

The life cycle of indigenous households in the Ecuadorian Amazon, livelihoods and environmental impacts: changes over 20 years and future perspectives

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1. Introduction

Indigenous populations continue to be subject to predation and loss of traditional lands with the consequent destruction or at least damage to their livelihoods and culture, both in the Amazon region and throughout the world. This also has profound implications for the health of the planet both in the immediate impacted areas and for the earth as a whole: loss of native forests and biodiversity, increase in carbon dioxide and global warming, interruption of terrestrial and atmospheric water cycles, etc. In the case of the great Amazon basin, by far the largest tropical forest in the world, many populations have had significant contact with outsiders only during the last half century. Therefore, it is important to better understand how their livelihoods respond to the myriad of external forces, the implications for the environment, and their prospects for survival. This paper will present the results of a case study based on recently completed doctoral research in Brazil (Salinas, 2021), based on detailed data from a panel of indigenous households and their communities in Ecuador.

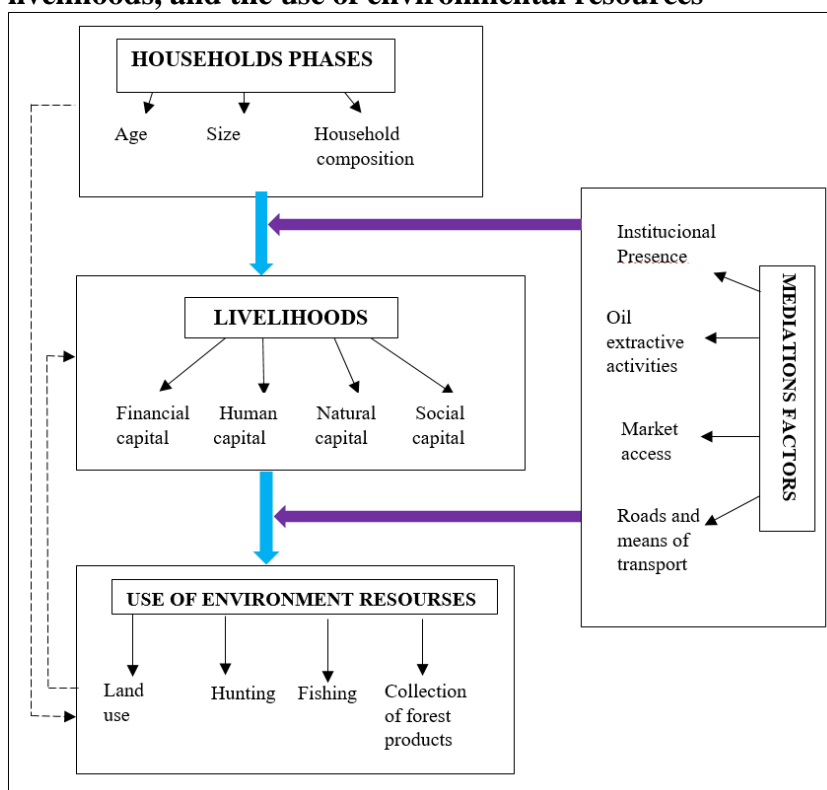
2. Conceptual approach: a novel methodology

The approach involves, first, developing a methodology to classify households according to their phase in their life cycle (Becker, 1960; Becker y Lewis, 1973), then to assess how changes in the size and composition of the household by age may tend to affect household livelihoods (Bebbington, 1999; Bury, 2004; Sherbinin et al., 2008; Babigumira et al., 2014), which in turn affects the natural environment (Walker y Homma 1996; Marquette 1998; McCracken et al., 1999) Of course, there are other factors involved in the process, which can change over time and which therefore should also be measured if possible (Spangenberg y Lorek, 2002). Detailed data is available for both households and communities on things such as infrastructure that can be used with the new methodological approach to analyze how different *phases of the life cycle* of indigenous households and their livelihoods are impacted by mediating factors.

Following the classification of indigenous households in six phases based on the demographic data collected in the panel survey, their livelihoods are measured and linked to their access to and use of capital in measured in four dimensions (natural, financial, social and human) to meet material needs, with implications for the natural environment (Cundill, Shackelton y Larsen, 2011; Babigumira et al., 2014) over a period of almost 20 years. The life cycle phase was analyzed in terms of each phase associated with a different combination of livelihoods (Perz, 2001).

Key factors affecting these combinations are identified and referred to as 'mediating factors', which influence decisions to engage in specific forms of livelihoods, which have different relationships with the natural environment, and therefore different impacts, which change over time as households evolve through phases. Figure 1 below illustrates these processes conceptually.

Graph 1. Conceptual framework of dynamics of indigenous households, their livelihoods, and the use of environmental resources



Source: Figure adapted based on Hunter (2005)

Classifying households from survey data according to the household life cycle phase seeks to identify how households choose different livelihood strategies at each phase, given their size and demographic composition as well as their land and other assets or capital endowments, in order to understand the decisions faced by households in terms of consumption needs and productive capacity (for example, according to the number and quality of children and adult and prospects for participation in the labor market). Six phases of the home were created, as indicated in the table below.

Table 1. Age groups that constitute phases of household

Phase	0-6*	7-17*	18+*	Where only heads of household reside, with no members other than X	
				Head equal to or less than 64	Head 65 +
Phase 1 new home	X	-	-	X	-
Phase 2 early phase	X	X	-	-	-
Phase 3 middle phase	X	X	X	-	-
Phase 4 later phase	-	X	-	-	-
Phase 5 late phase	-	X	X	-	-
Phase 6 final phase	-	-	X	-	X

* Ages of head and spouse are excluded here

3. Research data

The data come from two household surveys on “Population and Land Use in Indigenous Communities of the Amazon” in Ecuador, conducted by the University of North Carolina in collaboration with the EcoCiencia Foundation and the Center for the Study of Population and Social Development (CEPAR). The survey included two detailed questionnaires, one for the male head of household and one for the female head, most often the spouse. The male questionnaire covered land size and tenure; land use, production and sale of crops and livestock; salaried employment and location; hunting, fishing and gathering from the forest, as well as timber extraction; etc. The female questionnaire recorded a list of household members with education and other characteristics; migration; household goods, including agricultural tools and vehicles; fertility, mortality and health; participation in community organizations and *mingas* (shared community work); etc. A community-level survey was also implemented with community leaders on population size, community infrastructure and organization, location relative to roads and commercial towns, means and frequency of transportation, contacts with external agents and institutions, among other things.

The project covered the five main indigenous ethnic groups of the three Amazonian provinces of northern Ecuador (Sucumbíos, Napo and Orellana), in order of decreasing population size: Kichwa, Shuar, Waorani, Cofán and Siekopai. The communities were selected randomly, but using “controlled sampling” (Goodman & Kish, 195x) to represent not only the five main ethnic groups, but also the diversity in population size of communities and location with respect to roads, rivers and towns/markets. In each community, a maximum of 22 households were randomly selected. In total, there were 484 households with complete data from both questionnaires in 2001, increasing to 599 households in 2012 because derivative households formed after 2001 from the original household members were also covered (mostly children growing up to form own independent households).

4. Data analysis method: mathematical non-statistical

All the concepts and variables were measured from data of the household questionnaires in the two years, 2001 and 2012 (table 2), for the household panel and community questionnaires for the mediating factors panel (table 3).

