Sustainability Assessment of Identity Territory of the Southern Coast of Bahia, Brazil

Avaliação da Sustentabilidade do Território de Identidade do Litoral Sul da Bahia, Brasil

Arise Natiana Araujo Teotonio Guimarães*, Jaenes Miranda Alves**, Ronaldo Lima Gomes***, Denise Kronemberger**** e Claudiano Carneiro Cruz Neto*****

Abstract
The present work carried out an analysis of human and ecosystem well-being of the municipalities of the Southern Littoral Identity Territory of Bahia. The study area covers a total area of 14,664.5 km² and a population of 772,683. We chose to use the Barometer of Sustainability, based on 21 indicators referring to the human and ecosystem dimension. The municipalities presented indices that are classified as potentially unsustainable, intermediate and potentially sustainable. The result of the human welfare index indicates that almost all municipalities are classified as Intermediaries, with the exception of Arataca, Mascote and São José da Vitória. On the other hand, the result of the ecosystem well-being index indicates that the municipalities located in the coastal zone of the South Coast presented better results. They were classified as potentially sustainable because they have areas of environmental conservation. The conclusion of the study reveals that there are demands in the social, economic, institutional and environmental areas for all municipalities.
Keywords: Welfare index; Sustainable Municipalities; Sustainability Assessment

Resumo
O presente trabalho realizou uma análise de bem-estar humano e ecossistêmico dos municípios do Território de Identidade Litoral Sul da Bahia. A área de estudo abrange uma área total de 14.664,5 km² e uma população de 772.683. Optamos por utilizar o Barômetro da Sustentabilidade, baseado-nos em 21 indicadores referentes a dimensão humana e ecossistêmica. Os municípios apresentaram índices que se classificam como potencialmente insustentáveis, intermediários e potencialmente sustentáveis. O resultado do índice de bem-estar humano aponta que quase todos os municípios são classificados como intermediários, à exceção de Arataca, Mascote e São José da Vitória. Por outro lado, o resultado do índice do bem-estar do ecossistema aponta que os municípios localizados na zona costeira do Litoral Sul apresentaram melhores resultados. Foram classificados como potencialmente sustentáveis porque possuem áreas de conservação ambiental. A conclusão do estudo revela em que há demandas nas áreas social, econômica, institucional e ambiental para todos os municípios.
Palavras-chave: Índice de bem-estar; Municípios Sustentáveis; Avaliação de Sustentabilidade

* Master degree by Santa Cruz State University; ** Economics Professor at Santa Cruz State University; *** Professor at Santa Cruz State University; **** Projects managerStudies in IBGE; ***** PhD from University of Brasilia.

1. Introduction

The economic growth, based on the intensive production of goods and services as a goal of nations, has made some changes in the environment and directly impacted natural resources. This degradation, more visible and worrying, added to the way the nations develop, can lead to the exhaustion of the natural resources. Due to this scenario, many concerns arose from some countries, so they have initiated a series of conferences aiming to promote discussions about population consumption.

The guidelines for a sustainable development were proposed in 1992 at the Rio 92 Conference, which were presented in the document known as Agenda 21. At that time, the need to develop indicators of sustainable development at all levels was highlighted in order to contribute to the sustainability of environment and development integrated systems. The traditional indicators commonly used to indicate sustainability such as gross national product (GNP), were not considered appropriate anymore (United Nations Conference on Environment & Development, 1992).

Ever since a profusion of studies was carried out to develop methodologies capable of assessing sustainability through the use of indicators. Finally, the aim of this paper is to present an overview of the municipalities from the Identity Territory of the Southern Coastal of Bahia sustainable development.

2. Sustainable Development, Sustainability and its Concepts

The origin of the understanding of sustainability arose with the identification of environmental issues created from agriculture, human activity that used to make the greatest impact on the ecosystem. From the time man ceased being a nomad and settled in one place, he felt the need to grow food for his subsistence, hunting is no longer the main source of survival. Thus, the population started taking natural resources for their living without worrying about their misuse, once the environment offered a rich natural diversity. By the time the Industrial Revolution happened, this degradation accelerated with the land being farmed on a larger scale, also the use of agricultural machinery added to the disposal a greater amount of waste.

The concept of sustainability has been evolving and improved, until the term sustainable development (SD) was created. 'Satisfying the needs of the present generation without compromising the needs of the future generation' is a concept given to SD by the World Commission on Environment and Development in 1987. This new way of understanding development was published in Our Common Future, also known as the Brundtland Report, a document led by Gro Harlem Brundtland and Mansour Khalid. The report emphasizes an interconnection between technology, society, politics and economics, as well as the need for an ethical stance on the responsibilities of contemporary members of the current society and between the next generations (BRÜSEKE, 1994).

The debate at the international level deepened in the United Nations Conference on Environment and Development (UNCED), known as Rio 92 or Earth Summit. This conference took place in Rio de Janeiro in 1992 under the leadership of the United Nations, which in turn led to the creation of Agenda 21, among other important documents. The Agenda was created to facilitate the use of the proposed ideas, which brought a practical view of local and national application of SD policies (Blanc et al., 2012).

In 2012, Rio de Janeiro hosted the United Nations Conference on Sustainable Development (UNCSD), also called Rio + 20, which was until now the last conference of this magnitude organized by the UN. At that event, leaders from many UN participating countries were there to discuss the proposals made by the United Nations Department of Economic and Social Affairs (UNDESA) and the United Nations Development Program (UNDP)[1].

The Millennium Declaration and the Millennium Development Goals (MDGs) were created in 2000 with a 15-year deadline, whose focus was eradicating extreme poverty and reducing gender inequity**.** After Rio + 20, the Summit decided to improve the MDG aims and to put them in the context of the sustainable development proposal (UNITED NATIONS SUSTAINABLE DEVELOPMENT SOLUTIONS, 2013). This way, in 2012, the UN Network of Solutions for Sustainable

[1] 'Their aims were to renew commitment policies for sustainable development, assess progress so far, identify remaining gaps in the implementation of outcomes from major summit meetings on sustainable development, and address new and emerging challenges' (United Nations Department of Economic and Social Affairs; United Nations Development Program, 2012).

Development was created, which supports the Rio + 20 SD concept on four dimensions: 'economic development (including the end of extreme poverty), social inclusion, environmental sustainability and good governance, including peace and security' (UNSDSN, 2013). Thus, the Rio + 20 final document highlights the need to build Sustainable Development Goals (SDG), which are coherent and integrated with the development of the Agenda beyond 2015 (United Nations Department of Economic and Social Affairs, 2014).

