

A Study on the dimensions of sustainable urban development in the perception of the inhabitants of Imperatriz-MA

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Abstract

The objective of this paper is to analyze the dimensions of sustainable urban development in the perception of the inhabitants of Imperatriz - Maranhão. To do so, the research was based on a quantitative and descriptive approach using a probabilistic sample, considering 4.84% sample error and 95% confidence level. The data collection procedure was done through a closed questionnaire based on the concepts of Barbieri and Lage (2001). The data analysis procedure was divided into three stages: descriptive statistics, KMO and factorial analysis. Finally, it can be concluded that the city of Imperatriz-MA is not within the principles of sustainable urban development by the opinion of the inhabitants. Despite this conclusion and based on the data collected, it is important to highlight that the population is not participatory in the process of building a better and more sustainable city. In this way, the creation of a more sustainable city requires the participation not only of the public power, but also of the population in general

Key words: Urban Development. Sustainability. City Management.

Resumo

O objetivo deste artigo é analisar as dimensões do desenvolvimento urbano sustentável na percepção dos habitantes de Imperatriz – Maranhão. Para tanto, a pesquisa valeu-se da abordagem quantitativa e descritiva por meio de uma amostra probabilística, considerando 4,84% de erro amostral e 95% de nível de confiança. O procedimento de coleta de dados se deu por meio de um questionário fechado com base nos conceitos de Barbieri e Lage (2001). O procedimento de análise de dados foi dividido em três etapas: estatística descritiva, KMO e análise fatorial. Por fim, pode-se concluir que a cidade de Imperatriz-MA não está dentro dos princípios de desenvolvimento urbano sustentável pela opinião dos habitantes. Apesar desta conclusão e com base nos dados coletados, é importante evidenciar que a população não é participativa no processo de construção de uma cidade melhor e mais sustentável. Deste modo, para a criação de uma cidade mais sustentável é preciso a participação não só do poder público, mas também da população em geral.

Palavras-Chave: Desenvolvimento Urbano. Sustentabilidade. Gestão de Cidades.

1 Introduction

A study performed by the United Nations Population Fund (2015) shows that the world faces the biggest wave of urban growth in history. The study shows that by 2015, approximately 3.6 billion people live in the urban areas, and by 2030 that number will increase to 5 billion

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people. In observing the Brazilian reality, this growth is even greater. According to the 2010 Census, the Brazilian population living in the urban area represents 84.35% and in 2030 this index will reach 91.1% (IBGE, 2010).

Given this scenario, it is noted that the cities, faced with disorderly growth, face major social, economic and environmental changes. Chourabi et al. (2012) explain that in practice the problems related to these transformations are, for example: difficulty in waste management, scarcity of resources, air pollution, human health problems, traffic congestion, inadequate and deteriorated, and old infrastructures and between others.

Thus, as the world awakens to the impacts of climate change and the effects of rapid urbanization and modern urban lifestyles, the concept of sustainability has been pushed to the forefront of public policymaking (ZHAO, 2010; YIGITCANLAR; TERIMAN, 2015). Given the above, the great challenge to technicians and scholars of urban planning and public managers is to promote orderly urban development together with the objective of improving citizens' quality of life (ANGELIDOU *et al.*, 2018).

Scholars from around the world view sustainable urban development as a contemporary paradigm to address these challenges and provide an opportunity to form new mechanisms to build a desirable urban future (LUCK, 2007; YIGITCANLAR; FABIAN; COICETTO, 2008; RUNHAAR; DRIESSEN; SOER, 2009; ANGELIDOU *et al.*, 2018; GUZMÁN; RODERS; COLENBRANDER, 2017).

Sustainable urban development is perceived as a tool for improving the quality of life in a city, including environmental, cultural, political, institutional, social and economic components, without leaving a burden. For example, the result of reduced natural capital and a excessive local debt, on future generations - and thus form a sustainable city (JENKS; DEMPSEY, 2005; YIGITCANLAR, 2010; WHILE; JONAS; GIBBS, 2010; FLINT; RACO, 2012).