Table 2. Weights for measured attributes of environment and livelihoods, including numbers of attributes that constitute them

Variable	Weight
Environmental resources	100
1. Land use (78 variables)	50
2. Collection of forest products (8 variables)	10
3. Hunting (13 variables)	20
4. Fishing (15 variables)	20
Livelihoods	100
1. Financial capital (177 variables)	51
2. Natural capital (13 variables)	20

3. Human capital (12 variables)	21
4. Social capital (5 variables)	8

The greatest weight assigned to the impact of human activities on the environment is land use (50%), as it captures the main intensive form of land use and therefore the main effects on the forest. Among the main forms of land use for agriculture, for own use and/or sale in the market, are coffee, cocoa, corn, plantains and bananas, along with pasture for livestock. Cocoa and coffee are sold as the two major cash crops, and therefore also have a direct relationship to financial capital, along with competition for labor, so changes in the area in either affects changes in livelihoods linked to changes in the phase of the household cycle.

Table 3. Mediating factors, weights, and number of attribute variables

Variables	Weight
Mediating factors	100
1. Services available in community (9 variables)	4.5
2. Market access (14 variables)	36
3. Community transport services (4 variables)	4.5
4. Actors generating employment in community (6 variables)	13
5. Institutional presence of environmental and agricultural technical assistance (11 variables)	11
6. Direct contact with oil companies (11 variables)	29
7. Use of modern agricultural inputs (2 variables)	2

Referring to the previous conceptual figure and table 3, the factor that has the greatest weight is access to markets, since it facilitates (or not) the sale of products. This implies, for example, that increased road construction (which occurred between the two survey years, and since) is likely to lead to changes in crops grown and increased land in cash crops over time: this, plus the significant changes in the relative market prices of cocoa and coffee (the former rising, latter falling), led to a significant increase in land in cocoa, although overall there was a slight decrease in land in crops, as more roads and more education for farmers also facilitated more off-farm work for pay, often non-agricultural labor.

Weights for the attributes or variables were assigned based on (a) detailed data from questions in the household survey, and (b) the authors' extensive experience in the region over many years, reflecting on which aspects would seem most important. Once the weights are generated for each of the component variables, they are combined to create the factor, each with a maximum of 100 and a minimum of zero. As an example, hunting activities are assigned a total value of 20 points, which comes from questions about hunting frequency, how many people were involved: how frequent, duration, how far away, and how many and what animals were obtained. Therefore, each household will have its own calculated value, and all households in the same phase are aggregated to calculate means for each phase. These means evidently can change over time, e.g., as the frequency or duration or success of hunting changes. This example illustrates the procedures for the other variables and factors (further examples are in Annex, and complete data on weights in the thesis of Salinas 2020).

5. Results

The composition of the phases is found in table 2 and the highest concentration of households is found in the first three phases, both in 2001 and in the period of 2012. Phase 1 households remain almost stable in 2012, this corresponds to the new homes formed because the children who were adolescents and young people in 2001, in the course of these 11 years left and formed new homes, which were located in this first phase.

Phase 2 households are presented with this percentage in 2012 because being a population with high fertility it can continue to maintain a certain stability and its decline will be because part of them moved to phase 3; Hence, this phase (3) presents a higher percentage in 2012. Although it seems strange not to have many cases in the homes of phase 4, 5 and 6, this is due to the fact that it is a population with high fertility, where having few children to place them in this phase occurs in a limited way.

The average age of the heads of household by phase does not show varied trends. Households in phase 5 have the highest differences for 2012 for head and spouse, because being a population with high fertility and reduced infant mortality, the possession of children up to quite high ages of women is reported and, therefore increasing the age of the heads of household.

Table 4. Household composition sample by age of heads of household, average number of members by age groups, 2001 and 2012

Phase	Households 2001									
	People	Households	% Households	Average age of head	Average age of spouse	Average household members ^a	Average of members from 0 to 6	Average of members from 7 to 17 ^b	Average of members from 18 to 64 ^b	Average of over 65 ^b
1 (0 a 6)	415	111	23	26,41	23,16	3,74	1,74	0	0	0,01
2 (0 a 17)	1106	158	33	36,72	31,35	7,00	2,28	2,73	0	0,03
3 (0 a 18+)	1143	124	26	44,54	39,20	9,22	2,38	3,03	1,81	0,06
4 (7 a 17)	106	29	6	45,59	38,38	3,66	0	1,83	0	0
5 (7 a 18+)	215	38	8	48,39	46,42	5,66	0	2,26	1,55	0,03
6 (18 +)	65	24	5	60,38	50,00	2,71	0	0	0,88	0,08
Total	3050	484	100							
Phase	Households 2012									
	People	Households	% Households	Average age of head	Average age of spouse	Average household members ^a	Average of members from 0 to 6	Average of members from 7 to 17 ^b	Average of members from 18 to 64 ^b	Average of over 65 ^b
1 (0 a 6)	474	128	21	27,25	21,7	3,70	1,70	0	0	0,02
2 (0 a 17)	1187	181	30	33,66	29,82	6,56	2,11	2,46	0	0,03
3 (0 a 18+)	1540	173	29	45,17	41,83	8,90	1,99	2,68	2,25	0,1
4 (7 a 17)	155	39	7	44,94	42,00	3,97	0	2,13	0	0
5 (7 a 18+)	296	51	9	53,68	51,60	5,80	0	2,10	1,76	0,08
6 (18 +)	61	27	5	60,88	64,93	2,26	0	0	0,53	0,15
Total	3713	599	100							

a. Includes head of household and spouse

b. Does not include head of household or spouse

Source: PUT-CIAE of UNC-CEPAR, 2001 and 2012

5.1 Environmental Resources Situation Rate and Livelihoods Situation Rate

The rates were constructed by the evaluations that each household obtained by phase according to the indicators noted in the methodology section. Overall rates may change

over time, depending on the changes in the households between the surveys, in each of the component indicators. For the environment, the general name we use the Environmental Resource Situation Rate (ERSR), which is linked to the Livelihood Situation Rate (LSR).

Table 5. Amazonian indigenous household by phase: Situation of Environmental Resources and Situation of Livelihoods, 2001 and 2012

Phase	Environmental resources -ERSR-		Livelihoods -LSR-	
	2001	2012	2001	2012
1 (0 to 6)	14.6	9.6	15.8	16.6
2 (0 to 17)	15.2	10.9	17.4	20.2
3 (0 to 18+)	16.3	12.2	17.5	19.6
4 (7 to 17)	14.4	11.5	16.4	19.6
5 (7 to 18+)	15.7	12.2	17.8	19.5
6 (18+)	14.7	9.3	15.1	15.8

Source: PUT-CIAE of UNC-CEPAR, 2001 and 2012

The graph below (following Table 5) illustrates the impact of human activities on each aspect of the environment in the two years for each of the household phases, allowing comparisons over time. The measures show decreases in environmental impacts due principally to less land area in use and less hunting, with a modest increase in social capital (though not well measured from data in the survey—see conclusions) and little change elsewhere (see also below). The same methods are applied and graphs prepared for all six phases, the results of which are briefly summarized below.