In 2015, the 2030 Agenda for the Sustainable Development and 17 SDG were built and adopted by leaders worldwide, but they were officially put into use in January 2016. The SDG were created after the MDG and its main purpose is to end poverty around the world, then promote improvement in social, economic and environmental fields as well. The SDG consider the different potentials of each country and their ability to develop in accordance with their priorities. This is why they are integrated and indivisible and are universally applicable. The goals are related to end poverty, protect the planet and ensure prosperity for all (UNITED NATIONS, 2015).

Sustainability is a term that has been used in several dimensions, such as cultural, economic, social, environmental, institutional, geographical, etc. There is no narrow understanding, since it is considered to be a very broad conceptualization that suits various interests and positioning (RUSCHEINSKY, 2003). Although it is present in almost all the academic, political and cultural meetings, this concept is far from being a consensus (BRAGA et al., 2004). In relation to SD, sustainability characterizes development with quality, that is, sustainable actions are the ones that promote improvements in the man life, with minimum impacts on the ecosystem that surrounds him as much as possible.

If the term sustainability is used only in the sense of adaptation, it will not make much sense to human society because it is constantly changing over time. In this sense, technologies, cultures, information, conditions, values, capacities and priorities that surround men also change. So, a sustainable society can be identified as the one that allows and sustains these modifications (Hardel and Zdan, 1997). More specifically, Williams (p.4, 2010) believes that the sustainable urbanism is 'the prudent use of environmental resources and inter and intra-generational equity still serve us well'.

Taking into consideration that ecosystems as well as human societies are not static but dynamic, the term sustainability could never be used to maintain the same growth conditions as an optimal state. Therefore, there is no level of sustainability to be achieved, for it cannot be considered as an end in itself. In this way, a society is considered sustainable when it seeks to develop in conditions that promote the quality of people's lives improvement in a way that affects impacting the ecosystem as little as possible.

The International Union for Conservation of Nature and Natural Resources (IUCN), in consonance with Hardi and Zdan, believe that the path to sustainability must be a combination of human well-being and ecosystem well-being. The two kinds of well-being are equally important and need to make progress for a society to be considered sustainable. There is a relationship of interdependence between both systems, although they are measured separately (Hardi, Zdan, 1997; Omer, 2003).

Omer (2003) explains that human well-being is a condition in which the population identifies their needs and can make choices in a range of options to satisfy them. This well-being is essential for sustainability because there is no condition for a society to be sustainable with a low standard of living. On the other hand, when the ecosystem maintains its diversity and quality, and still has the capacity to support people to adapt to changes and provide options and opportunities for the future, this is called ecosystem well-being (Omer, 2003).

3. The Indicators of Sustainability Experience: Brazil and throughout the World

Agenda 21 ensured the need to develop indicators that could relate development to the environment and provide information for decision makers on this link. As a result, many countries were encouraged to create their own indicators of sustainable development. Rayén Quiroga (2001) reviewed the main initiatives for the use of indicators of environmental sustainability and sustainable development from the experiences of Canada, New Zealand and Sweden and classified them according to their creation: environmental indicators; indicators with a multidimensional approach; indicators with social, economic and environmental significance. It should be noted that these indicators were created before the publication of Agenda 21.

In the 1990s, the Organization for Economic Co-operation and Development (OECD) was in the spot for the creation of environmental indicators using the Pressure-State-Response methodology. In 1996, the International Institute for Sustainable Development (IISD) and the Rockerfeller Foundation discussed principles that could guide the identification of indicators - Bellagio Principles for Assessment (HARDI and ZDAN, 1997). Another example for using indicators was Seattle (USA), in which health indicators were created (in 1998) to identify problems related to well-being at the municipal level (SINGH et al., 2012).

For the second generation, the Commission on Sustainable Development (CSD) -UN published its first book with the collection of indicators and methodologies entitled Indicators of Sustainable Development: Framework and Methodologies (1996), also known as Blue Book. This publication assisted other countries in developing indicators that would apply to their realities (UNDSD, 2001). The literature suggests that some countries are still in the first and second generation, and some of them recognize the importance of moving to the third generation. Therefore, still is necessary to use indicators that show social, environmental and economic aspects from a country.

Brazil has indicators published by the CSD in its third edition. The first publications occurred in 2002, and have been biannual. The indicators portray short, medium and long term phenomena with multifunctions, such as assessing the country's behavior and trends, making comparisons between regions, Federative Units or with other nations (IBGE, 2004). In this country, the challenge of building indicators is even greater because of their diversity. Therefore, it was chosen to create indicators in the aggregation of the country unit territories in order to facilitate the provision of updated information for the reader (IBGE, 2002). Progress has been made in developing their own indicators separately from development strategies for Agenda 21 (Malheiros et al., 2008). The indicators are not linked to the themes recommended by Agenda due to a lack of IBGE data and strategies to follow an international framework rather than public policy.

In 2004, the amount is extended to another 59 indicators (IBGE, 2008). Revisions, extensions and improvements were made, so some indicators were condensed, others suppressed and others replaced (IBGE, 2004). In the 2008 version, only one indicator was added to the 2004 edition, which now has 60

indicators (IBGE, 2008). In 2010, the list was suppressed so that the indicators presented could represent more the Brazilian reality. For this reason, the new edition presented only 55 indicators, most of them from the 2008 version (IBGE, 2010c).

In 2012 edition, the goals originally proposed were maintained with the updating of its indicators and the introduction of new ones, the new ones corresponding to the changes suggested by the new edition of the Blue Book in 2007. In total, the number of indicators presented in the current edition is 62 (IBGE, 2012a). The last version so far was published in 2015. One indicator was added in its total amount and some of them were replaced due to lack of information, but all the kept indicators from previous publications were updated (IBGE, 2015). The guiding themes are: Environmental dimension: biodiversity, sanitation, fresh water, atmosphere, land, oceans and seas and coastal waters; social dimension: health, education, security, population, work and salary, housing; economic dimension: economic table; institutional dimension: institutional table and institutional capacity. Not all of these indicators have the IBGE as a source of data, but rely on many institutions, such as Ministries, State Environmental Organizations.

