

A Cost-Benefit Analysis of Securing Indigenous Environmental Management in Brazil

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Abstract

The crucial role of indigenous people in managing and preserving forests and, thus, contributing to combat climate change and biodiversity loss, has been receiving attention recently. Many studies showed a positive relation between tenure-secured indigenous forestlands and low deforestation rates in the Amazon region. Nowadays, there are near 1,133,000 km² (113 million hectares) of indigenous lands established in Brazil, equivalent to 14% of the national territory. Most of them are in the Brazilian Amazon region, comprising 24% of this region. After near a decade of decline in annual deforestation rates in the Brazilian Amazon, those rates are rising again. This trend reveals higher pressure on land-use and natural resources exploitation. Such pressures are especially noted by indigenous people in the South of the Amazon State, which seems to become a new frontier for expansion of economic activities in the Amazon region. This paper aims to show that improving indigenous people capacity on forest management and promoting sustainable economic activities in indigenous lands in Brazil are fundamental to the sustainable development of the country. Our investigation is based on review of current environmental and territorial management plans (named PGTAs) implemented by indigenous people after the launching of the National Policy of Territorial and Environmental Management of Brazilian Indigenous Land (PNGATI), in June 2012. A financial and economic cost-benefit analysis for the implementation of the PNGATI is presented to show that costs of forest protection are much lower than costs of forest recovering and benefits derived from sustainable land use are potentially much higher than benefits derived from exploitation of natural resources in a “business-as-usual” scenario.

Key words: Indigenous People, Forest Management, Sustainable Development

1 Introduction

The crucial role of indigenous people in managing and preserving forests and, thus, contributing to combat climate change and biodiversity loss has been recognized. Studies have showed a positive relation between tenure-secured indigenous forestlands and low deforestation rates in the Amazon region (IMAZON, 2015; GRAY et al., 2015; DING et al., 2016). Indigenous people usually live on resource-rich territory that they have protected and preserved for generations. These territories are, thus, targets for both extractive economic activities and to establish biodiversity conservation areas.

In Brazil, protection of indigenous lands has advanced in the last two decades, but there are still a lot of threats coming from (illegal) invaders mainly for logging, fishing and mining activities. Nowadays, there are 435 indigenous lands established in the Brazilian Amazon region (considering just the officially recognized and completely regularized), comprising near 108 million hectares (1,080,000 km²), equivalent to 21% of this region and 13% of the Brazilian national territory (FUNAI, 2012).

Improving indigenous people capacity on forest management and promoting sustainable economic activities in Brazil seems to be relevant to the sustainable development of the country. Environmental preservation of the indigenous lands reverts in benefits for the society and, directly, to the agents that use these benefits the most: agricultural producers and livestock farmers, who depend on good climate and water cycle for productivity.

This is central not only to promote an inclusive and sustainable economic growth as well as the country's resource basis will be much worse-off without protecting indigenous lands and its resources. Furthermore, supporting indigenous lands environmental management is directly related to the achievement of the 15th Sustainable Development Goal (SDG) expressed in the United Nations 2030 Agenda for Sustainable Development.

Therefore, a potential source of benefits deriving from indigenous forestlands maintenance – and conservation units in general – are positive externalities generated by preservation of forests, which can be measured by tons of avoided emissions of greenhouse gas (GHG) and, consequently, estimated in carbon credit market prices. Other goods and services provided by indigenous lands are not easily negotiated in the markets, or there are no markets for them, what makes it difficult to evaluate them (but not impossible).

In the Amazon region, particularly, the trade-off between development and preservation is a land-use change issue. Alternative uses of land constitute mainly in conversion of forests for agriculture and pasture. Other relevant uses include hydro-electric energy generation,

mining, road building, urban settlements etc. Frequently, conversion results in degradation and abandoning of the cleared area. One of the main concerns regarding loss of forests is loss of biodiversity. However, returns of investment in biodiversity prospection activities are not easily obtained nor foreseen. Still, the preservation of biodiversity is seen as a way to keep a future portfolio of assets (IGLIORI, 2006).

In such a context, a question arises: what is the most valuable asset? The standing forest, the biodiversity, pasture, wood? Amongst multiple uses and benefits from the forest, how to take a decision on how and when to use or preserve? Furthermore, for indigenous people one more challenge arises: besides advancements in land tenure and property rights in the last decades, economic development of their societies depend on their ability to manage and use natural resources in a sustainable way, and with greater autonomy (MACEDO, 2011).