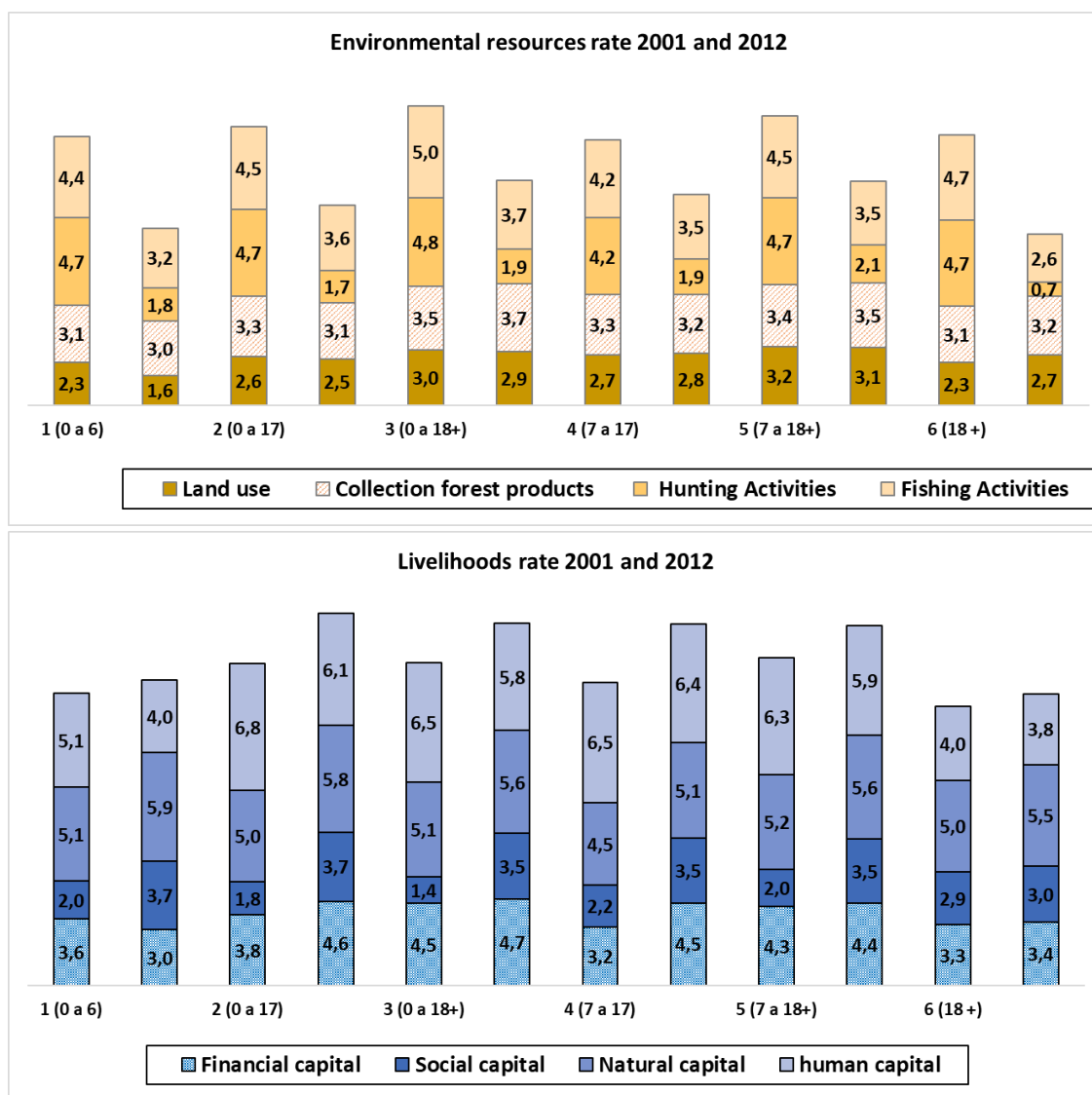
The results obtained from the calculation of these rates are shown in Table 5, in summary form for each of the household phases and for each of the calculated rates - livelihoods and environmental resources. The table indicates that, in general, environmental resources used are declining for all household phases –expressed in land use, hunting activities, fishing and collection of forest products-, while the means of life –financial, human, natural and social capital- tend to increase overall in all phases.

Regarding environmental impacts of households, in general, all phases had a decrease in traditional self-subsistence activities - *hunting and fishing* – although this does not usually yield monetary returns but provides high protein food. The collection of forest products is an activity that remains almost constant in all phases. However, *wood harvesting* and sales increased in phase 6. In all phases, regardless of whether they sold more or less wood, incomes from this activity rose.

Regarding area in *land use*, phase 1 households cut back slightly and phase 4 households more, although they continued to have the largest average ha in current agricultural use in both 2001 and 2012. Nevertheless, households in the other four phases tended to increase their areas in use, especially phases 5 and 6, with the highest mean areas in coffee as well as in market sales, plus increases in the area in cocoa, but often replacing coffee so new deforestation was minimal. Phase 6 experienced the biggest increase in land use and therefore deforestation, because in 2001 they had the least intervened land, but could not resist the economic benefits of cocoa.

Natural capital does not tend to significant changes, but to growth despite the increase in land use, but that this situation is compensated because hunting and fishing activities decrease, not only in the percentage of households that stop carrying out activity, but also in its frequency. To this must be added what was noted above: that the use of land is almost maintained.

Graph 2. Amazonian indigenous households, phases 1-6: details of environmental resource situation rate and the livelihood situation rate, 2001 and 2012



Source: PUT-CIAE of UNC-CEPAR, 2001 and 2012

In all household phases, curiously, *human capital* declined, due in part to smaller household sizes (mostly due to subdivisions, a bit to a slight decline in fertility). This takes into account that the variables that constitute the measure are education of the head of the household and education and number of household members between 7 and 17 and their involvement as household labor for work on the farm and off-farm. Greater school attendance leads to reduced time in agricultural activities on their own farms.

Social capital increased for almost all phases, albeit to different degrees. This increase is mainly due to a modest increase in work in community *mingas* (e.g. building or repairing a school, or pier in the river shore), reflecting compliance with social norms, with *mingas* to repair houses of other members falling slightly. But see conclusions for caveats on its measurement.

Financial capital grew minimally for phases 3, 5 and 6 households, significantly for phases 2 and 4, and only one showed a decrease (phase 1). Participation in paid work is the main factor accounting for the rise, reflecting a broad expansion from paid work in

2001 concentrated in oil activities. By 2012, although oil work continues to be an important source of work, there is a greater diversification in work activities and locales away from the community thanks to improvements in access to towns.

The analysis of the graphs in this section, summarized in Table 5, clearly shows livelihoods with an upward trend, while environmental resources are decreasing due to the impact of indigenous populations. How mediating factors affected these changes is investigated below.

In this context, it is important to recognize that mediating factors changed substantially between the two years, due in part to more roads and improvements in existing roads providing better market access, and thus more off-farm employment and income and less agriculture. All phases had slightly lower environmental impacts in 2012 than in 2001, with the older households in phase 6 having the largest changes and the most deforestation due to a greater use of land in agro-productive activities (livestock and cocoa). Mediating factors play an important role in this phase because it had the weakest links to the market in 2001, while in 2012 it was a phase with high market sales.

5.2 Incidence of mediating factors

The incidence of mediating factors (IMF) takes into account the set of indicators that make up the mediating factors. The values found are seen in table 6. The upper panel shows values for each of the variables analyzed, which compose these factors. The lower part shows the incidence of mediating factors by household phase for each of the years studied, is the sum of the values obtained from the seven variables that make up the mediating factors in the top panel.

