

How far are the Brazilian Amazon cities to achieve SDGs? An analysis based on SDGs and Social Progress Index indicators

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Introduction

The Brazilian Amazon is one of the world's richest regions in biodiversity, water, minerals and other natural resources. However, it is also the region with the worst socioeconomic indices in Brazil for its more than 24 million inhabitants in 772 municipalities (IBGE, 2016). Until recently, the Amazon's social performance was assessed only by indexes which are themselves highly influenced by economic indicators, such as Gross Domestic Product (GDP). From the concept of sustainable development, measuring the progress of societies based only on GDP is questionable. The idea of creating global goals based on indicators came from the Governments of Colombia and Guatemala and became official at the Conference Rio +20 (Haffeld, 2013; Hák *et al.*, 2016). Preceded by the establishment of the Millennium Development Goals, the Sustainable Development Goals (SDGs) are a indicators-based approach under-pinned by the major global assessment of progress towards countries' (Sachs, 2012). The SDGs comprise 17 goals (Figure 1) and 169 targets (UN 2016). Today the world is discussing how to implement the Sustainable Development Goals (SDGs) as a guide and measurement of the socioeconomic and environmental conditions in both rich and poor regions, such as the Brazilian Amazon region.

The [Social Progress Index](#) (SPI) is the first comprehensive model for measuring social progress that does not depend on GDP but rather complements it (Potter *et al.*, 2015). For the Brazilian Amazon (SPI Amazonia), it allows to measure the social welfare regardless of the country's economic development and uses indicators which better represent the reality of the region (SPI, 2014).

Thus, this study aims to i) verify which of the municipalities in the Amazon are closer to achieving the Sustainable Development Goals, based on the SPI Amazonia indicators; and ii) identify in which issues are the main challenges to achieve the SDGs in order to support valuable and useful suggestions for each municipality.



Figure 1. The 17 Sustainable Development Goals. *Source: UN 2016*

Methodology

In order to accomplish the objectives mentioned above, we first identified the indicators that are similar to both indexes (SPI and SDGs). As the SDGs' indicators are still being discussed, we used the 76 official SDG indicators selected on the [SDG Index](#) report (Sachs et al 2016) for Brazil. This index has fewer indicators than the preliminary pool of indicators (177) set to Brazil by United Nations Statistics Division (UNSTAT), but still is a more complete index when compared to the 47 indicators from SPI. For this reason and because SPI does not use economic indicators, not all SDGs are covered by SPI. From the total 17 SDGs, the SPI has similar indicators with 13 SDGs. The SDGs that were not covered by the SPI were 1 (No Poverty), 7 (Affordable and Clean Energy), 13 (Climate Action) and 17 (Partnerships for the goals). Four SPI indicators were related to more than one SDG each, which is the case of water supply (SDG 6 and 11), mortality from respiratory diseases (SDG 3 and 11) and protected areas (SDGs 14 and 15) (Annex 1). The SPI indicators organize the municipalities in three levels of social progress (green – good result; yellow – neutral; or red - weak); we gave different weights for each, so the municipality with higher score is the one with more green and less red indicators. We used the Linear Regression in Past Program to make comparisons between our indicators themselves and others, such as GDP.

Results and Discussion

In general, the municipalities scores ranged from 1.55 to 2.40 between the Amazon municipalities (Figure 2). From the 772 Amazon municipalities, Boa Vista (RR) and Palmas (TO) are the closest to achieve SDGs as a whole. These two main towns received 2,4043 points in a total of 3,0000. In comparison to the 10 highest scores cities, Boa Vista distinguished itself on the SDG 2 (end hunger) while Palmas had good results on the SDG 4 (quality education) when compared to the other municipalities. The main challenge for the

top 10 municipalities is related to the SDG 16, which means “peace, justice and strong institutions” (Figure 3).