Given this context, it is observed that there is little literature on the discussions about the theme of sustainable urban development in the perception of the inhabitants, which is the lacuna of this article.

Given the prospect of deepening understanding of the theme, the following question was formulated to guide this research: How do the inhabitants of Imperatriz - MA recognize the social, economic, environmental and political dimensions of sustainable urban development?

2 Sustainable urban development

The discussion on sustainability is a new paradigm of development that emerged from thinking about the intersection of environmental, social, and economic concerns of the late twentieth and early twenty-first century (ANGELIDOU *et al.*, 2018).

The framework of these discussions was the Brundtland Commission of 1987 in which sustainable development was defined as development that caters to present generations without compromising the ability of future generations to meet their own needs (BRUNDTLAND, 1987). Atkinson (2007) argues that the concept of sustainable development gains a foothold in the academic environment and the formulation of public policy when the United Nations creates programs, reports and conferences related to the theme.

The United Nations in 2015 adopted the document entitled 'Transforming Our World: The 2030 Agenda for Sustainable Development'. Agenda 2030 "is a plan of action for people, the planet and prosperity, which seeks to strengthen universal peace" (UNITED NATIONS, 2015) and this plan indicates 17 sustainable development goals (SDGs) and 169 targets for eradicate poverty and promote a dignified life for all. The 17 SDGs are:

- Goal 1: End poverty in all its forms everywhere
- Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
- Goal 3: Ensure healthy lives and promote well-being for all at all ages
- Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
- Goal 5: Achieve gender equality and empower all women and girls.
- Goal 6: Ensure availability and sustainable management of water and sanitation for all.
- Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all.
- Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
- Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.
- Goal 10: Reduce inequality within and among countries.
- Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable.
- Goal 12: Ensure sustainable consumption and production patterns.
- Goal 13: Take urgent action to combat climate change and its impacts.
- Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
- Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems.
- Goal 16: Promote peaceful and inclusive societies for sustainable development.
- Goal 17: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development.

Although the central role of cities in sustainable development is clearly reflected in the objectives of sustainable development, specifically in objective 11, Bibri and Krogstie (2017) explain that the concept of sustainability has emerged to a large extent in urban planning and development since the 1990s.

Castells (2000) believes that a city or any ecosystem is sustainable if its conditions of production do not destroy, over time, the conditions of its reproduction. The author adds that sustainable development is essentially a form of intergenerational solidarity, that is, older generations knowingly consume and pollute less so that future generations can enjoy the same living conditions or even better conditions.

For Bibri and Krogstie (2017) and Angelidou *et al.* (2018), the desired result for cities is that they are more habitable, that the population consumes fewer resources and that human activity impacts less on the environment. The authors also point out that urban sustainability denotes a desired state in which urban society strives to achieve a balance between

environmental protection and integration, economic and cultural development, equity and social justice, and political participation.

In this context, this article was based on the concepts of sustainability developed by Barbieri and Lage (2001, p. 3-4) to formulate the dimensions of sustainable urban development. The authors divide sustainability into five concepts, as presented below:

Sustainability in the environmental dimension: includes the integrated management of natural resources, sustainable management of resources, clean technologies, preservation, recycling and reuse, combating waste, conserving finite resources, maintaining an environmental ethics more in solidarity with nature and future generations (BARBIERI; LAGE, 2001, p. 3-4).

Sustainability in the economic dimension: includes the creation of mechanisms for a new integrated, locally based productive system in which diversity and complementarity of economic activities are stimulated, generating a chain of initiatives so that agriculture, industry, trade, and service sectors generate improvements in living conditions for all systems involved, whether social or natural (BARBIERI; LAGE, 2001, p. 3-4).