2 Costs and Benefits Analysis of the Indigenous Lands

A traditional cost-benefit analysis (CBA) compares costs and benefits associated to different components and consequences resulting from policies, plans, programs or projects. Both costs and benefits are estimated in monetary values. A CBA aims to evaluate if a project, program, plan or policy is feasible from an entrepreneur point of view (financial feasibility) and if is desirable from the society perspective as a whole. In the realm of this study, in order to assess “what is most valuable” (forests, cattle pasture, biodiversity etc.) we propose an Economical and Financial CBA on indigenous lands management, protection, conservation and sustainable use. The economic analysis includes costs and benefits derived from externalities (positive or negative), while the financial analysis includes expenses and revenues at market prices (HANLEY e SPASH, 1993; MOTTA, 1998; KETTUNEN e BRINK, 2013).

There is no single definition on how to conduct an Economical-Financial CBA. Hanley and Spash (1993) propose a basic structure comprised of eight steps: (i) definition of what will be submitted to the analysis; (ii) identification of economical and financial impacts; (iii) identify economically relevant impacts; (iv) determining the physical amounts of cost and benefit flows; (v) monetary valuation of relevant impacts; (vi) discounting of cost and benefit flows; (vii) applying the net present value test; and (viii) conducting a sensitivity analysis.

2.1. Benefits of the Indigenous Lands

How to estimate benefits from indigenous lands ecosystem services? Young (2015) considers that there is a direct relation between environmental management activities and the benefits provided by conservation units. Therefore, proposes a guide on benefit assessment: (1) avoided GHG emissions by (a) forest degradation and deforestation, (b) forest recovery, and (c) removal of cattle production; (2) avoided soil erosion; (3) maintenance of water resources and quality; (4) maintenance of biodiversity; (5) public use; (6) public image; (7) scientific research; (8) environmental education; and (9) overall impact on the local economy.

It is worth noting that although indigenous lands (ILs) are not conservation units, both are categories of protected areas (indigenous lands may be considered a special form of protected area) and relevant to environmental preservation strategies. They are two different instruments of policy and should not be confused, even though they both generate environmental positive externalities, especially in the Amazon region (BARRETO FILHO, 2014).

Therefore, reviewing the benefits proposed by Young (2015) it is possible to consider numbers 1, 2, 3 and 4 as totally adequate to ILs. Benefits number 5 and 6 do not apply, and benefits 7 and 8 eventually occur but are not that relevant for quantification of impacts. The last benefit, 9, can be applied to the monetary value invested in IL management and maintenance. Furthermore, this benefit may have a magnifying impact of 1.3 to 1.5 times the amount invested.

On the other hand, in a study aiming at designing a national policy for payment for environmental services (PES), Young (2016) has identified the following main potential benefits: (i) avoided GHG emission; (ii) avoided soil erosion; (iii) maintenance of biodiversity in priority areas. Complementarily, assuming that all protected areas provide a variety of current and future benefits for human well-being and are fundamental to the planet survival, Dudley, Stolton e Kettunen (2013, p. 11-32) propose a two level distinction of ecosystem services: (i) supporting services (as in Figure 1), i.e., services necessary for the production of all other ecosystem services (ecosystem processes, lifecycle and biodiversity maintenance) and (ii) a wider range of ecosystem services: provisioning, regulating and cultural services (as in Figure 2).

Figure 1 – Ecosystem Services for Life Support

Supporting Services		
Ecosystem process maintenance , such as soil formation and nutrient cycle	Lifecycle maintenance , such as nursery habitats and seed dispersal	Biodiversity Maintenance , such as species and genetics

Fonte: Dudley, Stolton e Kettunen (2013, p. 15), elaboração própria

Figure 2 – Ecosystem Services and Goods

Provisioning Services	Regulating Services	Cultural Services
Food provisioning	Climate regulation	Recreation and Tourism
Water provisioning	Natural Hazards	Aesthetic Values
Raw materials	Purification of water, soil and air	Arts and Science Inspiration
Medicinal resources	Water flow regulation	Education and Research
Ornamental resources	erosion and soil fertility	Spiritual and Religious
Genetic resources		Cultural identification
		Mental and Physical wellbeing

Fonte: Dudley, Stolton e Kettunen (2013, p. 15), elaboração própria

The next items show main benefits selected as relevant to the current CBA. It is worth noting that there are huge methodological limitations to provide accurate monetary values to most of these benefits. However, it is still a task worth taking to illustrate alternative strategies and possibilities of environmental valuation.

