.8%) claimed that it NEVER occurs; and the great majority remained in the range NEVER – ALMOST NEVER – MORE OR LESS: (78.24%), which denotes an absence of community proactivity in relation to the factors that can substantially harm the survival of an extractive community;

e) In the question "Does the community plan the use of the territory?", 43.50% of the informants alleged that NEVER, which added to the 26.1% that answered MORE OR LESS, gives us the worrying picture that the sustainable use of the environment is not in focus, which compromises the sense of sustainability as the use of the environment without compromising it for future generations.
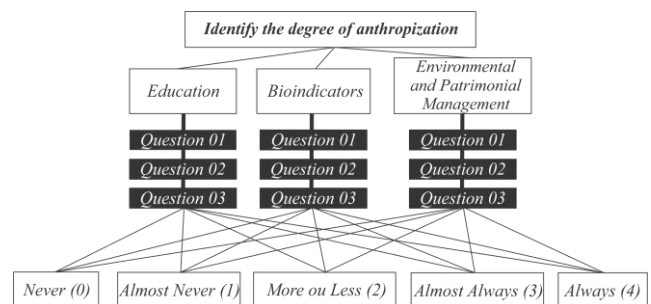

Fig.1 AHP Hierarchy

The AHP was used as a complementary method to determine the ranking of factors competing with positive or negative anthropization, thus justifying the choice of the most important themes in measuring the values attributed by the informants. The AHP calculations were made using the MATLAB[3] tool, due to its capillarity in solutions of the same nature. Fig. 1 illustrates how the problem was hierarchically organized, with the three axes and three questions for each, totaling the 09 questions representing the criteria, and the alternatives being anthropization values (0-4).

For applying the AHP, determining the comparative criteria matrix is the first step. Determining the criteria that will be used in the choice of alternatives

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[3] https://www.mathworks.com/products/matlab.html

for decision making is the first part for using the AHP. After defining the criteria, the comparative criteria matrix is assembled, taking into consideration the rule suggested by (Saaty, 1991), the matrix is filled by comparing the criteria that appear in the left column against the characteristics that appear in the top row.

The evaluation of the experts or users corresponds to the answers to two questions: which of the two metrics is more important with respect to a top-level criterion, and with what intensity, using the 1-9 scale (Saaty, 1990). The values established by the experts through peer review in this work are presented in Table 4.

To interpret and give the relative weights to each criterion, the second step, it is necessary to normalize the comparative matrix. The normalization is done by dividing each value in the spreadsheet with the total of each column. Next, the Eigen vector is calculated, which will present the relative weights among the criteria and will be obtained approximately through the arithmetic mean of the values of each criterion. With the conclusion of this step the weights of each criterion are obtained (0.274, 0.271, 0.180, 0.104, 0.079, 0.032, 0.024, 0.020, 0.017).

Table 5 consists of the alternatives and criteria, with each criterion having its weight defined by the specialist in the decision area (in this work we will use the weights generated by the AHP).

The results of the two techniques – percentage and AHP – were equal in relation to the degree of anthropization of the community, with emphasis on grade 4, which obtained the highest percentage in the AHP (35%) The overall ranking was as shown in Table 6.

With the technique we conclude that as the populations investigated are at a threshold point between the harmonious and sustainable relationship with the environment, on the one hand, and on the other hand the exploitation and environmental degradation, that is, this apparent balance between positive anthropization (sustainable) or negative anthropization (degradable) demonstrates the turning point in the survival and sustainability of populations and ecosystems surveyed, as to say that there is time to conduct the search for a state of equilibrium. This is even what the Report United Nations Intergovernmental Panel on Climate Change (IPCC) says, in its 2021 version, which points out the determining role of human influence on global warming. Reaching a balance of a median index in our indicators can provide, based on the numbers, the construction of a series of initiatives in which consumption is not totally abhorred and the bankruptcy of life and of the planet is not decreed due to social vulnerability, income inequality, pollution, and deforestation, but that we can propose "sustainable" human development aimed at equitable social progress.