Some articles of assessments at the municipal level can be cited: Teixeira et al. (2012) - Indicators of local sustainability: Sustainable Jaboticabal Project experience; Coutinho and Malheiros (2012) - Indicators of local sustainability: Ribeirão Pires case, SP; Instituto Nossa Ilhéus (2011) - Ilhéus Indicators system.

4. Methods Found in Literature

Existing methods that evaluate sustainability are inefficient regarding the availability, monitoring and capacity of data analysis and interpretation (BELLEN, 2006). This happens because there is not always an assessment of all the diverse dimensions of all factors also data are not available for all scales because these assessments are carried out mostly at the national level. Due to many interpretations of the sustainability concept, many methods have been created to analyze what they 'believe' to be sustainability. The focus was to assess sustainability at the macro level - the first publications and experiences of these tools were at the national level. According to its improvement, it was noticed the need to assess smaller scales such as state, regional or local.

There are also studies that assessed the development of states and municipalities in Brazil, such as: Cervi and Carvalho (2010), who estimated the Ecological Footprint in Rio de Janeiro; Clemente et al. (2011) evaluated the sustainable development index of Ceará; Siena (2008) applied the barometer tool to assess sustainability in Rondônia, among many others.

5. Methodological Procedures

5.1. Study area

The Identity Territory of the Southern Coastal of Bahia, covers a total area of 14,664.5 sq. km and its population of 772,683 inhabitants are distributed in the urban and rural areas of the municipalities: Almadina, Arauca, Aurelino Leal, Barro Preto, Buerarema, Camacan, Canavieiras, Coaraci , Itabaípe, Itapitanga, Jussari, Maraú, Mascote, Pau Brasil, Santa Luzia, São José da Vitória, Ubaitaba, Una and Uruçuca (IBGE, 2010). The region is relevant in economic and ecosystemic matters. It is characterized as an area of coca monoculture, which after passing through a system crisis needed new economic alternatives to support the population. Besides, this territory is considered one of the most important points of the Atlantic Forest remnants (TERRITORIAL INFORMATION SYSTEM, 2011).

5.2. The Analysis Method

Using the Barometer of Sustainability method (Prescott-Allen, 2001) presents the advantages, for example, it is globally known and widely used. Furthermore, it is the only method to consider the wellbeing of human and ecosystem equally important (Guijt et al., 2001). It means, each system scores until 50% of the wellbeing assessment.

The indicators with their results were interpreted by a performance scale ranging from 0-100, divided into 5 grades, classified as: unsustainable (0-20), potentially unsustainable (21-40), intermediate (41-60), potentially sustainable (61-80) and sustainable (81-100). The method can be expressed by the adapted equation (1) from Kronemberger et. al., (2004):

$BS_x = \left\{\left[\frac{(DL_A - DL_x)x(BS_A - BS_p)}{(DL_A - DL_p)}\right]x(-1)\right\} + BS_A$ $\mathrm{BS_x BS_x} = \{-[\frac{(\mathrm{LP_A\text{-}LP_x DL_x})\times x(\mathrm{BS_A BS_A\text{-}BS_p BS_p})}{(\mathrm{DL_A LP_A\text{-}LP_p DL_p})}]\} + \mathrm{BS_A BS_A}$(Equation 1)

Where,

A= previous limit of the range containing x.

p= posterior limit of the range containing x.

BS= value in the Barometer of Sustainability scale.

LP= value of the Local Performance Indicator.

5.3. Choosing the Systems, Dimensions and Indicators

The method works with two approaches, focused on ecosystem conditions and human aspects. The goals proposed by the National Agenda 21 were used, according to the specific principles for the Brazilian Northeast region. The human wellbeing system is composed of the dimensions: Health and Population, Wealth, Education, Governance and Equity. The Education and Governance dimensions replace, respectively, the Knowledge and Culture, and Community dimensions proposed in Prescott-Allen (2001), due to the reality of the territory and the need for assessment. In addition, they sum a set of 21 indicators distributed in an inequitable way, based on the data availability for each dimension.

The ecosystem consists of dimensions: Atmosphere, Earth, Biodiversity and Sanitation. The Atmosphere, Biodiversity and Sanitation dimensions replace, respectively, the Air, Species and Population and Resource Usage dimensions proposed in Prescott-Allen (2001). There are 10 indicators, which are also distributed in a non-equally way. The aggregation of the indicators and the index mapping helped to diagnose the wellbeing of the study area. The indices are presented graphically through the Barometer of Sustainability. The indicators were aggregated under the same level of importance - arithmetic mean, establishing the same importance for each indicator.

6. Results and Discussion

The assessment allows visualizing the reality of each municipality, to see if growth has been happening in an efficient way. In other words, a development is considered healthy if it promotes the quality of life extension and therefore the Ecosystem is impacted as little as possible. All municipalities presented Wellbeing Indexes for the Dimensions, ranged on the grades: potentially unsustainable, intermediate and potentially sustainable. However, when they were combined into the systems wellbeing, they were classified only as potentially unsustainable and intermediate by the distribution of their indexes (Figure 1). The indicator Life Expectancy at Birth represents a newborn average life expectancy, and according to IBGE (2012a), the better the living conditions, the longer the longevity. For this indicator, all assessed municipalities had an average of less than 70 years, which places them outside of the desirable classification. A component that possibly influences crucially Life Expectancy at Birth is the Schooling of people. In other words, Schooling is the number of years of studies required to complete education in Brazil (KRONEMBERGER et al., 2008), and for that, all municipalities presented results below 10 years. From the point of view of the ecosystem dimension, we consider the access to the water supply system, since we understand that life expectancy at birth is also depends on this indicator. The results show that only the city of Itabuna is qualified as Sustainable because it has a water supply system that serves 95% of the population.

The Housing Suitability results indicate that the proportion of households with minimum living conditions (IBGE, 2012a) is unsatisfactory. The conditions of access to services such as water supply, sanitary sewage and garbage collection are not positively assessed according to the results. As a consequence of the Ecosystem dimension results, the Housing Suitability grades were considered unsustainable.

A curious fact is that, with the exception of Barro Preto and Itabuna, all municipalities were classified as sustainable in Air dimension. This indicator assesses the Vehicles *per capita*. Possibly, the good result of other municipalities can be justified by the fact that they do not present a high average monthly salary. It can be observed that the lower the average monthly salary, the lower the number of vehicles *per capita*, since fewer people have income available to maintain a car. However, observing the details of the Unemployment Rate - which indicates the percentage of

people who were looking for work in relation to the total economically active population in the period surveyed (IBGE, 2012a) – with the exception of Itacaré, which is considered as intermediate, all municipalities were classified as potentially unsustainable.