Sustainability in the social dimension: it includes meeting the essential needs of a society, such as health, education, housing, infrastructure and basic sanitation and guaranteeing the fundamental human rights, as well as reducing social inequalities, combating poverty as a priority. In order to achieve this goal, it must rely on the transfer of exogenous resources and the mobilization of endogenous resources, whether public or private (BARBIERI; LAGE, 2001, p. 3-4).

Sustainability in the cultural dimension: it includes the development of projects that contribute to the preservation of local cultural diversity, against mass culture, enabling society based on traditional and ethical values, creating conditions for the expression of local art and for transferring traditions for future generations. It also enables society to exercise conscious citizenship for the construction of an ethics based on principles of solidarity and mutual trust (BARBIERI; LAGE, 2001, p. 3-4).

Sustainability in the political dimension: includes the creation of conditions for the effective participation of civil society in the planning and social control of public policies, based on the availability of a disaggregated information base, allowing a more accurate analysis of the economy and social reality local, providing conditions of success for the participation of society in sustainable development projects. It is also necessary to develop a principle, within the public administration, directed to the interests of society, in order to eliminate any clientelistic or distorted practice on the concepts of governability. Balanced accounts and accountability with the public patrimony are part of this dimension (BARBIERI; LAGE, 2001, p. 3-4).

3 Methodology

This research is characterized as descriptive and quantitative, since according to Cervo and Bervian (2007) it has as a method to observe, register and correlate facts or phenomena without manipulating them.

Based on the IBGE Census (2010), the municipality of Imperatriz in Maranhão has 247,505 inhabitants. The sample of this work was probabilistic and finite, that is, considering a sample error of 4.84% and a confidence level of 95%, we had a sample of 409 inhabitants. This number was obtained by the following equation, suggested by Spiegel (1978):

Equation 1:
$$n = \frac{N \cdot Z^2 \cdot p \cdot (1 - p)}{Z^2 \cdot p \cdot (1 - p) + e^2 \cdot (N - 1)}$$

Where:

n - calculated sample;

N - population;

Z - normal standardized variable associated with the confidence level;

p - true probability of the event;

e - sample error.

Data collection was done through a closed questionnaire divided into four parts, namely: demographic profile, social, economic and environmental and political dimensions. The questions were based on Barbieri and Lage (2001).

The questionnaires were applied in the following places: Imperatriz Boardwalk, Tocantins Shopping, New Imperatriz Neighborhood Fair, Federal Institute of Maranhão / Imperatriz Campus, Imperial Shopping, Bacuri Small Fair and Small Market Sector. The choice of these places was due to the great circulation of people and all socioeconomic and cultural classes and age groups. Table 1 presents the schedule for the application of the questionnaires.

Table 1 - Schedule for Questionnaire Application

Data	Place	Applied Questionnaires	Incomplete Questionnaires	Valid Questionnaires
26/02/2018	Imperatriz Boardwalk	58	7	51
28/02/2018	Tocantins Shopping	64	5	59
02/03/2018	New Imperatriz Neighborhood Fair	69	8	61
06/03/2018	Federal Institute of Maranhão	87	9	78
08/03/2018	Imperial Shopping	75	6	69
09/03/2018	Bacuri Small Fair	48	8	40
10/03/2018	Small Market Sector	56	5	51
Result		457	48	409

Source: Prepared by the authors

After data collection, the data were tabulated in the Microsoft Excel spreadsheet and the data analysis was divided into 3 steps: descriptive statistics (frequency, mean and standard deviation), KMO (Kaiser-Meyer-Olkin) and factor analysis using SPSS software - version 22. This analysis wants to test the following hypothesis:

H1: The inhabitants of Imperatriz-MA recognize the dimensions of sustainable urban development.

4 Analysis of results

The research was limited to knowing the public opinion of a population sample of the municipality of Imperatriz-MA, on identifying the benefits provided by adopting public actions related to the concepts of sustainable urban development. The numbers represent the primary data collected in the research through a structured questionnaire with closed questions and multiple choices.