Table 4 Pairwise Comparison Matrix

	P. 01	P .02	P. 03	P. 04	P. 05	P. 06	P. 07	P. 08	P. 09
P. 01	1	1	2	6	6	6	9	9	9
P .02	1	1	2	3	9	9	7	9	9
P. 03	1/2	1/2	1	5	3	7	6	6	6
P. 04	1/6	1/3	1/5	1	3	3	7	7	7
P. 05	1/6	1/6	1/3	1/3	1	3	7	7	7
P. 06	1/6	1/9	1/7	1/3	1/3	1	2	2	2
P. 07	1/9	1/7	1/6	1/7	1/7	1/2	1	2	2
P. 08	1/9	1/9	1/6	1/7	1/7	1/2	1/2	1	2
P. 09	1/9	1/9	1/6	1/7	1/7	1/2	1/2	½	1

Table 5 Matrix of Alternatives and Criteria

	P. 01	P .02	P. 03	P. 04	P. 05	P. 06	P. 07	P. 08	P. 09
Alternative 0	6	7	6	0	3	3	3	11	10
Alternative 1	1	1	5	0	4	3	1	6	0
Alternative 2	6	2	7	0	4	5	2	1	6
Alternative 3	2	5	3	3	3	4	2	3	6
Alternative 4	8	8	2	20	9	8	15	1	1

Table 6 Ranking obtained by applying the AHP

Score	Ranking using AHP
4	1st (35%)
0	2nd (24%)
2	3rd (18%)
3	4th (14%)
1	5th (9%)

IV. CONCLUSION

The objective of the Anthropic Indicators proposal is to produce an indicator that shows indices revealing the state of anthropization of traditional peoples and communities, or autochthonous communities, according to their experiences and impressions about events, conditions, and practices of their daily lives in relation to the ecosystems in which they operate. By translating the experiences and impressions into numerical values that explain the occurrence and frequency of events, conditions, and practices, the informants point out their reasons for having a certain human need, which can imply consequences to the environment, in a gradient that goes from occupation, exploitation, expansion, and degradation – negative impacts – on the one hand, to regeneration, occupation, protection, conservation, and preservation on the other hand, in this case in a perspective of seeking sustainability and the good living.

As much as this initial study is more focused on presenting the anthropic indicators method, we cannot fail to mention that the delimited problem-questions for each Axis were partially answered:

1) "what are the human needs (basic or "invented") for us to have a balanced living between human and environment and between the different social groups users of the same ecosystem?" – we present the Theme Education as one of the human reasons to have the production of culture, it is as a set of human production that ensures the fixation in a certain environment (ecosystem). Certainly, knowing the space is a sine qua non condition for anthropization to occur, and this knowledge is given through educational transfer, which must have the quality to ensure an inclusive education of people and knowledge, which was not revealed by the informants;

2) "what impacts on the environment and what social inequalities, between groups in contact in the same territory (biome and ecosystem), can the fulfillment of these human needs provoke?" – the Theme Bioindicators showed that communities are fully unaware of the space in which they live and work, which compromises better management of fishery resources and natural services on their behalf, whether it is the control of plant species or the bioindicator service that waders and migratory birds can offer to these communities;

3) "what initiatives do (we) promote to balance human differences (social and cultural) and minimize the environmental imbalances that result from these contacts?" - the Theme Environmental Management revealed the communities' total unpreparedness regarding the need for territorial, environmental, and patrimonial management as a guarantee of sustainability for today and for future generations.

But our main objective with this study was obviously to confirm the validity, reliability and methodological representativeness of the indicators, because the results could determine a tool that is suitable for measuring the events, conditions and practices of the users of the ecosystems investigated in the Amazon biome, having the voice and the turn of those who historically have had their discourse excluded from the indicators responsible for leveraging public policies that are directed to indigenous populations. In addition, the reliability of the occurrences and their frequencies can be more legitimate, since it is a matter of valuation according to the impression of the agents and direct patients of the ecosystemic events, with the coverage being representative of local social actors.

Finally, with this tool of anthropic indicators we can understand that anthropization more than a pejorative concept is a way to relativize the human presence in the environment, without neglecting that this presence causes profound changes that lead to configure it as a new geological era, the Anthropocene, but that is necessary, because otherwise we would return to a prehistory, in which humans would not have much chance of survival.

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