When it comes to Biodiversity and protected areas, only seven municipalities have been classified as sustainable. These indicators can be considered complementary in terms of analysis. In addition, almost all municipalities are sustainable in terms of Municipal Councils and Environmental Licensing. The Deforestation in the Atlantic Forest indicator contributed negatively to the Ecosystem performance, even though some municipalities were assessed as sustainable in Biodiversity. This happens because these municipalities have big remnants areas of Atlantic Forest.

Surely, the reflection of the non-implementation of Agenda 21 influences this result. Regarding Agenda 21, only 6 municipalities started implementing it, which does not guarantee that the guidelines proposed by the document were actually implemented. From the point of view of local sustainable development, all municipalities were considered unsustainable for GDP *per capita*, that is, domestic production does not guarantee the population access to private services and good necessary to them. Besides that, at the level of investment in education, the population lacks because there is little investment.

The lack of inter-institutional joints among the municipalities had a negative impact. The joints are intermunicipal public consortium, with the state and with the government; agreement with the private sector; and support from the private sector or communities, and eleven different policies: education; health; assistance and social development; employment and/or work; tourism; culture; housing; environment; transport; urban development; and basic sanitation (IBGE, 2011b). If there were greater investments in interinstitutional joints, there would probably be better proposals to increase the satisfaction of the basic needs of the population. The Interinstitutional Joints of Municipalities results show how important is to establish partnerships between municipalities and various agents to solve problems and meet local needs. These joints are even more important for small municipalities with few resources**.**

The grades of each municipality and its classification according to the BS cannot be justified by their location in the territory, since they are not homogeneously distributed within the territorial limit, although the territory has been created by its identity, social, cultural and territorial cohesion. There are municipalities with scores below 45 (intermediate classification) both in the coastal region of the territory as Itacaré, and in its inland as Itapitanga. However, it is worth mentioning that Ilhéus and Itabuna have the highest indexes of Human Wellbeing index and are also the municipalities with the largest population, which makes them more eligible to receive more financial resources from the State and the Federal Govern.

For the Ecosystem, only the following indicators are considered sustainable: Vehicles *per capita* and Burnings and Forest Fires. The satisfactory result regarding Vehicles *per capita* is due to the fact that this territory has small territorial and population size municipalities. Thus, in order to avoid Ar quality as being a future issue, it is necessary to encourage the population to use public transportation and make some investments in its quality. The sustainability of the Burning and Forest Fires indicator reveals the relevant contribution to what the territory has done to the non-air pollution or soil contamination, not to mention aspects of mitigation of major impacts on fauna and flora. Usually, the fires are identified in extensive areas of agricultural use, which is not the case of the evaluated region.

Although Deforestation in the Atlantic Forest is the only indicator considered to be unsustainable for the Ecosystem, it represents an aspect of great significance for the study area. It has evaluated the biome of the Identity Territory of the Southern Coastal of Bahia, in a state of awareness for many years due to its intense degradation along the Brazilian coast. Thus, it is imperative to protect the remaining forest areas and to promote the protection of other areas. It is noteworthy that, although the Sanitation dimension was not classified as unsustainable, it presented all indicators as potentially unsustainable. Most municipalities in the territory lack services that guarantee a healthier life with access to basic services, such as water supply, sewage, household waste collection and sewage treatment. The territorial distribution of municipalities' scores for the Human and Ecosystem System are shown in Figure 2.

The scores of each municipality (Figure 3) to the Ecosystem can be justified by their geographic location. The coastal region of the territory is the area where the

remnants of the Atlantic Forest predominate in the state of Bahia and also the Conservation Units of the region. Thus, municipalities that are close to the sea, has Ecosystem wellbeing index considered as potentially sustainable. This system is composed of the dimensions Atmosphere, Land, Biodiversity and Sanitation, the only dimension that cannot be justified by the location of the municipalities is Sanitation, because it depends on political actions, which was considered the access of the population to the services and not the impacts caused by the precariousness of the services. However, the dimensions Atmosphere, Land and Biodiversity are directly related to the conservation of the green area that is part of each municipality.

7. Final Considerations

No municipality has reached a score for the Wellbeing higher than 81 or less than 20, so none of them has been classified as sustainable or unsustainable. In the Human system, approximately 88.5% of the municipalities presented indexes with scores between 41-60, being thus judged as intermediaries for sustainability. Meanwhile, only 11.5% were classified as potentially unsustainable with scores between 21-40. For the Ecosystem, 69.2% of the municipalities were considered as intermediaries against 30.8% as potentially sustainable.

Although both systems have a low coefficient of variation (<30%), the Ecosystem Wellbeing indexes vary between municipalities 10% more than the Human System. Thus, the municipality with the highest performance in the Human System was Ilhéus (55), but in the Ecosystem Ilhéus and Itacaré were even, both with a score of 72. On the other hand, the lower scores of these two systems did not belong to a single municipality, Mascote, with 34 in the Human and Barro Preto, with 42 in the Ecosystem were the highlights.

The municipalities presented Human and Ecosystem Wellbeing indexes that are classified as potentially unsustainable, intermediate and potentially sustainable. So, none of them were considered sustainable or even unsustainable. Looking at the distribution of the Human Wellbeing index in the territory, it is possible to identify that almost all the municipalities are classified as intermediaries, except for Arataca, Mascote and São José da Vitória. This way, there are demands in the social, economic and institutional areas for all municipalities. On the other hand, the distribution of

the Ecosystem Wellbeing index can be justified by the location of the municipalities. That is, municipalities that are in the coastal zone of the South Coast were classified as potentially sustainable because they have areas of environmental conservation.

The positive aspects that increase the index of sustainability in this territory are the low incidence rates of AIDS, the participation of most municipalities in the Watershed Committee, the low number of vehicles *per capita* and the low number of burnings and forest fires per unit of area. On the other hand, the gaps identified in the territory as eligible for financial investments are found in the indicators: Monthly Average Salary, GDP *per capita*, Homicide Mortality, Local Agenda 21, Interinstitutional Joints of Municipalities and Deforestation in the Atlantic Forest.