Table 6a. Amazonian indigenous household by phase: values of variables that constitute the Incidence of Mediating Factors, 2001 and 2012

Factors/Phase	1 (0 to 6)		2 (0 to 17)		3 (0 to 18+)		4 (7 to 17)		5 (7 to 18+)		6 (18+)	
	2001	2012	2001	2012	2001	2012	2001	2012	2001	2012	2001	2012
Community Services	2.2	2.5	2.2	2.5	2.3	2.4	2.5	2.2	2.6	2.5	2.4	2.5
Market access	8.9	10.8	9.1	10.7	9.2	10.4	9.3	10.6	8.8	10.4	8.6	11.3
Transport services	1.1	1.1	0.9	1.1	0.9	1.1	0.9	1.1	0.9	1.1	0.8	1.2
Actors that generate employment	2.3	3.8	2.5	3.2	3.1	3.5	2.8	3.1	2.4	3.8	2.8	3.8
Institutional presence	0.5	3.1	0.5	3.1	0.4	3.0	0.4	2.9	0.4	3.2	0.3	2.7
Direct contact with oil companies	2.8	3.1	2.9	2.9	3.1	3.3	3.1	2.6	2.5	3.2	2.0	1.3
Agricultural inputs	0.1	0.2	0.1	0.4	0.1	0.4	0.0	0.5	0.1	0.4	0.2	0.4

Table 6b. Incidence of Mediating Factors Rate by Household Phase

Phase	2001	2012
1 (0 to 6)	17.9	24.6
2 (0 to 17)	18.2	23.9
3 (0 to 18+)	19.1	24.1
4 (7 to 17)	19.1	23.0
5 (7 to 18+)	17.7	24.6
6 (18+)	17.0	23.1

Source: PUT-CIAE of UNC-CEPAR, 2001 and 2012

All components indicators of the mediating factors show a notable increase, but the highest increase occurs in the mediating factor called institutional presence, which

contains two elements: i) institutions linked to environmental issues and, ii) institutions involved in agro-productive issues. From their almost absence in 2001, both rose rapidly, so this factor rose overall by almost six times, especially in relation to State institutions and non-governmental organizations with projects for the rights of indigenous populations and economic development, generating considerable employment.

Another substantial mediating factor that tended to grow was access to markets, followed by actors that generate employment and improvements in community transportation services-- factors that account for higher market sales of agricultural products and more employment. Work with oil companies also increased, but minimally. Overall, as mediating factors, market access rose logically for households in all phases.

Once this incidence of mediating factors has been calculated, calculations of the indices of environmental resources and livelihoods are carried out.

5.3 Environmental resources index and livelihoods index

This analysis aims to study relationships between mediating factors, environmental resources and livelihoods of households, and show the effects of changes over time in mediating factors. The focus is on how livelihoods influence environmental resources taking into account the effects of mediating factors.

We start with the environmental resource situation index (ERSI) and the livelihood situation index (LSI), described in table 6, as well as the incidence of mediating factors (IMF), in table 5. We then proceed to the calculation of the overall indices. This involves the multiplication of the livelihood indicators in each phase by the mediating factors to identify the effects on environmental resources.

The calculated indices will be between 0 and 100, the 2001 values correspond to the base time reference values; and the values obtained for 2012 will show the changes over time (or not).

The way to determine the indices of the situations of environmental resources and livelihoods is by carrying out the following calculations:

$$ERSI = ERSR * IMF / 10 \quad (1.1)$$

$$LSI = LSR * IMF / 10 \quad (1.2)$$

Where:

ERSR = Environmental Resources Situation Rate, for each household phase, by year (see table 5).

LSR = Livelihood Situation Rate, this for each of the phases of the household, by year (see table 5).

IMFR = Incidence of Mediating Factors, for each of the household phases, by year (see table 6b).

An example illustrates how the values in table 7 and graph 3 (a,b) below are calculated. The Environmental Resources Situation Index in 2001 for households in phase 1 was 14.6. This is multiplied by the Incidence of Mediating Factors for this same year, which leads to a value of 17.9 (table 5b). This is divided by 10, resulting in the value of 26.1 as the Environmental Resources Situation Index for households in phase 1 in 2001. This calculation is performed for each of the household phases, for each year and for each index.

Table 7. Amazonian indigenous households by phase: Environmental Resource Situation Index and Livelihood Situation Index, 2001 and 2012.

Phase	ERSI		LSI	
	2001	2012	2001	2012
1 (0 to 6)	26.10	23.67	28.31	37.04
2 (0 to 17)	27.60	26.05	31.73	45.87
3 (0 to 18+)	31.14	29.47	33.46	45.45
4 (7 to 17)	27.51	26.42	31.33	43.60
5 (7 to 18+)	27.85	29.94	31.40	45.96
6 (18+)	25.20	20.63	25.89	34.28

Source: PUT-CIAE of UNC-CEPAR, 2001 and 2012

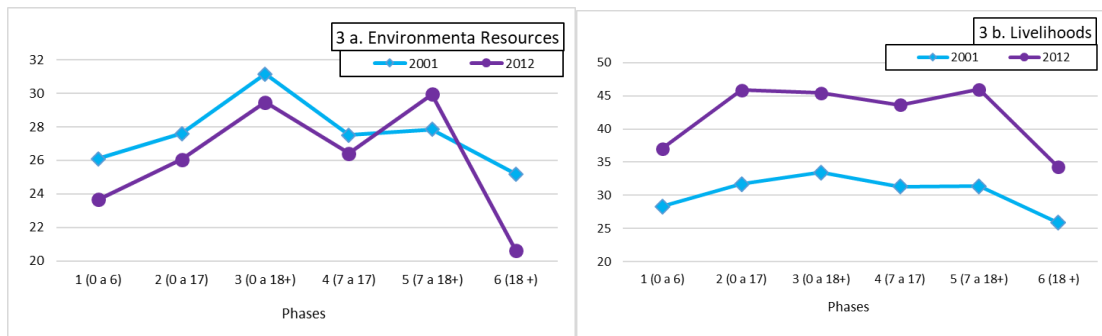
The way to interpret the Environmental Resources Situation Index (ERSI) is that if there is a decrease in its value from 2001 to 2012, that means there is less use of environmental resources, or in any of the dimensions that have been analyzed, or vice versa.

How can we verify if this incidence really occurs due to mediating factors? All societies show changes over time, as observed in comparing values in the previous section. The incidence is achieved by first examining the changes in the dependent variables analyzed, in this case, environmental resources, which in Graph 3a are expressed in the differences found between the values for 2001 and 2012 in the situation of environmental resources.

The interpretation of the Livelihoods Situation Index is similar: if the value is higher in 2012 than 2001, we assume livelihoods improved. Carrying out the same exercise as with the previous index, the difference between the situations and indices, in the same way shows even larger differences (Graph 3b).

The differences that occur when subtracting between the rates are different values when performing this same calculation between the indices. This indicates that the mediating factors contribute to changes in the incidence measures of both environmental resources and livelihoods in different ways for each household phase, depending on its own endowments and situation, as verified in graph 3.

Graph 3. Amazonian indigenous household by phase: a. Environmental Resources Situation Index; b. Livelihoods Situation Index, 2001 and 2012



Source: PUT-CIAE of UNC-CEPAR, 2001 and 2012

We now summarize the findings by phase between 2001 and 2012.