2.1.1 Avoided Emissions of Greenhouse Gases (GHG)

Most emissions of Greenhouse Gases (GHG) in Brazil are explained by land-use change, especially in the Amazon. Nowadays, land-use change is responsible for 40% of the total gross emissions in the country (and 19% of the net emissions), followed by energy and agricultural/pasture. Emissions of GHG in Brazil have raised from 2.1 billion tCO₂eq, in 2015, to 2.3 tCO₂eq, in 2016, an increase of 8.9% - the highest rise since 2004 and the highest amount since 2008 (AZEVEDO, 2016; Observatório do Clima, 2017). It is estimated that the almost 400 indigenous lands and near 100 conservation units in the Brazilian Amazon region preserve a stock of 16.5 billion tCO₂eq, equivalent to 34% of the total carbon stock in the Amazon. If

these lands cease to be protected, we could admit, *grosso modo*, that near 5 billion tCO₂eq would be released to the atmosphere until 2050 (NERY et al., 2013).

Therefore, avoided emissions from deforestation are a good measure for the benefits of the (standing) indigenous forestlands. Young (2017) proposes that the amount of avoided emissions is a function of: (i) size of the area; and (ii) opportunity cost. In the Amazon region, opportunity cost tends to be lower than in other regions in the country. However, the forest region has a high density of carbon per hectare. Therefore, preservation of forests may be induced at a lower cost of tCO₂eq (YOUNG, 2017, Appendix B, p. 181). Furthermore, a policy of payment for environmental services (PES) in Brazil have the potential to avoid emissions in 17 million hectares at the price of R\$ 403,00/ha/year (US\$ 122,00), resulting in avoiding the emission of almost 5 billion tCO₂eq between 2016 and 2030, in the Amazon and Cerrado regions (YOUNG, 2017, p. 28).

Alternatively, “the economic value of carbon storage resulting from avoided deforestation could be estimated by multiplying the annual carbon-stock values by an estimate of the so called “Social Cost of Carbon (SCC), which internalizes global externalities caused by CO₂ emissions”, as explained by Ding et al. (2016, p. 37). The SCC is calculated based on a global damage function and can be interpreted as “the value of avoided climate damages at the margin”, or the “benefit to society associated with one tone CO₂ emission reduction”. The US Government’s last estimate of the global social cost of carbon is US\$ 41.00/tCO₂. Relating this value with the estimate forest cover in the Amazon biome, Ding et al. (2016, p. 38) estimated the carbon storage benefits from avoided deforestation on indigenous forestlands in US\$ 14.00/ha/year (R\$ 46.20/ha/year).

2.1.2 Avoided Soil Erosion

An estimate of soil erosion level was obtained for the five Brazilian different biomes by Young (2016) through the Universal Soil Loss Equation (USLE). It resulted in 8.7 ton/ha/year of soil erosion in Brazil, in average. This number is relevant for the potential erodibility of the soil, a criterion for definition of priority areas to be benefited from avoided soil erosion. The economic value of the soil erosion could be estimated in terms of avoided costs for water treatment or avoided costs of recover from landslide natural disasters, for instance. However, in the Amazon, the intense forest cover reduces erosion impact. Furthermore, it is a more significant criterion under urban areas, or near urban areas. Therefore, avoided soil erosion will

not be chosen as a potential benefit of the indigenous lands in the current analysis (YOUNG, 2017, p. 43-44).

2.1.3 Conservation of Biodiversity

Environmental goods and services can be valued by measuring individual preferences for preservation (non-use values) or use (use-values). Non-use values refer to the intrinsic value, or existence value of the resource. Use-values include direct use (extractive resource use) and option values, which are goods or services of potential value that are held in reserve for future consumption. The total economic value is the sum of use and non-use values of the good or service (NOGUEIRA e MEDEIROS, 1999).

For some authors, existence value may be compared to available goods in the market for an estimate of value, even if the substitution among market and non-market good is weak, or not entirely possible. To others, it is impossible to give nature a monetary value. This is a controversial issue, and valuation of environmental goods and services are subjected to methodological limitations and lack of consensus. However, this is a relevant question for the Amazon forest region, which concentrates 40% of high biological importance area for conservation, and 36% of very high, according to the Convention on Biological Diversity (CBD) definitions (MMA, 2007).