Such issues require the attention of governors and society in order to promote more quality to the lives of people living in the region. In addition, the Sanitation dimension stands out, which, although not classified as unsustainable, presented potentially unsustainable scores for all indicators evaluated. That is, the people who live in that territory lacks access to sanitation services. It is important to emphasize that the fact of having access to the services does not imply having good quality of services.

References

BELLEN, H. M**. Indicadores de sustentabilidade: uma análise comparativa**. 2. ed. Rio de Janeiro: Editora FGV, 2006.

BLANC, D; Liu W, O'CONNOR, Z. **Rio+20 working papers.** Un Division Sustainable Development, 2012.

BOSSEL, H. **Indicators for sustainable development: theory, method, applications.** International Institute for Sustainable Development; 1999. Disponível em: http://www.iisd.org/pdf/balatonreport.pdf

BRAGA, T. et al. **Índices de sustentabilidade municipal: o desafio de mensurar.** Revista Nova Economia, Belo Horizonte, 2004.

BRÜSEKE, F. **Desenvolvimento e Natureza: estudos para uma sociedade sustentável**. INPSO/FUNDAJ, Instituto de Pesquisas Sociais, Fundação Joaquim Nabuco, Ministério da Educação, 1994.

CRUZ NETO, C. **Crescimento do Produto Econômico e Meio Ambiente.** EDUCAÇÃO E MUDANÇA, v. 1, p. 906-104, 2014.

GRAYMORE, M; SIPE, N; RICKSON, R. **Regional sustainability: how useful are current tools of sustainability assessment at the regional scale?** Ecological Economics, 2008.

_____. Sustaining human carrying capacity: a tool for regional sustainability assessment. Ecological Economics. 2010; 69: 459-468.

GUIJT, I; MOISEEV, A; PRESCOTT-ALLEN, R. **IUCN resource kit for sustainable assessment.** Part A: Overview. IUCN Monitoring and Evaluation Initiative, 2001.

GUIMARÃES, R.; FEICHAS, S. **Desafios na construção de indicadores de sustentabilidade.** Ambiente & Sociedade, Campinas, v. XII, p. 307-323, 2009.

HARDI, P; ZDAN T. **Assessing sustainable development: principles in practice.** IISD, 1997. Disponível em: http://www.iisd.org/pdf/bellagio.pdf

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA. **Censo Demográfico 2010.** Rio de Janeiro, 2010. Disponível em: http://www.censo2010.ibge.gov.br.

_____. Indicadores de desenvolvimento sustentável. Rio de Janeiro: IBGE, 2002.

_____. Indicadores de desenvolvimento sustentável. Rio de Janeiro: IBGE, 2004.

_____. Indicadores de desenvolvimento sustentável. Rio de Janeiro: IBGE, 2008.

_____. Indicadores de desenvolvimento sustentável. Rio de Janeiro: IBGE, 2010c.

_____. Indicadores de desenvolvimento sustentável. Rio de Janeiro: IBGE, 2012a.

_____. Indicadores de desenvolvimento sustentável. Rio de Janeiro: IBGE, 2015.

WILLIAMS, K. **Sustainable cities: research and practice challenges.** International Journal of Urban Sustainable Development, 2010.

KRONEMBERGER, D et al. **Desenvolvimento sustentável no Brasil: uma análise a partir da aplicação do barômetro da sustentabilidade.** Sociedade & Natureza, v. 20, p. 25-50, 2008.

KRONEMBERGER, D. et al. **Indicadores de sustentabilidade em pequenas bacias hidrográficas: uma aplicação do 'barômetro da sustentabilidade' à bacia do Jurumirim (Angra dos Reis/RJ).** Geochimica Brasiliensis, v. 18, p. 086-098, 2004.

MALHEIROS, T.; COUTINHO, S.; PHILIPPI, A. **Indicadores de sustentabilidade: uma abordagem conceitual.** In: PHILIPPI JR, A.; MALHEIROS, T.F. (Ed.) Indicadores de sustentabilidade e gestão ambiental. Barueri, SP: Manole, 2012.

MEADOWS, D. **Indicators and information systems for sustainable development. The Sustainability Institute**, 1998. Disponível em: http://www.iisd.org/pdf/s_ind_2.pdf

OMER, K. **Assessing Northern areas' progress towards sustainability: baseline report.** IUCN Pakistan, Northern Areas Programme, 2003. Disponível em: http://cmsdata.iucn.org/downloads/assessing_nas.pdf

PRESCOTT-ALEN, R. **The wellbeing of nations: a country-by-country index of quality of life and the environment.** Island Press; 2001.

RUSCHEINSKY, A. **No Conflito das Interpretações: o enredo da sustentabilidade.** Rev. Eletrônica Mestr. Educ. Ambiental, v.10, 2003.

SHIELDS, D; SOLAR, S; MARTIN W. **The role of values and objectives in communicating indicators of sustainability.** Ecological Indicators, 2002.

SICHE, R. et al. **Índices versus indicadores: precisões conceituais na discussão da sustentabilidade de países.** Ambiente & Sociedade, v. X, n.2, p. 137-148, 2007.

SILVA, E. **Diagnóstico do município de Teresópolis (RJ) na perspectiva do Barômetro da Sustentabilidade. 2006**. 79 f. Monografia (Pós-graduação em Análise Ambiental e Gestão do Território), Escola Nacional de Ciências Estatísticas. Instituto Brasileiro de Geografia e Estatística, 2006.

SILVA, M**. Indicadores de sustentabilidade para o município de Altamira-Pará: uma aplicação do barômetro da sustentabilidade.** 2013. Dissertação (Mestrado em Gestão de Recursos Naturais e Desenvolvimento Local na Amazônia), Programa de Pós-Graduação em Gestão de Recursos Naturais e Desenvolvimento Local na Amazônia. Universidade Federal do Pará. Belém: 2013.

SISTEMA DE INFORMAÇÕES TERRITORIAIS. **Relatórios Analíticos. Projeto: qualificação da gestão territorial e fortalecimento do capital social por meio da monitoria e avaliação das condições de vida e da sustentabilidade no Litoral Sul da Bahia.** Ministério do Desenvolvimento Agrário, 2011. Disponível em: http://sit.mda.gov.br/download/ra/ra090.pdf.

SPANGENBERG, J. **Institucional sustainability indicators: an analysis of the institutions in Agenda 21 and a draft of indicators for monitoring their effectivity.** Sustainable Development, 2002.