Regarding the Environmental Resources Situation Index (ERSI) among households in the phases that show the most significant changes, first is *phase 5*, as it is the only one showing a rise between years. The reason is that the age composition of members of households in this phase (between 7 and 17, plus those over 18), yields a relatively large number of members (5) which allows them to carry out self-subsistence activities (hunting, fishing and collection) as well as other livelihood activities producing income. This is linked to the fact that they do not have younger child members, who need child care time. Looking at land use, although already high in 2001 it still rose further, notably for growing cocoa. Second, household members in this phase collected even more forest products and wood. Third, for fishing, frequency fell by very *in the last seven days*. And, finally, while hunting declined, the frequency did not change significantly as in all other phases, and continued to have the highest percentage hunting *among the last seven days*.

In this phase one also observes a complement of activities in the use of environmental resources. Land use is one of the main sources of monetary resources, facilitated by the growing institutional presence, which implies: knowledge and information leading to increasing productivity in growing agricultural products. Sale of products is facilitated by new and better roads, as well as means of modes of transportation and mobilization, including to sell wood. These greater resources allow households in this phase to meet needs better, including education, food, clothing, etc.

This same phase (5) also experiences the most significant differences in indices corresponding to changes in livelihoods (LSI). The change is concentrated in natural capital, due to the situation already described. But financial capital which was already high in 2001 remained almost the same for 2012. Social capital, as in other phases (and due partly to limited data—see conclusions), increased slightly due to compliance with community social norms, which in this phase were easy to fully meet because of having so many household members over 18 years of age.

The main mediating factor that generates an increase in LSI in this phase is improved access to and use of mobilization facilities from and to these communities to be able to have more direct relations with the market for sales of products and purchases. Another is the greater presence of institutions, some providing employment opportunities and others that provide them with information, inputs and technical assistance such as for agriculture. These factors make it easier for members of these households, especially over 18, to engage in agricultural activities that generate income (cash crops) as well as self-subsistence activities.

Moving on to *Phase 6*, this is among those with the largest changes in ERSI, it had the greatest deforestation for a greater use of land in agro-productive activities, taking into account that in 2001 it had less land intervened. For 2001 its main activities were hunting, fishing and gathering, but for 2012 these are diametrically modified, because the use of land is the guideline of its activities. This change is directly related to the fact that greater deforestation does not allow them to carry out other activities -hunting, fishing and gathering-, in addition to the fact that agro-productive work limits their time for these self-subsistence activities.

Mediating factors play a transcendental role in households in this phase 6 (institutional presence with knowledge, information, ease of selling their products due to the presence of highways), because it was one of the households with the least links with the market in 2001; but for 2012 it is among the phases that sold the most products. Its almost zero experience in land use for 2001 acquires fundamental changes to be its main activity in 2012; hence its concentration in agricultural activities.

The households in this phase 6 are made up of members over 18 years of age, people who may have greater access to worked land (this by adjudication) and especially with ages at which they can dedicate more time to agricultural production, without direct responsibilities with other members of other ages who need care.

As for the LSI, phase 6 households also have a significant difference between the indices, although less. The dimension of financial capital is again the one that directs this difference. This is corroborated with almost all the indicators of this capital. Its sale has impressive changes, because it was the one that obtained the least income and was almost concentrated only on the sale of subsistence crops in 2001, but this is modified to focus mainly on the sale of cocoa, implying a greater use of land and markets.

Regarding paid work, despite being one of the phases that had one of the highest links with access, it shows a notable reduction, which in a way would validate the presence of more work in agro-productive activities, which is why To add that they are a home in the final phase and continue with their most typical jobs, such as that of the farm.

Its natural capital has impressive changes because it was the one that had the most forest cover and by 2012 it is among those that have had the most deforestation. This may be related to the greater reduction in hunting, because the less forest the fewer animals to hunt.

Moving on to *phase 1*, for the ERSI, are the following with substantial differences, in land use it has the lowest rate of households sowing cocoa and the lowest average of ha with this product. It has significant reductions in the households that hunt, as well as in the frequency for those that do, the same for fishing. This household phase decreased the use of environmental resources in all its dimensions. For households in this phase (1), their main source of resources for 2012 is given by the presence of actors or activities that generate employment in the area, by indicating a diversification in the type of work to which they are linked, where the agricultural activity - laborer - the one that has the greatest changes compared to the other phases.

In what corresponds to the LSI, the households in this phase 1, although they increase the index, are among those that do so the least. Because its financial capital decreases, it has less land use and it is the only one that decreases the sale of agricultural products

because it is relatively new or in formation, where the planting of perennial products can take a few years, which limits its access to these resources.

Due to the limited education of these populations, their links would be limited to jobs as day laborers, but above all agricultural. Therefore, although it is one of the two phases that increase access to paid work, it is the one with the least difference in earnings in 2012 in relation to 2001. Thus, to household income that is limited by the reduction in the sale of agricultural products is added the little profit for paid work.

This change in its agro-productive activities increases natural capital, due to what has already been noted, but above all because it is a home with a new formation, where access to goods and payment for services generated by state institutions or not (electricity, goods, etc.) is accurate, and your money needs are greater.

Moving on to *phase 3* homes in ERSI present a diverse set of dimensions. First, there is an increase in its use of land, small in relation to 2001, to concentrate on cocoa and grass; It is among the highest rates in the collection of forest products - being the second highest in wood-, but in hunting and fishing dimensions it makes the respective reductions, which are expressed in their frequency.

This phase is made up of members of all ages, hence the increase in their agricultural activity, although not as prominently as in the rest of the phases because their use of time, especially of heads of household, has a high dedication for those under six years of age and those who are studying. Due to the number of household members (9 on average) and the ages of the members that make up this phase, monetary resources are required for their vital needs, resources that can be obtained by the age group over 18 years of age, which can be find a link with the actors that generate employment in the area.

The households in this phase 3 in the LSI concentrate their capital on natural resources because their increase in land use is minimal for 2012; financial capital barely grew slightly, but it should be noted that it was the highest in 2001, mainly due to the demographic composition (age and number of members) of this phase, which allowed it to have labor to carry out agroproductive activities. It does not grow substantially for 2012 because part of this workforce is transferred to education.

Human capital decrease, a value that acquires mainly because this is one of the phases that increased the type of labor for *others* and is also among those that most reduced the participation of *all members of the household*, because the mobility facilities allow them to go out to find other jobs or engage in formal education, which reduces their working time on their own farm.

The interference of mediating factors in this household phase, especially in natural capital, is facilitated by the institutional presence that encourages them to continue using the land to obtain monetary resources and reduces the rest of the activities that do not generate money. Added to this is the ease of access to markets and populated centers that allow them to sell them, as well as migration for access to paid work, which, due to the age composition of its members, has one of the highest demands for services and goods. and for so much money.

Regarding to the *phase 2* the ERSI: a slight increase in the dimension of land use –for the sowing of cocoa and pasture-; reduction in the size of the collection of forest

products –although not wood-; The hunting dimension also falls, but in fishing, it is the one that decreased the least in its frequencies. It has the highest rates of households with a clothesline, corroborated by a high rate of cocoa sales. It is one of the phases that is among the highest percentages of wood sales, although not necessarily of income.