Cost-Benefit Analysis to assess securing indigenous forestland tenure in the Amazon basin has estimated ecosystem services, but not biodiversity conservation *per se*. In general, extractive uses are easily quantified; however, benefits deriving from non-use value are not properly estimated yet (GRAY et al., 2015; DING et al., 2016). Even though, Ding et al. estimate approximated values for ecosystem services benefits based on studies of van Beukering (2015), in US dollars, at 2015 price level (DING et al., 2016, p. 39):

- i) hydrological services: US\$ 287,00/hectare/ano (R\$ 947,00/ha/ano);
- ii) nutrient retention: US\$ 150,00/hectare/ano (R\$ 495,00/ha/ano);
- iii) regulation of local climate and water cycling: US\$ 373,00/hectare/ano (R\$ 947,00/ha/ano);
- iv) polination: US\$ 45,00/hectare/ano (R\$ 148,50/ha/ano);
- v) existence value: US\$ 15,00/hectare/ano (R\$ 49,50/ha/ano);
- vi) recreation and tourism: US\$ 5,00/hectare/ano (R\$ 16,50/ha/ano).

2.1.4 Social Benefits

Besides environmental benefits, other categories of benefits include social benefits and collective-action benefits, as proposed by Ostrom (1990), meaning that collective problems need to be addressed by the community “to change the rules of the game that constrains them”. Ostrom has studied the governance of common pool resources (CPR), which have both public and private goods characteristics: like public goods, it is difficult to exclude users and, like private goods, a resource extracted by an agent reduces the availability of the resource to others. As a result, CPRs tend to be treated as free-access resources (and not collective resources). Therefore, securing indigenous lands result in economic benefits deriving from (i) reduced conflict; (ii) reducing transaction costs; and (iii) enhance resource management (DING et al, 2016, p. 30). In this view, local economy is also benefited by purchases and income related to indigenous land management, as proposed by Young (2015), and can be considered a social benefit.

2.2 Costs of the Indigenous Lands

Costs to maintain and manage indigenous lands may be very similar to those necessary to manage conservation units and protected areas. Two categories of costs may compose a strategy for environmental conservation: (1) forest restoration costs; and (2) opportunity costs (YOUNG, 2016, p. 179-180). Ding et al. (2016) present the following costs for establishing and maintaining tenure of indigenous lands: (1) tenure-security establishment costs; (2) indigenous lands establishment; (3) indigenous-land management, operating and monitoring costs; and (4) opportunity costs (foregone income from alternative land-use such as agriculture or cattle pastures).

Regarding these costs, it is observed that tenure-security and establishment costs are already spent in Brazil, where indigenous lands recognition and demarcation have advanced a lot in the last decades. For the purpose of the current cost-benefit analysis, the third category is relevant (management, operating and monitoring). These costs were estimated by a joint study from The Nature Conservancy (TNC), the indigenous agency (FUNAI), and the Ministry of the Environment (MMA), in 2013, to estimate costs of implementation of the National Policy for Terrestrial and Environmental Management of Indigenous Lands - PNGATI (TNC/FUNAI/MMA, 2013).

Therefore, three categories of costs were selected for the current CBA: (1) forest restoration costs; (2) opportunity costs; and (3) PNGATI implementation costs.

2.2.1 Forest Restoration Costs

Young (2016) has estimated costs of forest recovery for each Brazilian biome (Amazon, Cerrado, Caatinga, Mata Atlantica, Pampas e Pantanal) and, considering prices for fencing, supplies and labor, has reached the median value of R\$ 7.466,00/ha/year (US\$ 2,490.00/ha/year). This amount could be even higher if considered transport and management costs and, in the case of Amazon, native seeds (YOUNG, 2016, p. 16).

2.2.2 Opportunity Costs

In the Amazon biome, Brazilian law (Forest Code, 2012) imposes a limit of land-use of just 20% of the private forestland areas. Therefore, just 21 million hectares out of the 108 million ha of the regularized and recognized indigenous lands would be available for alternative uses such as agriculture and cattle pasture. Furthermore, it is no reasonable to suppose that all 20% of disposable area would be really used. Main vectors of deforestation in the Amazon are Soya Beans and Cattle Pasture, followed by logging and other agricultures crops (RODRIGUES et alli, 2017).

Opportunity costs were estimated by Young (2016) through three different methodologies: (i) presumed profit from agricultural and pasture activities (as estimated by the Brazilian Institute of Geography and Statistic – IBGE); (ii) local land market price (in the municipalities level); and (iii) econometric modelling of land prices as of physical and market characteristics. The medium value found amongst the three models was R\$ 403,00/ha/ano (US\$ 122,00).