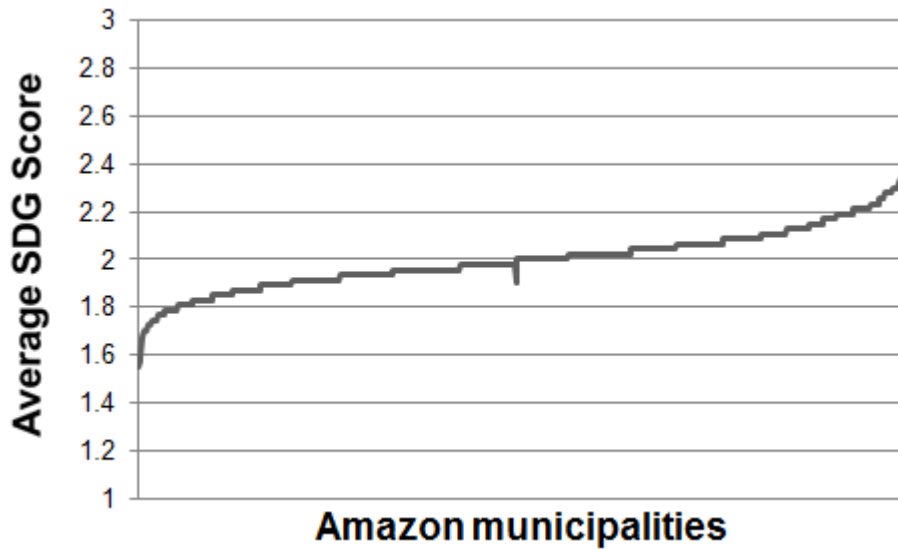


Figure 2. Average performance range for the SDGs score for the Amazon municipalities.



Figure 3. Scores for each SDGs from the 10 first municipalities, based on SPI indicators (1-Boa Vista, 2-Palmas, 3-Lucas do Rio Verde, 4-Gurupi, 5-Paraíso do Tocantins, 6-Manaus, 7-Santa Inês, 8-Pedro Afonso, 9-Sinop, 10-Porto Nacional) .

Regarding the municipalities with the 10 worst SPI scores (Figure 4), Brejo de Areia (MA), Campinápolis (MT) and Amajari (RR) are the farthest to achieve the SDGs according to SPI indicators. For Campinápolis, its main challenge is at the SDG 2 (Zero hunger) while for Brejo de Areia and Amajari is at SDG 5 (Gender Equality) and 16 (Peace, Justice and Strong Institutions). These two SDGs are correlated with the SPI dimension 3: Is there

opportunity for all individuals to reach their full potential? This is the third level to reach social progress and this is the lowest performing dimension for the whole Amazon, showing an average index score of only 48.33, whereas in the rest of Brazil it is 61.18 (SPI Amazonia 2014).



Figure 4. Scores for each SDGs from the 10 last municipalities, based on SPI indicators (1- Brejo de areia , 2-Campinápolis, 3-Amajari, 4-Recursolândia, 5-Bom Jesus do Araguaia, 6-Cachoeira Grande, 7-Uiramutã, 8-Alto Alegre, 9-Machadinho, 10-Presidente Juscelino).

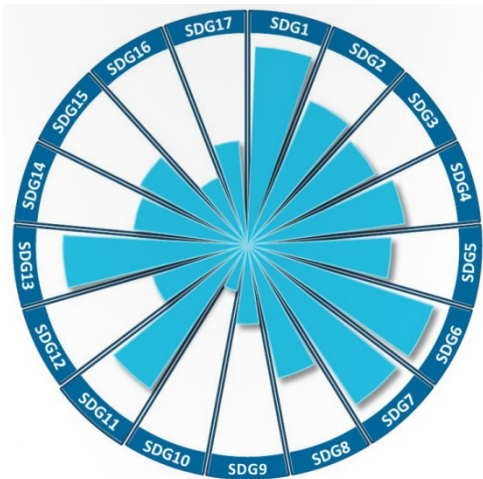
Looking at each SDG, the Brazilian Amazon has presented higher scores on the SDGs 14, 6 and 10 (Figure 5). However, these result does not indicate necessarily that SDGs 14 (Life below water) and 10 (Reduced inequalities) are fully accomplished in Amazon, but can be consequence of the lack of match indicators for both SDGs: they have only one SPI matching indicator. When we compare our results to BR Amazon with the official Brazil's performance by SDG, the more SPI matching indicators, the more similar are the results between Brazil and SPI Amazonia.

The lower scores for both Brazil and Amazon is at SDG 16 (Peace and Justice), related to dimension 3: Opportunities. The SDGs 7 and 9 also presented low scores, but can be influenced by having only one SPI matching indicator. On the other hand, it is important to highlight Brazil and Amazon region performance on the SDG 6 (Clean water and Sanitation), related to SPI Dimension 1 (Basic Human Needs), achieving very good results on providing access to clean water to population.