UN. **Indicators of sustainable development: guidelines and methodologies.** Third Edition. United Nations Publications, 2007. Disponível em: http://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=107&menu=35.

UN**. Transforming our world: the 2030 Agenda for Sustainable Development.** Resolution adopted by the General Assembly on 25 September 2015, 2015. Disponível em: https://sustainabledevelopment.un.org/post2015/transformingourworld

UN CONFERENCE ON ENVIRONMENT & DEVELOPMENT – UNCED. **Agenda 21.** Rio de Janeiro, 1992. Disponível em: https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf

UN DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS – UNDESA. **Report of the Open Working Groups of the General Assembly on Sustainable Development Goals.** Sixty-eight session, 2014. Disponível em: https://sustainabledevelopment.un.org/content/documents/1579SDGs%20Proposal.pdf

UN DEPARTMENT OF ECONOMIC AND SOCIAL Affairs – UNDESA, United Nations Development Programme – UNDP. **Synthesis of National Reports for Rio+20,** 2012. Disponível em: http://sustainabledevelopment.un.org/index.html.

UNITED NATIONS SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK – UNSDSN. **Uma Agenda de Ação para o Desenvolvimento Sustentável: relatório para o secretário geral da ONU,** 2013. Disponível em: http://unsdsn.org/.

WORLD COMISSION ON ENVIRONMENTAL AND DEPEVELOPMENT World (WCED). **Our common future**. Oxford and New York: Oxford University Press, 1987. Disponível em: http://www.un-documents.net/our-common-future.pdf

Table

Table 1. Scale of the Indicators of Sustainable Development used to assess the Human and Ecosystem Wellbeing

			BAROMETER OF SUSTAINABILITY SCALE				
			0-20	**21-40**	**41-60**	**61-80**	**81-100**
			Uns.	**PU**	**Int.**	**PS**	**Sust.**
Human	Health and Population	Life expectancy at birth (years)	< 50	51 – 60	61 – 70	71 – 79	≥ 80
		Infant mortality rate (per 1,000 live births)	≥ 100	99 – 50	49 – 20	19 – 10	9 – 0
		Hospital beds (per 1,000 people)	0 - 0,5	0,6 - 1,9	2,0 - 2,4	2,5 - 3,0	> 3
		AIDS incidence rate (number of diagnosis per 100,000 people)	> 50	50 – 25	25 - 10	10 - 1	0
		Population density (people per sq. km of land area)	≥ 5550,4	<5550,4 a ≥3702,6	<3702,6 a ≥1854,7	<1854,7 a ≥6,8	< 6,8
		Dependency ratio (%)	≥ 86,7	<86,7 a ≥66,3	< 66,3 a ≥ 39,9	<39,9 a ≥16,5	< 16,5
	Wealth	Unemployment rate (%)	>71,3	71,3≤ a >47,5	47,5≤ a >23,8	23,8≤ a >0	0

	Average monthly salary (R$)	≤ 910	>910 a ≤1310,1	>1310,1 a ≤1710,2	>1710,2 a ≤2110,3	>2110,3
	Gross Domestic Product *per capita* (R$)	≤ 22116	>22116 a ≤41012,5	>41012,5 a ≤59909	>59909 a ≤ 78805,5	>78805,5
Education	Literacy rate (%)	0 - 50	51 – 60	61 - 80	81 - 94	95 – 100
	Average years of schooling (years)	0 - 4	5 – 7	8 – 10	11 – 13	≥14
Governance	Homicide Mortality (deaths per 100,000 population)	150 - 30	29 – 12	11 – 4	3 – 2	1 – 0
	Traffic-related death rate (deaths per 100,000 population)	≥180,75	<180,75 a ≥ 120,5	<120,5 a ≥60,25	<60,25 a ≥1	<1 a 0
	Municipal Councils for the Environment (existence)	Do not exist	-	-	-	Exist
	Watershed Committees (participation)	Do not participate	-	-	-	Participate
	Local Agenda 21 (stage of implementation)	Total absence of discussion	Principles of Discussion	Awareness / Mobilization	Elaboration of the Sustainable Development Plan	Implementation of actions in public policies

		Environmental licensing (issue)	Do not issue	Issue			
		Interinstitutional joints of municipalities (number of joints)	≥0 a ≤11	>11 a ≤22.	>22 a ≤33	>33 a ≤44	>44 a ≤55
	Equity	Gini Index (dimensionless)	1 a ≥0,8	<0,8 a ≥0,5	<0,5 a ≥0,4	<0,4 a ≥0,2	<0,2 a ≥0
		Busy women /100 Busy men (number)	0 a 20	>20 a 40	>40 a 60	>60 a 80	>80 a 100
		Housing suitability (%)	0 – 20	21 – 40	41 - 60	61 - 80	81 - 100

Table 1. Scale of the Indicators of Sustainable Development used to assess the Human and Ecosystem Wellbeing (conclusion)

System	**Dimensions**	**Indicators of Sustainable Development**	**BAROMETER OF SUSTAINABILITY SCALE**				
			0-20	**21-40**	**41-60**	**61-80**	**81-100**
			Uns.	**PU**	**Int.**	**PS**	**Sust.**
Ecosystem	Atmosphere	Vehicles *per capita* (per 1,000 people)	800 – 651	650 – 601	600 - 401	400 - 201	≤ 200
	Land	Intensive farming (machine units/ 1,000 hectares)	≥51,2	<51,2 a ≥34,4	<34,4 a ≥17,5	<17,5 a ≥0,6	<0,6
		Land use (%)	100 – 96	95 – 91	90 - 86	85 - 81	≤ 80

		Burnings and forest fires (number of heat sources/1,000 sq. km per year)	700 – 201	200 – 101	100 - 51	50 - 11	≤ 10
		Deforestation in the Atlantic Forest (%)	100 – 81	80 – 61	60 - 41	40 - 21	20 - 0
	Biodiversity	Protected areas (%)	0 – 10	11 - 15	16 - 25	26 - 30	> 30 a 100
	Sanitation	Water supply coverage (%)	0 – 69	70 - 79	80 - 89	90 - 94	95 - 100
		Access to sanitary sewage (%)					
		Access to the household waste collection service (%)					
		Sewage treatment (%)	0 – 70	71 - 80	81 - 90	91 - 95	> 95

Note: Uns.= unsustainable, PU= potencially unsustainable, Int.= intermediate, PS= potencially sustainable, Sust.= sustainable.