2.2.3 Costs of Implementation of the PNGATI

The National Policy for Environmental and Terrestrial Management in the Indigenous Lands (PNGATI) is a comprehensive policy established on June 2012 by the Federal Government Decree n. 7747, aiming at “secure and promote protection, restoration, conservation and sustainable use of indigenous lands natural resources”. To achieve this objective, PNGATI presents 52 goals divided into seven dimensions of environmental management: (i) territorial protection; (ii) governance and participation; (iii) linking between protected areas and indigenous lands; (iv) prevention of environmental damages; (v) sustainable use of natural resources and production; (vi) intellectual property protection; and (vii) capacity-building (BRAZIL, 2012).

One of the main tools in this policy is the design of Territorial and Environmental Management Plans for Indigenous Lands (PNGATs), to be developed by indigenous people according to the principle of ethno development. This concept arises in South America in the 1970's decade and proposes “development of ethnic groups inside wider societies”, respecting cultural particularities of the smaller ethnic groups (STAVENHAGEN, 1985 e BATALLA, 1985, *apud* VERDUM, 2006, pp. 71-79).

In 2013, a joint study conducted by The Nature Conservancy (TNC), the indigenous Brazilian federal agency (FUNAI), and the Ministry of the Environment (MMA) reviewed PNGATI's 47 objectives and divided them into 8 categories of management related to the 7 above mentioned dimensions of the PNGATI. Costs were estimated to cover all 8 management categories within 37 indigenous lands groups comprising 514 different indigenous lands, 132 demarcation studies and 12 ethno-environmental protection fronts (which are governmental task-forces equipped to protect access to isolated indigenous groups). Besides, other necessary management costs were added: (i) specific costs for defense of isolated indigenous groups; (ii) general costs for indigenous conferences and FUNAI's surveillance activities; (iii) new ethno-environmental protection fronts; and (iv) new indigenous lands regularization and demarcation.

The following Tables 1 and 2 show costs of implementation of PNGATI, estimated in a total annual amount of R\$ 471,963,860.00, at 2013 price levels (near US\$ 142,000,000 at rate of exchange US\$ 1.00 = R\$ 3.30). It is worth noting that 50% of the budget refers to the first dimension of PNGATI, which is “territorial and natural resources protection” and includes costs for demarcation, monitoring and surveillance of indigenous lands. Other 25% of the budget costs concentrate in the 5th dimension, which is “to promote sustainable production activities”.

The financial study has also shown federal government public resources allocated from 2002 to 2011, thus giving a baseline for 10 years of PNGATI's implementation.

It was reported that, during the period of 2002 to 2011, budget raised continuously in the various federal governmental programs related to indigenous groups (environment, health, education etc.). The average value reached R\$ 862 million (US\$ 261 million), mainly divided into health and food security program (R\$ 380 million, near US\$ 115 million); and management costing (R\$ 347 million, near US\$ 105 million). Therefore, R\$ 135 million out of R\$ 862 million are already applied into PNGATI categories. To totally implement the policy it would be necessary an additional amount of R\$ 336 annual million (US\$ 102 million).

Table 1 – PNGATI Annual Costs of Implementation

PNGATI Dimension	Categories	R\$ Annual		%	US\$ Annual
1 - Natural Resources and Territorial Protection	Environmental Monitoring and Surveillance	106.638.348,00	242.169.010,00	51%	73.384.548,48
	Indigenous Lands Demarcation	89.191.630,00			
	Future Indig. Lands	41.495.392,00			
	Protection of Isolated Indigenous Groups	4.843.640,00			
5 - Sustainable Use	Sustainable Use and Income Generation	116.927.450,00	116.927.450,00	25%	35.432.560,61
2 - Governance	Management Infra-Structure	43.874.580,00	65.806.950,00	14%	19.941.500,00
	Territorial Planning	13.367.070,00			
	Governance	2.488.800,00			
	Conferences and Joint Surveillance	6.076.500,00			
4 - Environmental Damage	Environmental Damage Recovering	43.179.305,00	43.179.305,00	9%	13.084.637,88
7 - Capacity-Building	Indigenous Capacity-Building	2.960.000,00	2.960.000,00	1%	896.969,70
Total			471.042.715,00	100%	142.740.216,67