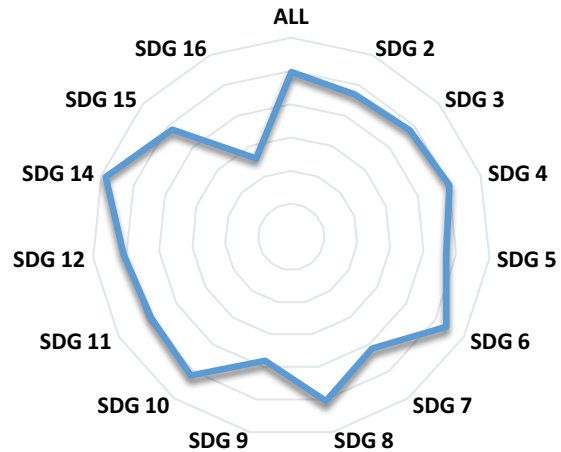
AVERAGE PERFORMANCE BY SDG

Brazil

BR Amazon



Source: *SDG Index & Dashboard-Country Profile (2016)*



Source: *Modified from SPI Amazonia (2014)*

Figure 5. Average performance between SDGs indicators in Brazil and SDGs indicators based on SPI to Brazilian Amazonia.

Comparing SPI x SDG

When we compare SPI and SDG indicators, we can see that the SDGs have a wider range of indicators: 76 indicators comparing to 47 for SPI. Those indicators cover aspects that SPI Amazonia does not, such as income and climate-related indicators (SDG 7) - CO₂ emission, clean energy and climate change vulnerability, for example. Since we believe that addressing climate issues and sustainable consumption are key elements to improve human and ecosystem wellbeing, we suggest that SPI includes climate indicators in the component "Foundations of Wellbeing" over the next reviews. To measure the ecosystem wellbeing, specific indicators for endangered natural resources (fisheries and biodiversity) are covered by SDG 14 and 15. On the other hand, SPI could improve their indicators of deforestation rates and protected areas with more specific indicators for natural resources. Nevertheless, indicators from SPI Amazonia such as violence against woman and indigenous, and racial inequality (not financial inequality) are very consistent with the Brazilian Amazon context and could also be included in the SDGs indicators for Brazil.

SDG x GDP

From our values of SDG, it was possible to observe a trend is that the higher the GDP, the greater the SDG, as can be seen in Figure 6. However, this result although it has significant features is weak due to the large number of exceptions. This result corresponds that even though the cities with the highest GDP have more chances to achieve the SDG, according to SPI, there are municipalities in this region that have high chances of achieving good results even with lower GDP.

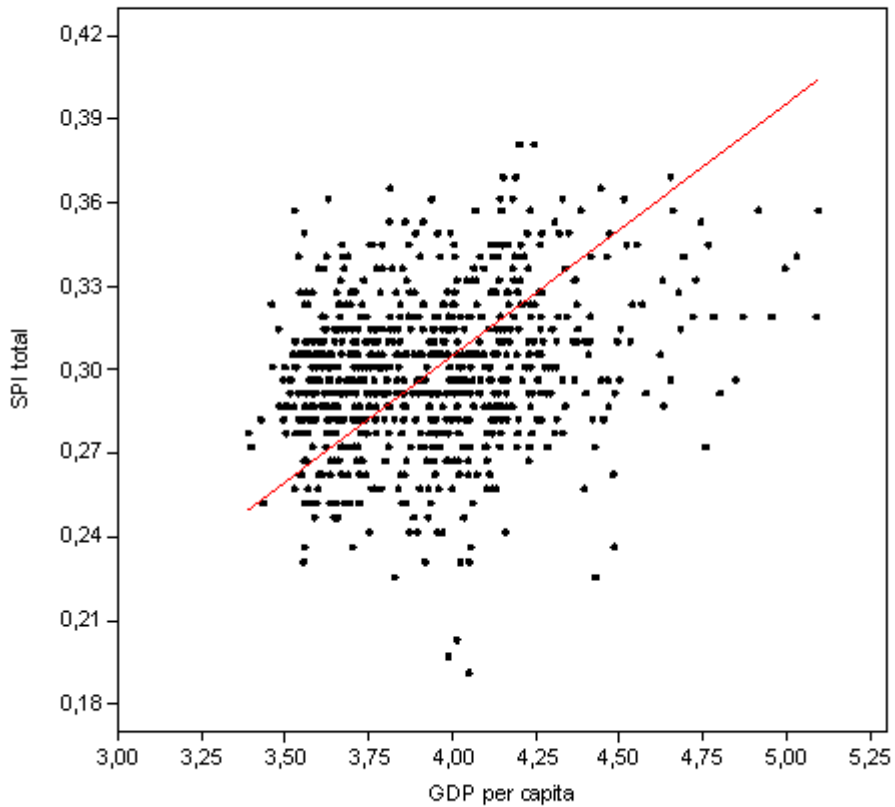


Figure 6. Correlation between calculated SPI and GDP per capita in the municipalities of the Brazilian Amazon. $p=0,001$; $r^2=0,061$.