4.1 Characterization of the research area

Known as the gateway to the Amazon, the city of Imperatriz was founded on July 16, 1852 with a privileged geographical and strategic situation, located on the right bank of the Tocantins River, intersected by the Belém - Brasília and Ferrovia Norte - Sul Highway. It is considered one of the main cities of the new agricultural division formed by the states of Maranhão, Tocantins, Piauí and Bahia, known as the "MATOPIBA" region.

With 247,505 inhabitants (IBGE, 2010), the municipality of Imperatriz had its occupation accelerated after the opening of the highways Belém - Brasília (BR-226 and BR-222), which runs the west of Maranhão in the territory of the municipality. These highways allowed for easier road communication between Imperatriz and Belém, São Luís, Anápolis, Brasília, Goiânia, São Paulo, the entire Central West and Northeast (IMPERATRIZ CITY HALL, 2019).

According to the Imperatriz City Hall (2019), Imperatriz presents itself as a commercial and service warehouse, which supplies local markets in a range of 400 km, and forms with Araguaína-TO, Marabá-PA, Balsas-MA and Açailândia-MA, an important economic province. The municipality is located in the area of influence of major projects, such as the Serra dos Carajás (Marabá / Paraupébas) mining, the Salobro Igarapé (Marabá / Paraupébas) mining, the Carajás / Itaqui railroad, the Norte-Sul railroad, the pig iron industries (Açailândia), the cellulose and paper industry Suzano (located on Rice Road).

In view of the above, the city is the second largest political, cultural and population center of the State (IMPERATRIZ CITY HALL, 2019), after the capital São Luís; second largest GDP of the State of Maranhão and 165^o of Brazil, with a GDP at current prices of R\$ 6.977,188,00 million (IBGE, 2019).

Complementing the good economic performance, when analyzing the Human Development Index (HDI), as shown in Table 2, Imperatriz, in 2010, obtained an HDI of 0.731 and was in the high human development range (HDI between 0.700 and 0.799). When analyzing Table 2, it was verified that the dimension that contributes most to the HDI of the municipality was Longevity, with index of 0.803, followed by Education, with index of 0.698, and Income, with an index of 0.697.

Table 2 - Human Development Index

	HDI Income			HDI Longevity			HDI Education			HDI		
	1991	2000	2010	1991	2000	2010	1991	2000	2010	1991	2000	2010
Imperatriz	0,570	0,623	0,697	0,593	0,712	0,803	0,259	0,465	0,698	0,444	0,591	0,731
Maranhão	0,478	0,531	0,612	0,551	0,649	0,757	0,173	0,312	0,562	0,357	0,476	0,639
Brazil	0,647	0,692	0,739	0,662	0,727	0,816	0,279	0,456	0,637	0,493	0,612	0,727

Source: PNUD Brazil (2012)

Still in Table 2, it was verified that between 1991 and 2000, the HDI of Imperatriz increased from 0,444 in 1991 to 0,591 in 2000, presenting a growth rate of 33.11%. The human development gap, or the distance between the municipality's HDI and the index ceiling, which is 1, was reduced by 73.56% between 1991 and 2000. During this period, the largest growth, in absolute terms, was Education followed by Longevity and Income. When analyzing the years 2000 to 2010, the HDI increased from 0.591 in 2000 to 0.731 in 2010 - a growth rate of 23.69%. The human development gap was reduced by 65.77% between 2000 and 2010. In this period, and in the same way as between 1991 and 2000, the largest growth rate in absolute terms was Education followed by Longevity and by Income.

After characterizing the study area, it is important to understand the demographic profile of the survey respondents and the dimensions of sustainable urban development. These issues are addressed below.