Source: TNC/FUNAI/MMA (2013), elaborated by authors

Table 2 – PNGATI Additional Costs of Implementation

Other Management Costs	R\$ (annual)	US\$ (annual)
Protection of Isolated Indigenous Groups	4.843.640,00	1.467.769,70
Indigenous Conferences and Surveillance Activities	6.076.500,00	1.841.363,64
New Ethno-Environmental Protection Fronts	921.145,00	279.134,85
New Indigenous Lands Demarcation	41.495.392,00	12.574.361,21
Total de Outros Custos	53.336.677,00	16.162.629,39

Source: TNC/FUNAI/MMA (2013), elaborated by authors

2.3 Cost-Benefit Analysis

According to the guide suggested by Hanley and Spash (1993), the action to be assessed in the current CBA is defined as “secure protection, conservation and sustainable use of the indigenous lands in the Brazilian Amazon for a ten-year period”. Impacts were defined according to the benefits and costs assumptions, as well as their monetary values. Therefore, 4 different cost-benefit flows were designed and submitted to the net present value test, and a discounting rate of 6% was applied. Internal discount rate was equals to zero, because the investment made so far in the recognition and demarcation of indigenous land was not considered. It is worth noting that the size of the area considered was 20% of the 108 million hectares of indigenous land, therefore, an area of 21 million hectares (remembering that Brazilian Forest Code allows just 20% of private land-use in the Amazon forest biome).

Four estimates were done considering the same PNGATI implementation costs. Benefits were different in each simulation, with the following values:

(i) GHG’s avoided emissions benefits: R\$ 403,00/ha/year x 21 million ha = R\$ 555.7 million (US\$ 169 million/year);

(ii) forest recovery benefits: R\$ 7,466.00/ha/year x 1,5 million ha = R\$ 11,199 million (US\$ 3,394 million/year), assuming that both deforestation and recovery occurs continuously during a period of ten years, and not all at once;

(iii) carbon storage benefits: R\$ 46.20/ha/year x 21 million ha = R\$ 1,000 million (US\$ 303 million/year); and

(iv) ecosystem services benefits.

Table 3 – Indigenous Land's Conservation Annual Costs (US\$ million)

COSTS	Annual
	US\$ million
PNGATI Cost	142,73
Other Management Cost	3,58
Investment	9,52
Future IL Establishment	12,58
TOTAL	168,39

Source: elaborated by authors

Results from the four cost-benefit flows and net present value are shown below.

Table 4 – Indigenous Land's Benefit-Cost Analysis Result (US\$ million)

Analysis (US\$ million)	Avoided Emissions (at opportunity costs of land-use change)	Avoided Forest Recovery	Avoided Emissions (at Social Costs of Carbon)	Ecosystem Services Maintenance
Costs	1.683,94	1.683,94	1.683,94	1.683,94
Benefits	1.831,82	33.936,36	3.030,30	132.839,39
Benefits less Costs	147,88	32.252,42	1.346,36	131.155,45
Net Present Value	108,84	23.737,88	990,91	96.531,52
Benefit/Cost	1,09	20,15	1,80	78,89

Source: elaborated by authors

It is directly possible to conclude that any of the four conservation alternatives are feasible according to the Net Present Value test (all positive values) and benefit/cost rate higher than one. As expected, benefit/cost value in terms of ecosystem services maintenance is the highest one; however, this value must be carefully taken because there is no consensus to date in the literature regarding methodology for ecosystem services valuation.

The second highest value is a quantifiable value which reflects market prices for recovering forest costs in terms of fencing, supplies and labor. It is an impressive value, meaning that it is 20 times more cost-efficient to preserve than to recover degraded forest areas.

The other two alternative benefits, (i) reduced emission from degradation and deforestation (REDD), at foregone opportunity costs, and (ii) carbon storage at social carbon costs, are very similar and reflect values that could be financed under a Payment for Environmental Services (PES) scheme.

3 Linkages Between Sustainable Development Goals and Indigenous Policies

According to Leese and Meisch (2015), the underlying ideas of many environmental issues addressed by environmental policies are actually caused by unintended external effects of other policies that misjudge interaction with the natural system. This idea has been debated since the Limits to Growth Report (1972). In order to address this problem, one option is to develop a cross-sectoral policy integration analysis. In this context, the Nexus Methodology could be a tool for the analysis of national policy setups.

Nexus approach could help to highlight the links between the problems and policies proposed to combat them in different sectors. This is so because “insufficient understanding and accounting of trade-offs and synergies across sectors have resulted in incoherent policies, adverse impacts of development policies focused on specific sectors on other sectors and, ultimately, and in diverging outcomes and trends across broad objectives for sustainable development”. In this sense the goals and targets proposed by the SDGs can be seen as a network, with links among goals through the targets (LEBLANC, 2015).