Figures

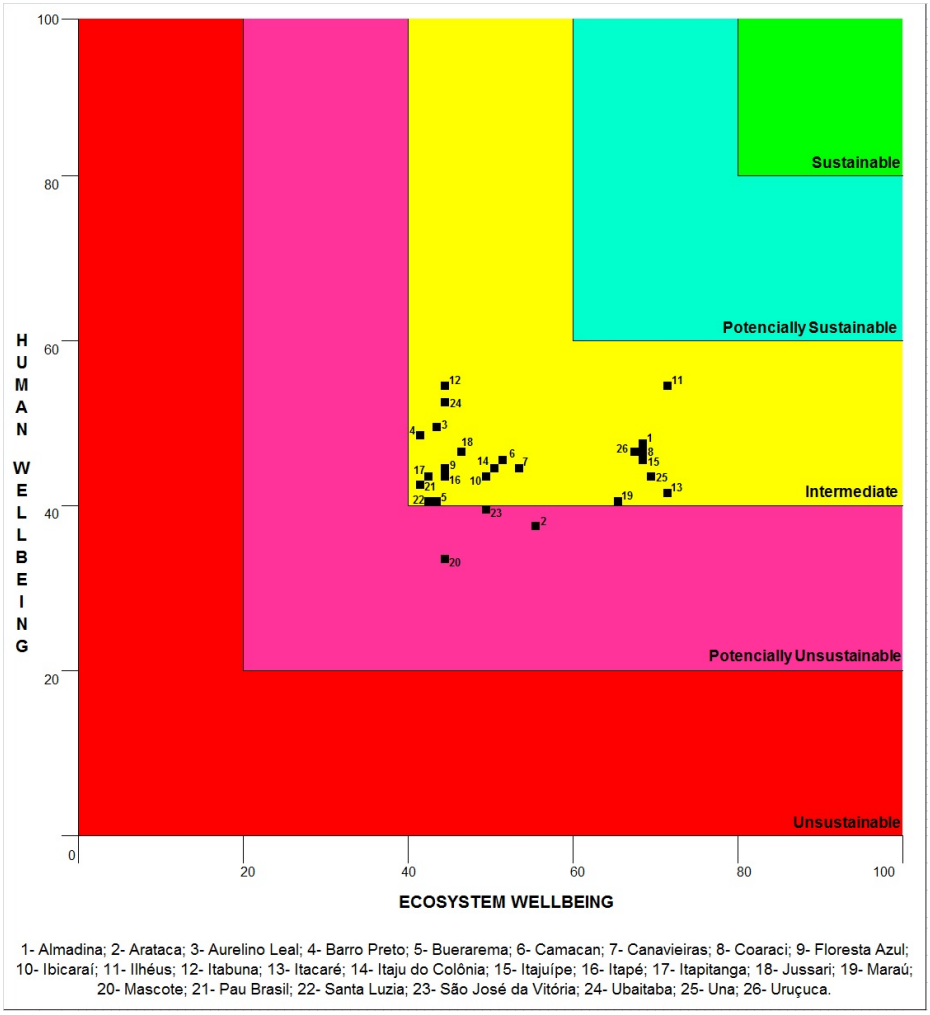
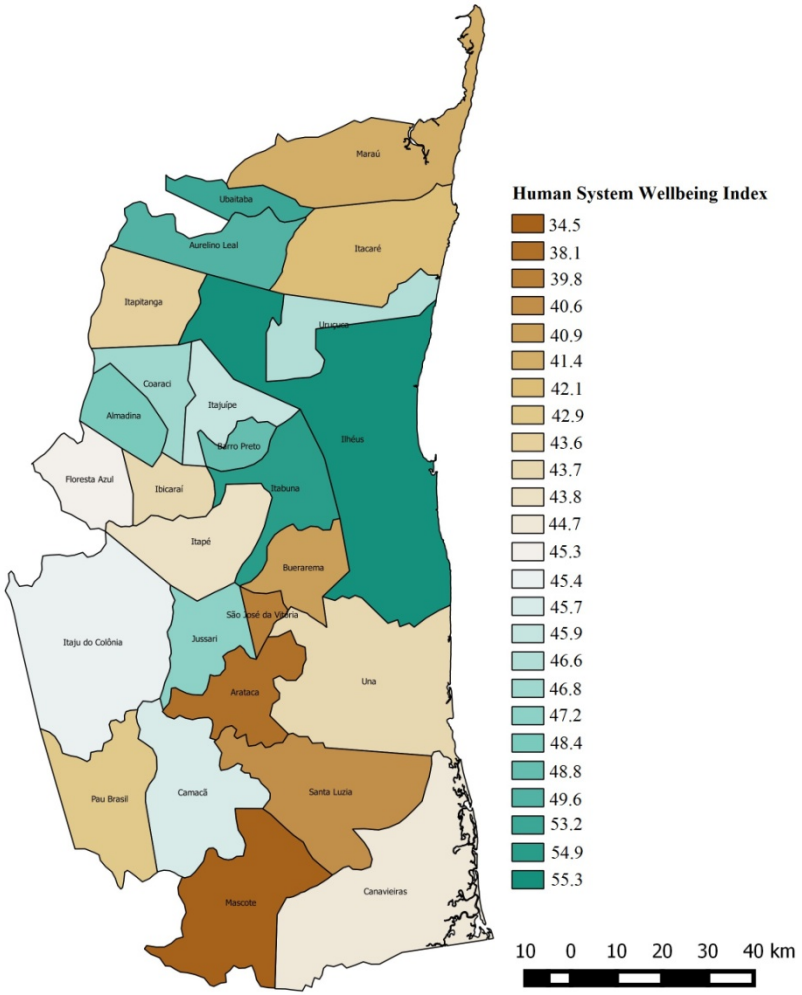
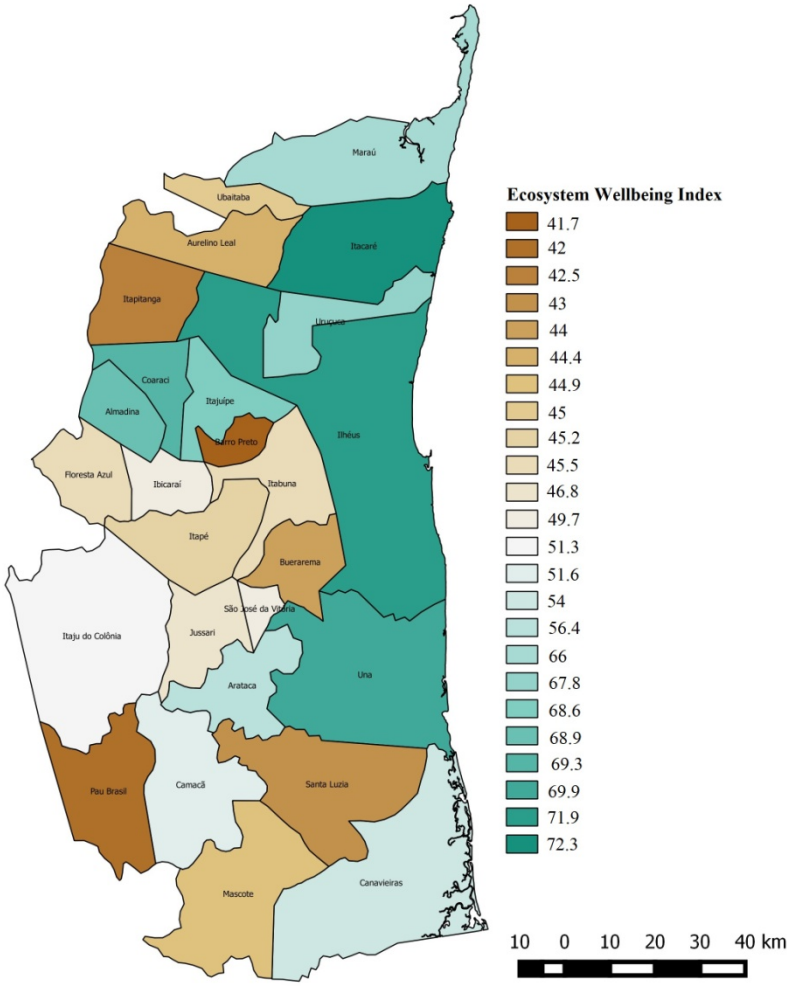