4.2 Demographic profile description

The profile of the respondents was composed by four demographic issues on: gender, age, schooling and income. Referring to the gender of the research participants, according to Table 3, it is observed that the female gender was predominant, representing 52.8%, and 47.2% was of the male gender. According to the 2010 Demographic Census (IBGE), the city of Imperatriz had a female population of 51.83% (128.278) and a male population of 48.17% (119.227), that is, the survey sample is in line with the reality of the city when related to its distribution by gender.

Table 3 - Gender of the respondents

Gender	Frequency	Percentage	Valid Percentage	Cumulative percentage
Female	216	52,8	52,8	52,8
Male	193	47,2	47,2	100,0
Result	409	100,0	100,0	

Source: Elaborated by the authors

Regarding educational level, it can be observed in Table 4 that 37.9% of the respondents have completed high school, followed by a complete college education with 28.6% of the participants.

Table 4 - Scholing

Scholing	Frequency	Percentage	Valid Percentage	Cumulative Percentage
1st to 4th year of elementary school	9	2,2	2,2	2,2
5th to 9th grade of elementary school	24	5,9	5,9	8,1
Complete High School	155	37,9	37,9	46,0
Incomplete High School	58	14,2	14,2	60,1
Complete College Education	117	28,6	28,6	88,8
Especialization Course	41	10,0	10,0	98,8
Master Degree	5	1,2	1,2	100,0
Result	409	100,0	100,0	

Source: Elaborated by the authors

When analyzing Table 5, referring to the age range of the respondents, it is verified that the predominant age group is formed by young people up to 25 years old, corresponding to 38.10% of the respondents followed by the age group of 26 to 35 years corresponding to 33% and above 36 years corresponds to 28.9% of the respondents.

Table 5- Age

Idade	Frequency	Percentage	Valid Percentage	Cumulative Percentage
18 to 25	156	38,1	38,1	38,1
26 to 35	135	33,0	33,0	71,1
Over 36	118	28,9	28,9	100,0
Result	409	100,0	100,0	

Source: Elaborated by the authors

The last variable of the profile to be analyzed is the income range. When analyzing Table 6, it was verified that 30.1% in the salary range from R\$ 955 to R\$ 1908, followed by the range from R\$ 1909 to R\$ 2862, represented by 25.7%. These data contradict data provided by UNDP Brazil (2012), which showed that Empress's average per capita income increased 120.81% in the last two decades, from R\$ 278.01 in 1991 to R\$ 386.04 in 2000 and to R\$ 613.87 in 2010. This is equivalent to an average annual growth rate in this period of 4.26%. The average annual growth rate was 3.71% between 1991 and 2000 and 4.75% between 2000 and 2010. The proportion of poor people, that is, with per capita household income of less than R\$ 140.00 (at August 2010 prices) went from 54.78% in 1991 to 35.76% in 2000 and to 14.35% in 2010.

Table 6 - Income

Income Range	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Not able to inform, variable income	23	5,6	5,6	5,6
Less than R\$ 477	16	3,9	3,9	9,5
Between R\$ 478 to R\$ 954	27	6,6	6,6	16,1
Between R\$ 955 to R\$ 1908	123	30,1	30,1	46,2
Between R\$ 1909 a R\$ 2862	105	25,7	25,7	71,9
Between R\$ 2863 a R\$ 4770	76	18,6	18,6	90,5
Between R\$ 4771 a R\$ 6678	25	6,1	6,1	96,6
Above R\$ 6676	14	3,4	3,4	100,0
Result	409	100,0	100,0	

Source: Elaborated by the authors

In sum, it can be affirmed that concerning to the demographic profile of the population sample analyzed in this stage, the present study perfectly characterized its population when compared with the official data of the municipality, corroborating in the validation of the objectives of this phase and contributing to the foundation of the research in the next phases.

4.3 Analysis of descriptive statistics

In order to obtain a better understanding of the results, the data were first analyzed through descriptive statistical techniques specifically the frequency, mean and standard deviation. The dimensions will be analyzed in the following order respectively: social, economic and environmental and political.