Based upon Nexus Methodology as detailed by KLINGBERG (2016), the following matrix (Figure 3) was designed to develop the analysis of SDG n. 15, and its linkages with both other environmental related SDGs and the PNGATI dimensions.

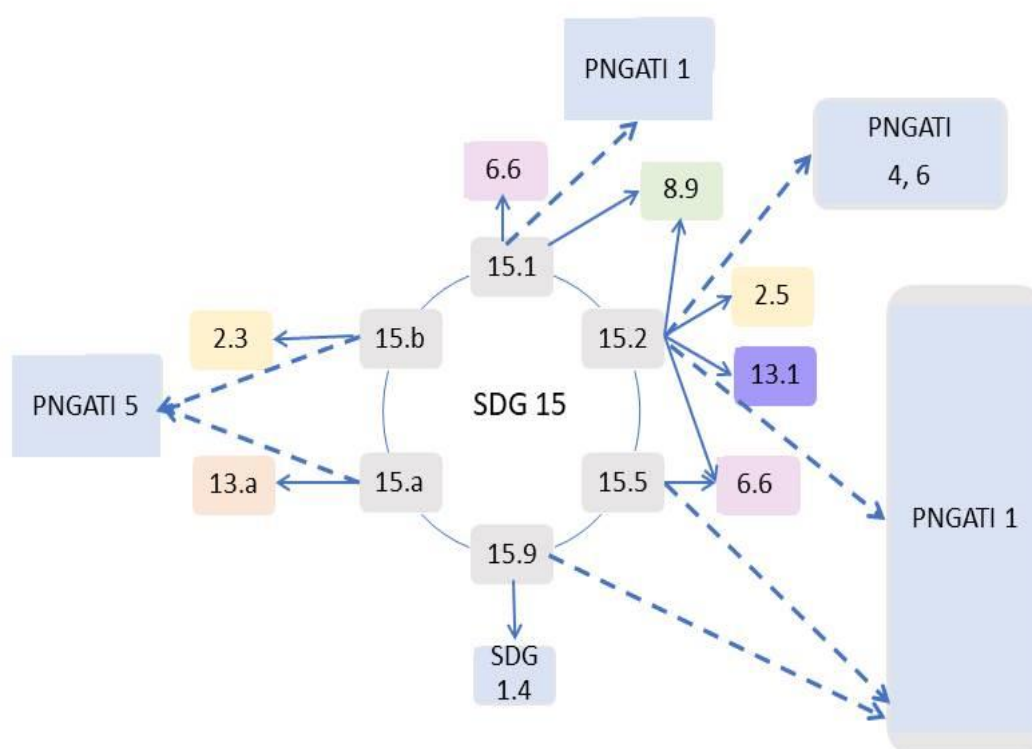
To show how the analysis was done, take for instance SDG 15, target 15.2: By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystem and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements. First, considering that most Brazilian Indigenous Lands are located in the Amazon region, thus, inside tropical forests ecosystems, it can be seen that the target above is related to the entire PNGATI’s dimension n.1, related to territorial and natural [forest] resources protection.

Second, it can be observed that dimension one includes nine objectives, one of them to protect and restore river sources and water courses of relevance for indigenous lands. Therefore, not only target 15.1 is related to 6.6 as well as PNGATI dimension 1 relates to both targets, noticing that target 6.6 intends to, by 2020, protect and restore water-related ecosystems, including mountains, forests, rivers, aquifers and lakes.

Proceeding with this kind of analysis it is possible to see the relations included in the matrix and, therefore, to propose actions for joint monitoring of the targets pursued under these policies, seeking to find synergies and possible threats as well (Figure 3).

Although SDGs numbers 2, 13 and 15 are the ones specially related to the environmental dimension of the sustainable development concept, it became clear that other SDGs are also relevant to this dimension. In the “Agenda 2030 Monitoring Plan” proposed by the Brazilian National Commission on SDGs, one of the programs developed by the Ministry of the Environment (MMA) - the program n. 2078 named “Biodiversity Conservation and Sustainable Use” - comprises targets mentioned under SDGs numbers 1, 2, 8, 10, 12, 13, 15 and 17. This reinforces the idea that actions needed to achieve environmental sustainability are really broad and have to be continually called for attention under other related development strategies.