The households in this phase 2 are made up of members from zero to 17 years old, ages that require monetary resources due to the “new” needs developed, children's health, education, goods and payment of services, among others, needs that become more evident and they are in demand for new access to information (television, contact with other actors, and so on). The concentration of land for agricultural products allows them to access these resources, the sales of which are facilitated by the mediating factors already analyzed and for this phase another mediating factor is presented to a greater extent: access to credit –reimbursable- and to the Human Development Bonus (HDB).

This phase 2 for the LSI is expressed mainly in its financial capital dimension. Report the greatest differences in income from the sale of coffee, cocoa and subsistence crops and the sale of harvested forest products; sells the most wood; takes second place as regards access to credit; and, in the percentage of households that have someone linked to paid work, there is no decrease and presents the highest income differential.

The conjugation of four capitals results in the households in phase 2 being the ones that most grew in their livelihoods, elements that were presented by the mediating factors already analyzed.

It is highlighted that the services that tend to improve the quality of life of these populations (electricity, education, health, among others), also generate needs, especially in this phase of the household because its members are between zero and 17 years old, ages that require expenditures and investments in education and health, and this phase has a high number of members (7), which also implies greater demands. Therefore, this household phase tends to focus on financial capital.

Finally, households in *phase 4* regarding the ERSI have a slight decrease in environmental resources. First, it reduces the use of land, but diversifies what it already has for growing cocoa and grass. This phase is the one that most proceeds to the sale of agricultural products, especially coffee and cocoa increases significantly, in relation to 2001, households in this phase are the ones that sell the most livestock. The hunting and fishing dimension decreases its greater frequency. It is the phase that decreases the most in the dimension of collection of forest products in general.

The households in phase 4 in the LSI, like the previous ones, it is the dimension of financial capital that changes the most and is expressed on the sale of agricultural products -subsistence crops, coffee and cocoa-; It has the highest percentage of sales and is among the highest in income and is the phase that increases its participation in paid work the most.

The dimension of human capital remains almost stable, but the number of students in the household increases and, therefore, greater needs for money. The size of natural capital is stable. Social capital increases by their participation in community social responsibilities.

One of the main mediating elements for this phase would be access to paid work. Although agricultural activities continue to be carried out, they do not increase in land

use, because households in this phase can access paid work due to the presence of actors in the area, which is explained because it is a phase that is made up of members between seven and 17 years old, who do not need further care, such as those under six years of age, therefore, they have time for these work activities.

Each phase of the household has had a different relationship with the different dimensions of environmental resources, and it is even more evident that the mediating factors affect each phase differently, changes that will correspond to the composition of the household and the type of relationships that are established with these factors.

5.3 Analysis of changes between 2012 and 2019: a quantitative-qualitative extension

It is emphasized again that this qualitative phase, although it could not be called representative, at least tries to identify and understand why? of the situations in 2019 through the voices of the subjects of this study.

The following summary will be carried out by the household phases to identify its characterization in 2019 in relation to 2012 and 2001.

First, the use of land will depend on the type of land distribution and ownership of the nationality. In the cases in which they are already distributed, this can be a limitation to expand their use, if they do not have more territory (as in the case of the chosen Kichwa community). For those who have it distributed but still have available forest (Shuar and Siekopai), their horizon of use in the short and medium term is extensive, sowing African palm or grass. Those that have communal use without distribution (cofan) do not envisage an extensive or mainly commercial use, other than for self-subsistence.

Phase 1, between 2001 and 2012, presented a greater sowing of commercial products such as cocoa, but not necessarily greater land use. In 2019, the use of land acquires another dynamic and is for use in extensive crops such as African palm and grass, implying deforestation. Despite this, the soil continues to be a source of environmental resources for self-subsistence, that is, short-cycle crops for food subsistence.

Hunting for this same phase (1) is an activity that is hardly carried out due to the change in the use of time, because the heads of households have some type of labor relationship and their lands are small and do not have the same environmental conditions. as in years past. Fishing is framed in this same situation. Despite the fact that between 2001 and 2012 there was a decrease, this 2019 continues the same trend. But, greater access to income allows them to buy more food, although not necessarily to meet the protein needs, given by what is hunted and fish. The exceptions are for the Cofan because they have a large reserve area that facilitates hunting and fishing.

Access to paid work is their main source of income, whether local or with mobilization, but none for skilled labor. This follows the trend established already in 2012, where financial capital is diversified, but prioritizing for paid work. This income is complemented by the sale of subsistence agricultural products such as plantain and cassava and perennials such as cocoa.

Social capital continues to be a fundamental element for almost all phases of the household and for almost all nationalities, with the exception of the Shuar community, where the entry of the oil company modified their intra-community social relations. To 2019 having access to income from work ties, although sporadic, allowed them to have

resources to pay others for work on the farm or at home, this for their own *mingas*. However, community *mingas* continue to be a main source of socialization, organization, and livelihood for communities.

Regarding human capital, phase 1 (and the other phases) realizes the importance of education, which has been a priority in these indigenous populations since 2001, although few of them have been able to enter university, which limits education forms of access to work. But the greatest recognition that is made is that this is going to be a capital to be prioritized with your children.

It is substantial to identify that seven years later the educational situation of this population in 2012 has not changed significantly; By 2012 this phase had a high percentage of people trained at the secondary level, but of these four members of phase 1, none had continued with higher education.

The natural capital for phase 1 basically acquires the category of resource to take advantage of for monetary benefit; This is demonstrated not only by their speeches but also by their land use. This is related to the fact that they are new homes and with money needs to access goods and services that are more limited (mobile telephony, electricity, markets, new ways of life, among others), which can be provided by the use of capital. natural.

Among the mediating factors, the improved and new routes have facilitated greater mobilization from and to the community, but also the entry of various actors who have provided various services in the community (health, education, training, productive projects, among others) and the fundamental thing, a greater contact with the local markets. Oil companies and palm producers reconfigure the scenarios even more, because they pose that access to material goods (for compensation or work) as the new development paradigms.

As a conclusion, from phase 1 it is noted that already in 2012 the new forms of land use that could be presented in this household phase were evidenced, and obviously the data from this 2019 allow us to verify what was proposed as a hypothesis: the prioritization of financial capital as the main way of life and that has a relationship with the greater use of environmental resources to access them.

Regarding to *phase 2* between 2001 and 2012 increases its land use especially in productive crops. For 2019 this same trend continues, wanting to focus on grass and African palm (for those who have territory). Those who do not yet have a connection with these types of products already include their planting and, therefore, deforestation in their plans. Self-subsistence crops are vital for these populations; hence its null changes.

Hunting and fishing for phase 2 has been reduced, because childcare limits the time for these activities and their territories and rivers no longer have animals to provide for themselves. Wood is still a notable forest product, especially because it is for household use. For 2019 it continues to have the most income from the sale of its products. A variety of labor linkages are reported. In two of the four homes in this phase, their work is outside the community, realizing that transportation facilities influence a greater mobilization of these populations. A significant item of income is the HDB and it has been used for agro-productive activities.

Human capital in all households in this phase is relevant, because having education can "*ensure access to work, learn Spanish, not fall into vices and be community leaders.*" Only one of the children of the households in this phase 2 does not study, but the money that this young man earns is partly destined to help the rest of the brothers to continue studying. The son of another household studies in the city and lives alone, which shows the relevance of formal education for these populations, and above all the need for monetary resources to cover these expenses.