When we observe the ODS individually, we noticed that most have the same tendency, however, the SDG 3 (Good health and Well-being) becomes an exception, where smaller GDPs have higher rates this SDG (Figure 7).

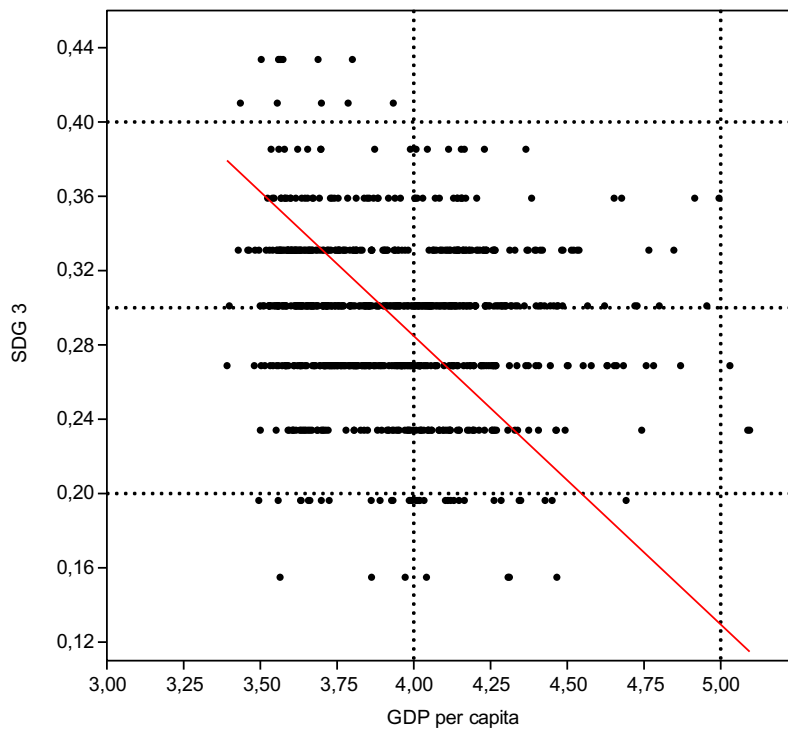


Figure 7. Correlation between SDG 3 calculated based SPI and GDP per capita in the municipalities of the Brazilian Amazon. $p=0,0001$, $r^2=0,023$.

Conclusion

The SDGs and SPI Amazonia are very close to each other in their goal: to measure and monitor human wellbeing. Even though SPI has less indicators than SDG, both are important tools for public policies. When used together they provide a better joint analysis to decision-making process in order to achieve a better social and environmental development.

As expected, Amazon is a multifaceted region with municipalities closer to achieve SDGs and others further. The SPI Amazonia reveals that the region is below the Brazilian average, which is incompatible with the region's environmental importance. In general, the biggest challenge for Amazon municipal government are at the Opportunity dimension more than the dimension 2 (Foundations of Wellbeing) and dimension 1 (Basic Human Needs). It shows that although Amazon has a long way to go, the first two dimension were better accomplished over the last years and they are starting to be ready to accomplish the next one: Opportunity.

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Annex 1. Matching indicators between SPI Amazonia and SDG indicators