According to Barbieri and Lage (2001), the first dimension was the social dimension, which includes meeting the essential needs of a society such as health, education, housing, infrastructure and basic sanitation and guaranteeing fundamental human rights, as well as the work of reducing social inequalities, combating poverty as a priority. In this research, the following variables were analyzed: Municipal Safety, Traffic Safety (streets and highways), Health Services offered by the municipality, Education, Basic Sanitation Service, Selective Collection Service and Internet Service provided in the municipality.

When analyzing Table 7, it was found that the low dispersion in the responses, since the variable obtained a standard deviation of 0.71082. When analyzing the frequency and mean (3,4841), it is noticed that the respondents feel insecure about the municipality's security (robbery, robbery and crimes in general) of Imperatriz-MA.

Table 7 - Safety in the municipality

Grade	Frequency	Percentage	Valid Percentage	Cumulative Percentage	Average	Standard Deviation
Very Safe	9	2,2	2,2	2,2	3,4841	0,71082
Safe	25	6,1	6,1	8,3		
A little safe	134	32,8	32,8	41,1		
Unsafe	241	58,9	58,9	100,0		
Result	409	100,0	100,0			

Source: Elaborated by the authors

When analyzing data on Traffic Safety (streets and highways) in Table 8, it was observed that the population also presents low dispersion in the answers, since the standard deviation was 0.65694. This low dispersion explains that all the respondents present the same opinion about the analyzed variable. It can be said that, when analyzing the frequency and average (3.343), respondents residing in Imperatriz feel unsafe in relation to traffic safety in the municipality.

Table 8 - Traffic Safety (streets and highways)

Grade	Frequency	Percentage	Valid Percentage	Cumulative Percentage	Average	Standard Deviation
Very safe	1	0,2	0,2	0,2	3,3423	0,65694
Safe	39	9,5	9,5	9,8		
A little safe	188	46,0	46,0	55,7		
Unsafe	181	44,3	44,3	100,0		
Result	409	100,0	100,0			

Source: Elaborated by the authors

Table 9 provides the data on health service provided by the municipality in the opinion of the inhabitants of Imperatriz. It was verified that 51.3% of the respondents consider the health service to be regular and 32.8% consider it to be bad. Thus, the mean of this variable was 3.1589 and the standard deviation was 0.70131, showing low dispersion in the answers.

Table 9 - Health service provided by the municipality

Grade	Frequency	Percentage	Valid Percentage	Cumulative Percentage	Average	Standard Deviation
Excelent	4	1,0	1,0	1,0	3,1589	,70131
Good	61	14,9	14,9	15,9		
Regular	210	51,3	51,3	67,2		
Very poor	134	32,8	32,8	100,0		
Result	409	100,0	100,0			

Source: Elaborated by the authors

In Table 10, which presents the data of the Education variable, it was also noted that 58.4% of the respondents considered regular the education provided in the municipality and 20.5% considered it very poor, featuring an average of 2.9756 and the standard deviation of 0.68912. When comparing the data of the respondents with the IDHM Education presented by the municipality in the years 1991, 2000 and 2010 respectively (0.259, 0.465 and 0.698), as shown

previously, it was verified that, despite the evolution in the HDI, the population believes that the education needs more attention from the public power.

Table 10 - Education

Grade	Frequency	Percentage	Valid Percentage	Cumulative Percentage	Average	Standard Deviation
Excelent	8	2,0	2,0	2,0		
Good	78	19,1	19,1	21,0		
Regular	239	58,4	58,4	79,5	2,9756	,68912
Very poor	84	20,5	20,5	100,0		
Result	409	100,0	100,0			

Source: Elaborated by the authors

According to the Municipality of Imperatriz (2019), the public managers of the municipality argue that they are investing heavily in the expansion of the provision of services related to basic sanitation. The funds for this investment come from 90% of the federal government, PAC-1, and 10% from the municipality as a counterpart. However, the Municipality of Imperatriz (2019) claims that less than 35% of the population of Imperatriz-MA has access to the basic sanitation service. Given the above and analyzing Table 11, it is verified that the respondents are in line with the current situation of the municipality, since 45% of respondents consider the regular basic sanitation service and 35.2% consider it poor.