Natural capital generates varied discourses where, although there is recognition of the forest as a provider of comprehensive environmental services, there is also recognition that it is its main form of access to financial capital; hence their options for land use are with the sowing of extensive crops.

The mediating factors, including transportation and mobilization facilities, change the scenario of these populations even more in 2019 and with greater clarity for this phase, because it benefits one of the capitals that they consider fundamental: the human, because it allows students to mobilize to study and have access to better educational centers.

All the households in this phase have participated in the various projects that have entered this community, because they have a longer-term use of land. However, the evaluation of these executed projects is not always positive because they did not have a real execution (more than initial) and they did not have technical assistance or follow-up.

Moving to *phase 3* for this 2019 maintains the trend of land use growth for the sowing of extensive products, one household had used 40% of its land (20 ha of 50 ha) and the other household plans to deforest 15 ha for palm planting, quite high values that, although they cannot represent the 2001 and 2012 periods as was done with the data, reflect the new trends that these household phases are following.

Hunting, fishing and gathering activities tend to decrease as activity and frequency, which are directly related to the greater use of time in productive activities.

Regarding access to financial capital, all the heads of these phases of household 3 had a job or some work relationship, to which was added some of their other members over 18 years of age; But another notable actor in the generation of income were the heads of households who had their own businesses (sale of chickens, handicrafts, baby food), with a continuous generation of household income.

The assets and, therefore, the resources with which this phase of the household is already beginning is expressed in the ownership of livestock, although not in a high number, it is significant given the conditions of this population. It is complemented by the sale of their agricultural products and non-reimbursable credits for investment in agro-productive activities and also the emergence of reimbursable credits that are already provided mostly for these populations, which in past years were not subject to credits. This facilitates investment in agro-productive activities, facilities that households in phase 1 and 2 will surely be able to access in the short and medium term, and which will have an impact on land use given the trends towards extensive crops.

Human capital is highlighted to improve living conditions and relationships with other actors, specifically mestizos. But being from middle-stage homes, they also show the

reality of indigenous people, the high school dropout rate due to the multiple disadvantages in which they find themselves (poverty, discrimination, mistreatment, school violence, among others) and the few links with higher education.

Natural capital is recognized for its vital importance in past years because it responded to their needs and traditional ways of life, but it is also recognized that today it is the only capital they have to be able to adapt to new socioeconomic situations.

For this phase (3) the mediating factors play transcendental roles, because they are homes with a longer life trajectory than the two previous phases; therefore, their traditional forms have been substantially modified by contact with the new social, cultural and economic patterns facilitated by them. However, the conditions in which these facilitators are present have not necessarily translated into better living conditions for these populations, as has been noted.

Moving to *phase 4* has a land use with a high destination for the sowing of products in the market - cocoa and coffee. Hunting is still reported, although its frequency is less. Fishing is one of the phases that most reports its activity, but fewer fish are collected and in a longer time. The collection of forest products is still reported, especially materials for artisan products. The wood collected is reported to be used solely for the maintenance of their homes, although it is indicated that the sale generates important values, but no household in all phases reported it.

Regarding financial capital, their labor ties are lower and may be related to the age of the heads of household. His main source of income is from the sale of his agricultural products and on a limited basis as an agricultural laborer. Therefore, they continue to maintain the trend given between 2001 and 2012, being a phase with high income from the sale of their production.

Natural capital in this phase acquires a more comprehensive vision regarding its use, where although the income that can be generated is recognized, its value for the future and to provide resources for their ways of life is also highlighted.

Among the mediating factors in this phase 4, the main and recognized one is the positive impact of the presence of the oil companies in their territories or close to them, due to the compensation or payments received. However, in this area, due to their longer years of presence, they may be more critical of the situations that have arisen, especially with regard to mediating factors, because they recognize the positive and negative impacts.

Regarding to *phase 5*, in what corresponds to land use for the nationalities that distribute their territory under inheritance, they have already done so and have few ha for their use (between 3 and 4 ha). Although they can continue to use the territory if their children have not done so, but officially it no longer belongs to them, the use is for subsistence crops, cocoa and coffee and with a high percentage of extensive crops - African palm and grass.

Hunting is a reported activity, but its frequency is reduced. A determining factor for the reduction of this activity is the presence of mestizos / colonists who enter their territories and hunt indiscriminately, generally for sale. Fishing is reported, but its frequency is still low because they do not have time to do it and because of the pollution

of the rivers. The collection of forest products is reported, but mostly medicinal products.

Regarding wood, in this phase is the only home that reports its sale in the last 12 months, although the income is low. This could be related to the fact that they are late-stage households that are already dividing up their territory and, therefore, the sale of wood can be one of the forms of access to income before delivery for the use of the children, or so that they themselves can proceed to planting, deforestation being necessary.

It is relevant to note that this phase of the household has palm plantations in production and cattle at ages of sale, so the financial capital is mainly for the sale of these products and crops. The adult members of this phase already work, but mainly as agricultural laborers. This household phase, between 2001 and 2012, was among those with the most households having livestock, a propensity that apparently continues to be maintained.

Access to reimbursable credits, which have been used for extensive crops, and non-reimbursable credits, which indicate that they will be used to continue buying heads of cattle, are reported. The concentration of income for this phase of the household is mainly in the use of the soil resource and in an extensive way.

The considerations of natural capital in this phase of the household acquire environmental importance, but also the recognition that it is a main source of their income, and before this recognition they inform of the need for planning the use of the territory, and in which the new generations are not found, because they downplay the importance of focusing on paid work,

The mediating factors in this population have allowed them to access markets more easily, but at the same time also have access to new contacts that provide them with information so that new land use patterns are more effective; hence they have a high use of agricultural inputs.

Regarding to *phase 6* the land use is in the few hectares that the heads of households have remained because the rest have already been distributed (nationalities that hand over the territory by inheritance). In their territory they have mostly planted perennial and extensive crops (African palm and grass). All its products are intended for sale.

Hunting is hardly reported, on the contrary, fishing is an activity that they do claim to practice, although the fish is less. They continue to collect forest products, including fruits. Likewise, the wood indicates that they continue to collect it, but for home use and not for sale.

The main component of financial capital is from the sale of livestock. Households that have people of legal age provide their sporadic services as agricultural laborers or in oil companies or in the community.

The relevance of human capital for this phase of the household is expressed because all the heads of households who have grown children and who are married continue to provide for their formal education (college and university).

Natural capital acquires a discourse similar to phase 5, where the environmental importance of its territory is recognized and therefore they state that environmental

institutional policies do not respond to what really happens in its territory, where there is an indiscriminate felling of trees, use of products that kill animals, there are no personnel to control hunters, among others. The recognition of this situation is to indicate that this is their only source of access to resources and that these are running out, but that they have to continue using it because that is their service.

The mediating factors are linked to the best and greatest forms of entry into the community and are positive because they can agree to sell their products directly to local companies, in the case of African palm, or intermediaries who always approach the communities. to buy the animals from them, which facilitates access to money easily and safely.

In this phase, institutional contacts, the various forms of work they had access to in previous years, as well as credits, have provided them with information, knowledge and resources to have these new ways of life focused on the use of the soil resource. basically. Contact with oil companies, although at present their role is less, surely in their income or compensation phases, provided these households with resources so that they can enter into these forms of use of land resources, specifically.