| SPI Amazonia | | SDG | |
|----------------------------------|--|---------|--|
| Dimension 1. Basic Human Needs | | | |
| Components | Indicators | Nº | Match Indicator |
| Nutrition and Basic Medical Care | Malnutrition | 2 | Prevalence of stunting, under-5s (%); Prevalence of wasting, under-5s (%) |
| | Mortality from undernourishment | 2 | Prevalence of undernourishment (%) |
| | Maternal mortality rate | 2 | Maternal mortality rate (per 100,000 live births) |
| | Child Mortality under-5s | 2 | Neonatal mortality rate (per 1000 live births) |
| | Mortality by infectious and parasitic illnesses | 3 | Mortality rate, under-5 (per 1,000 live births); Incidence of tuberculosis (per 100,000 people) |
| Water and Sanitation | Access to improved water source (% of population); | 6 11 | Access to improved water source (% of population); Improved water source, piped (% of urban population with access) |
| | Access to improved sanitation facilities (% of population) | 6 | Access to improved sanitation facilities (% of population) |
| | Difference between the% of rural population with access to water in 2010 | | |
| Shelter | Acceptable housing | 11 | Rooms per person |
| | Access to electricity (% of population) | 7 | Access to electricity (% of population) |
| | Waste collection | 12 | Municipal solid waste (kg/year/capita); Non-recycled municipal solid waste (kg/person/year) |
| Personal Safety | Homicides (per 100,000 people) | 16 | Homicides (per 100,000 people) |
| | Youth homicides (per 100,000 people) | 16 | |

| | | | |
|--|---|---------|---|
| | Traffic deaths rate (per 100,000 people) | 3 | Traffic deaths rate (per 100,000 people) |
| Dimension 2. Foundations of Wellbeing | | | Match Indicators |
| Access to Basic Knowledge | Illiteracy rate of 15 or more years old (%) | 4 | Literacy rate of 15-24 year olds, both sexes (%) |
| | Access to secondary schools | 4 | Population aged 25-64 with upper secondary and postsecondary non-tertiary educational attainment (%) |
| | Quality of Education (IDEB Score) | 4 | Expected years of schooling (years); PISA score (0-600) |
| | Access to primary and lower secondary education | 4 | Net primary school enrolment rate (%) |
| Access to Information and Communications | Voice connection | 9 | Proportion of the population using the internet (%); |
| | Data connection on mobile internet | | Mobile broadband subscriptions (per 100 inhabitants) |
| Health and Wellness | Mortality by chronic diseases | 3 | Daily smokers (% of population aged 15+) |
| | Life expectancy at birth | 2 | Healthy life expectancy at birth (years) |
| | Obesity | 2 | Prevalence of obesity, BMI \geq 30 (% of adult population); |
| | Mortality by respiratory disease | 3 11 | Physician density (per 1000 people) Annual mean concentration of particulate matter of less than 2.5 microns of diameter (PM2.5) ($\mu\text{g}/\text{m}^3$) in urban areas |
| | Suicide | 3 | Subjective wellbeing (average ladder score, 0-10) |
| Ecosystem Sustainability | Recent Deforestation | 15 | Annual change in forest area (%) |
| | Cumulative deforestation | | |
| | Degraded areas | 15 | |

| | | | |
|--------------------------------|--|-------------------------|--|
| | Waste of water | 6 | Freshwater withdrawal (% of total renewable water resources) |
| | Protected Areas | 14 | Terrestrial sites of biodiversity importance that are completely protected (%); |
| | | 15 | Marine sites of biodiversity importance that are completely protected (%) |
| Dimension3. Opportunity | | Match Indicators | |
| Personal Rights | Range of political parties | 16 | Corruption Perception Index (0-100) |
| | Urban mobility (public transportation per 1000 inhabitants) | 9 | Quality of overall infrastructure (1-7); Logistics Performance Index: Quality of trade and transport-related infrastructure (1-5) |
| | Death threats | 16 | Proportion of the population who feel safe walking alone at night in the city or area where they live. (%) |
| Personal Freedom and Choice | Child labour | 8 | Percentage of children 5–14 years old involved in child labor (%) |
| | Pregnancy in in childhood and adolescence | 3 | Adolescent fertility rate (births per 1,000 women ages 15-19) |
| | Family vulnerability (% of householders mothers without complete primary education and with children under 15 years) | 5 | Female labor force participation rate (% male) |
| | Access to culture, sports and leisure | 16 | Government efficiency (1-7) |
| Tolerance and Inclusion | Violence against women | 5 | Gender wage gap (% of male median wage) |
| | Violence against indigenous | 16 | |
| | Racial inequality in education | 10 | |
| Access to Advanced Education | Population aged more 25 with tertiary education (%) Enrolled in tertiary education (%) | 4 | Population aged 25-64 with tertiary education (%) |

| | | | |
|--|---|---|--|
| | Female access to education (15 years or more) | 5 | Female years of schooling of population aged 25 and above (% male) |
|--|---|---|--|