Table 11 - Basic Sanitation Services

Grade	Frequency	Percentage	Valid Percentage	Cumulative Percentage	Average	Standard Deviation
Excelent	8	2,0	2,0	2,0		
Good	73	17,8	17,8	19,8		
Regular	184	45,0	45,0	64,8	3,1345	,76952
Very poor	144	35,2	35,2	100,0		
Result	409	100,0	100,0			

Source: Elaborated by the authors

Table 12 shows that the selective collection variable presented an average of 2.8826 evidences that the population considers as regular this service offered by the municipality. It is worth noting that the standard deviation was the second largest with 1.20086 of the social dimension. According to the City Hall, Imperatriz is the first city in the state of Maranhão to count on the service of selective garbage collection in the residences and that the works were intensified from September 11, 2018 (IMPERATRIZ CITY HALL, 2019).

The City Hall also informs that only in the Association of Collectors of Recyclable Materials of Imperatriz (ASCAMARI), about 50 families obtain their income from the selective garbage collection. This work results in a reduction of approximately five tons of recyclables per week, which would be destined to the dump. With the collection of household waste, the amount of waste destined to the garbage dump will be reduced, as well as increasing the income of families living in the segregation and destination of recyclable products (IMPERATRIZ CITY HALL, 2019).

Table 12 - Selective Garbage Collection

Grade	Frequency	Percentage	Valid Percentage	Cumulative Percentage	Average	Standard Deviation
Very poor	83	20,3	20,3	20,3	2,8826	1,20086
Poor	47	11,5	11,5	31,8		
Regular	139	34,0	34,0	65,8		
Good	115	28,1	28,1	93,9		
Excelent	25	6,1	6,1	100,0		
Result	409	100,0	100,0			

Source: Elaborated by the authors

The last variable of the social dimension was the internet service provided in the municipality. According to information provided by the City Hall, the municipality of Imperatriz is participating in the "People Make a Connected City" Program and already offers open internet for the population. Free internet points are only available at bus stops in the central region. This service is the result of a partnership between the City of Imperatriz and the Jupiter company. However, this program does not reach the entire population, especially in the peripheral region.

Despite this initiative of the public power and as presented in Table 13, respondents (74.8%) believe that the service offered is between bad and regular. This also reflects the average (2.6553) and the standard deviation (1.21509) which is the largest of the social dimension.

Table 13 - Internet Service available in the municipality

Grade	Frequency	Percentage	Valid Percentage	Cumulative Percentage	Average	Standard Deviation
Very poor	94	23,0	23,0	23,0	2,6553	1,21509
Poor	85	20,8	20,8	43,8		
Regular	127	31,1	31,1	74,8		
Good	74	18,1	18,1	92,9		
Excelent	29	7,1	7,1	100,0		
Result	409	100,0	100,0			

Source: Elaborated by the authors

The second dimension analyzed was economic and environmental. The following variables were used for this research: job offer to characterize the economic dimension, green areas and preserved areas in the municipality and implementation of a sewage treatment plant for the environmental dimension.

When analyzing Table 14, it was verified that the respondents considered the supply of employment in the municipality of Imperatriz-MA as regular (58.4%) and poor (32.5%). This shows a low dispersion in the responses, since the standard deviation was 0.60822. The data are in line with the current Brazilian scenario in which the unemployment rate is 11.6%, corresponding to 12.2 million Brazilians out of the labor market (IBGE, 2019). But the data provided by the Ministry of Labor (2018) are contrary to the opinion of the population, since from 2016 to 2017 there were 2965 jobs created in the city representing a relative growth of 5.9%. This growth in the supply of employment in Imperatriz was driven by the construction sector, which created 1152 vacancies, showing a relative variation of 47.1%.