All the households analyzed in 2019 clearly demonstrate what this theoretical framework expressed in figure 1 proposed. In the first place, that households are going to have different dynamics because they are made up of various ages, sizes and compositions. These demographic dynamics were not directly expressed on financial, human, natural and social capital, that is, their livelihoods, but were mediated by some factors. The livelihoods, being mediated by these factors, responded in different ways to the use of environmental resources, responses that were given by the phase of home in which they were and their relationships with the mediating factors.

6. Conclusions

The characterization by period for 2001 and 2012 (a cohort analysis was also carried out but is outside the scope of this work) allows us to identify and measure the changes that occurred for each phase of the household in the dependent variables - livelihoods and environmental resources - and in the mediating factors that contributed to these changes. For almost all the questions in the survey, for almost all households, responses changed between the two years, so the components of the variables also had to change, as did therefore the variables themselves, for the mean values of the households in each phase, although to different degrees.

The analyses carried out – for periods and using indices - considered the populations as a single synthetic population, which is largely justified because they share common historical, social, political and economic realities, as well as territory. However, the qualitative phase found differences by nationality, revealing even more complex realities than those presented as a single population.

With the quantitative analysis, the importance of mediating factors--how they influence, modify and determine new realities of the populations was identified more clearly.

Finally, it was considered that these populations are encountering the destruction of their environment, culture and reality to which they have to respond urgently and do not necessarily do so with suitable environmental and social mechanisms, because their

responses are to fill gaps immediately, without necessarily complying with their human and indigenous rights, as well as the constitutionally recognized rights of nature.

Everything developed in this document recognized that the life cycle of the indigenous household varies significantly in degree and form in their livelihoods and in the impacts on environmental resources that are generated. It makes a much larger contribution by disaggregating by nationality. In this way, the differences are even more diverse and complex and it was possible to show that, despite having such common elements among these populations, the mediating factors exert different pressures depending on the situation in which society finds itself.

These populations have managed to maintain a certain heterogeneity in their livelihoods over the years without generating major impacts on environmental resources. However, the role played by mediating factors in the new configurations of the dimensions of livelihoods, where financial capital tends to be the one that directs and configures the rest of capital, implies new patterns and accumulation of greater impacts on the economy. natural capital in the future.

The maintenance and conservation of the northern Amazon of Ecuador must be based on an informed re-knowledge of the means of subsistence; The interrelationships that occur between these must recognize that these heterogeneities are becoming hegemonic, based on financial capital and mediated by certain factors that are not necessarily they are improving their living conditions.

It is necessary to recognize that the concepts of resource use and economic dependence, in a livelihood framework, provide the analytical means for an understanding and guidance of how to implement conservation and development initiatives in populations dependent on the forest and its resources.

Everything that has been found in this research shows that there are no simple answers to the new changes in the livelihoods of indigenous populations and the impact on environmental resources. The differences found between these 18 years studied further complicate the possible alternatives for these populations. However, it leaves considerable precedents for the path in which these populations find themselves and against which decisions, especially state decisions, must be immediate and specific. The realities of each of these nationalities, which may seem unique at first, are different as shown by the qualitative study carried out; thus, their conditions have different actors, needs and problems and, therefore, the intervention proposals must be diverse and respond to their genuine situations.

In this way, once these populations have been recognized, interventions can be more effective and respond not only to economic interests, but also allow the exercise of the rights of these populations as humans and as indigenous people, but above all from a comprehensive perspective of situation and action, that responds to superior interests that in this document have been classified as environment, with all the complexities between actions and actors that this contains.

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Annex 1

Tables A.1 (point 1.6) and A.3 (point 5) contain examples of the indicators that make up the variables of the dimensions.

Table A.1 Indicators of the multidimensional index of environmental resources.

TOTAL WEIGHT	100
1) DIMENSION: LAND USE	50
1.1 Type of land tenure	0.9
1.2 Total land (ha)	0.725
1.3 Total land under crops	3.37
1.4 Pastures	3.05
1.5 Coffee	10.13
1.6 Cocoa	13.83
Cocoa cultivation ha	
Between 0.1 and 1/2 ha	0.05
Between 1/2 and 1 ha	0.5
Between 1.1 / 2 and 2 ha	1
Between 2 and 3 ha	2
Between 3 ha onwards	3
How much you harvested in the last 12 months	
Between 0.1 and 1 qq	0.5
Between 1.1 to 3 qq	0.75
Between 3.1 to 10 qq	1
Between 11 to 50 qq	2
More than 51 qq	3.03
1.7 Banana	3
1.8 Other perennials	3
1.9 Cassava	3
1.10 Corn	6
1.11 Other short cycle	3
2) DIMENSION: COLLECTION OF FOREST PRODUCTS	10
3) DIMENSION: HUNTING ACTIVITIES	20
3.1 Hunting frequency	10.5
3.2 How many people in total hunt	4
3.3 How many animals in total did they hunt	5.5
4) DIMENSION: FISHING ACTIVITIES	20
4.1 Fishing at home	7.5
4.2 Fishing frequency	8.75
4.3 How much they caught in total	3.75

Table A.2 Indicators of the multidimensional index of livelihoods

TOTAL WEIGHT	100
1) DIMENSION: FINANCIAL CAPITAL	51.5
1.1 Household goods:	1.21
1.2 Producer goods:	2.2
1.3 Access to money	17.03
1.3.1 Cattle	3
1.3.2 Coffee	2.91
1.3.3 Cocoa	3.31
1.3.4 Sum of corn, banana, yucca, short cycle, other perennial	2.96
1.3.5 Sale of wood	3.01
1.3.6 Sale of collected products	0.10
1.3.7 Sale of hunting products	0.45
1.3.8 Sold fishery products	0.4
1.4 Access to paid work (last 12 months):	25.3
1.4.1 Labor bond family members	5
1.4.2 Type of employment relationship	5.67
1.4.3 Working days	8.04
1.4.4 Income per household	6.59
1.5 Access to compensation:	5.76
2) DIMENSION: NATURAL CAPITAL	19.5
2.1 Communal lands for self-subsistence activities	2
2.2 Home intervened land	7.5
2.3 % Household forest cover:	10
2.4 Community participates in the Socio-forest	1
3) HUMAN CAPITAL	21
3.1 Years of schooling of the head of household	6
3.2 How many people in the household are studying	10
3.3 Who works more on the farm	5
4) DIMENSION: SOCIAL CAPITAL	8

Table A.3 Indicators and weighting of the mediating factors

2) MARKET ACCESS	36
2.1 Ways of entering the community from the market	11
2.2 Travel time	10
2.3 Time to the nearest market	15
3) COMMUNITY TRANSPORTATION SERVICES	4.5
4) ACTORS THAT GENERATE EMPLOYMENT	13
5) INSTITUTIONAL PRESENCE IN ENVIRONMENTAL AND AGRO-PRODUCTIVE ISSUES	11
Ecotourism	1
Reforestation	1
Methods for combining forest use with crops or livestock	1
Environmental education	1
Socio-forest	1
Coffee	1
Cocoa	1
Won	1
Other traditional crops	1
Other non-traditional crops	1
Commercialization	1
6) DIRECT CONTACT WITH OIL COMPANIES	29
7) USE OF AGRICULTURAL INPUTS	2