Figure 3 - Linkages Between SDG Targets and PNGATI Dimensions



Source: author's elaboration

Regarding PNGATI, the analysis of SDGs 2, 13 and 15, and its linkages with both other environmental related SDGs and the PNGATI dimensions have shown that if all other Brazilian policies' objectives (and SDG related ones) would be achieved, PNGATI goals would benefit from and would be easier achieved. For instance, illegal activities are major threats to indigenous lands, therefore, law enforcement would only benefit them. Also, if the National System of Conservation Units (SNUC), the Forest Code, and related laws were truly enforced there would be fewer conflicts among indigenous, small farmers and traditional people living in adjacent areas regarding land-use and rights.

On the other hand, if this would be the only reason why indigenous rights have being threatened, the problems were easily solved. Therefore, the nexus analysis also shows that most Brazilian laws, especially the environmental ones, although well designed are not sufficient to tackle land-use conflicts. This is probably so because excessive emphasis has being traditionally given to command-and-control tools. Economic tools may be added to current efforts to ensure long-term sustainability of indigenous lands.

This is precisely what is missing under SDG n. 8, which aims to “promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all”. Targets and strategies designed under this goal cannot be applied to indigenous people, because they are not “employees” as in non-indigenous society. Their livelihood strategies have to include strengthening value for production chains of the extractive and hand-made products, so called “social-biodiversity products” in the Brazilian experience, i.e., products that bring additional benefits due both to its community-based origin as well as to biodiversity protection (ISA, 2017).

It is also worth noting that most PNGATI objectives are well fitted into the four-year planning (PPA 2016-2019) of the National Agency for Indigenous Affairs – FUNAI, and also FUNAI’s PPA would fit almost entirely into the Agenda 2030 Brazilian Monitoring Plan under numbers 2 and 155. However, only a small part of FUNAI’s targets were mentioned in the SDGs n. 15 and 16 Monitoring Plan. It means that if FUNAI’s planning will be successfully implemented not only PNGATI objectives will be achieved, but also SDG Agenda in Brazil will be strengthened by FUNAI’s contribution.

4 Conclusions

It is largely recognized that the regularization and demarcation of indigenous lands alone is not enough to guarantee their long-term conservation. Numerous conflicts still arise as result from illegal logging, fishing and mining activities. Also, there are legal activities competing for land-use, deriving from the economic expansion, especially in the Brazilian Amazon region (FUNAI, 2016 p. 14).

Nonetheless, cost-benefit analysis shows that benefits from conservation and sustainable use are much more cost-efficient than any other, from the society perspective. However, from the private perspective, business-as-usual activities in the Amazon are still worth taking, because entrepreneurs do not internalize environmental impacts. Usual economic

activities will end-up destroying natural capital and, at the limit, put at risk its own business, due to diminishing environmental quality (besides eliminating future-option value for the nature).

Therefore, payment for environmental services is a feasible and justifiable public policy to be put in place in Brazil. Other alternative policy is supporting the so called “social-bio diverse products”, which are products obtained by indigenous and traditional people in a sustainable manner, using their traditional knowledge. To recognize the aggregated value of social and environmental benefits of these products is also a feasible alternative to contribute to a long-term sustainability strategy of the indigenous people

Regarding SDGs, a significant contribution from Brazil experience would be to add to the 8th goal (“sustainable, sustained and inclusive development”) targets related to income generation beyond formal job market and more adequate to indigenous people livelihoods.

Management of public policies is, nevertheless, a complex matter. Policies’ monitoring and implementation requires a favorable political and institutional environment. It is not enough that public policies include in their discourse the concept of sustainable development, as included in Brazilian environmental policies. Environmental degradation has been deepening in the last three decades in despite of legal and institutional advancements. Part of this may be attributed to a persistent lack of coordination among governmental sectors and its hierarchical levels especially regarding environmental policies (MOURA e BEZERRA, 2016, p. 106).

It should also be noted that environmental policies face numerous resistance to its implementation because they are frequently seen as obstacles to economic activities. Lack of coordination is a usual justification for failures in public policies implementation (CASTRO e YOUNG, 2017). It is necessary to go beyond the sustainable development discourse and overcome lack of coordination. Nowadays, policies designed in the 60’s favor intensive land-use and coexist with policies implemented in the 90’s to avoid deforestation (ALVES, 2016).

As a result, a development strategy for indigenous people in Brazil can not depend on single approaches. In the words of Ostrom (1994), “neither market, nor state: governance of common-pool resources requires a match of institutions to the physical, biological, and cultural environments in which they are located that will enable institutions (and the resources to which they relate) to survive into the twenty-first century”.

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