Figure 1. The Barometer of Sustainability for the period 2006-2014. Source: Adapted from Prescott-Allen (2001).



a)



b)

Figura 2 – Performance Map from the Municipalities according to the scores: a) Human System, b) Ecosyste

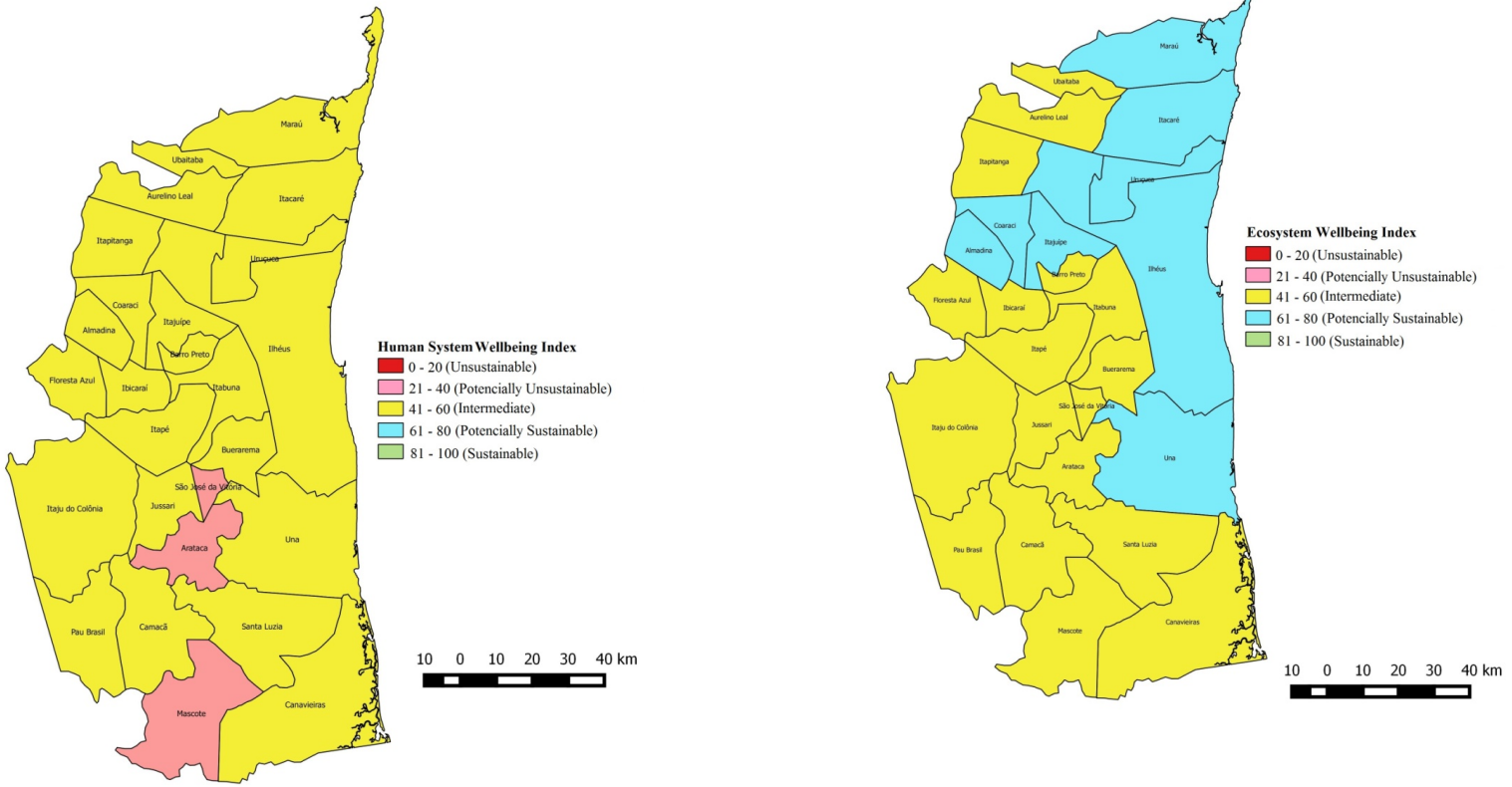


Figura 3 – Classification of Municipalities according to the Barometer of Sustainability: a) Human System, b) Ecosystem.