Table 14 - Job offer

Grade	Frequency	Percentage	Valid Percentage	Cumulative Percentage	Average	Standard Deviation
Excelent	1	,2	,2	,2	3,2323	,60822
Good	36	8,8	8,8	9,0		
Regular	239	58,4	58,4	67,5		
Poor	133	32,5	32,5	100,0		
Total	409	100,0	100,0			

Source: Elaborated by the authors

Concerning the environmental issues, it was verified that the municipality has the Ordinary Law nº 1068/03 to organize the urban afforestation and the green areas of its urban perimeter, imposing to the citizens the co-responsibility with the municipal public power in the protection of flora and establishes criteria and standards related to urban afforestation (IMPERATRIZ, 2003). However, the respondents report that the green areas and preservation areas in the municipality are insufficient, on 52.3% of the opinions, as presented in Table 15. Another important point to highlight is the degree of dispersion presented in this variable was 0.62489, that is, a low level of dispersion in the responses.

Table 15 - Green areas and preservation areas

Grade	Frequency	Percentage	Valid Percentage	Cumulative Percentage	Average	Standard Deviation
Enough	29	7,1	7,1	7,1	2,4523	,62489
Regular	166	40,6	40,6	47,7		
Not enough	214	52,3	52,3	100,0		
Result	409	100,0	100,0			

Source: Elaborated by the authors

The last variable of the economic and environmental dimension was the implementation of a sewage treatment plant. Currently, the municipality of Imperatriz has a sewage treatment plant in the Ouro Verde District, built in 1980. In analyzing Table 16, it was noted that respondents consider it very necessary to establish a sewage treatment plant (77, 3%). They consider the current situation of the municipality very precarious and argue that the sewage, of many residences, is discarded in the rivers of the region. This assertion is in line with the presented mean of 1.2469 and low dispersion of responses (standard deviation of 0.48014).

Current public management is investing in new sewage treatment plants to improve this service delivery. However, on September 19, 2017, the Public Prosecutor's Office of the State of Maranhão filed a Public Civil Action against the Environmental Sanitation Company of Maranhão (Caema) and the Municipality of Imperatriz on account of waste releases from residences and commercial establishments in streams without any previous treatment.

Table 16 - Implementation of a sewage treatment plant

Grade	Frequency	Percentage	Valid Percentage	Cumulative Percentage	Average	Standard Deviation
Very necessary	316	77,3	77,3	77,3	1,2469	,48014
Necessary	86	21,0	21,0	98,3		
A little necessary	6	1,5	1,5	99,8		
Not necessary	1	,2	,2	100,0		
Result	409	100,0	100,0			

Source: Elaborated by the authors

The third dimension analyzed was politics and according to Barbieri and Lage (2001, pp. 3-4) it includes the creation of conditions for the effective participation of the civil society in planning and social control of public policies, from the availability of a disaggregated information base that allows a more accurate analysis of the economy and local social reality, providing conditions for the participation of society in sustainable development projects. For this research the following variables were used: public hearings, population participation in public hearings and political decisions, implantation of bicycle lanes, sidewalks and the *Aedes Aegypti* mosquito.

In analyzing Tables 17 and 18 which refer to holding public hearings and the participation of the population in these hearings and in public decisions, it was found that, although the municipality informed the public hearings through the site and in the local media, 82,4% of the population that participated in the survey reported that public authorities do not hold such hearings, and 62.6% said they did not participate in public decisions, with a standard deviation of 0.38132 and 0.72800 respectively. It is important to remember that the participation of the population in public hearings is very important for the sustainable development of the municipality.

Table 17 - Public hearings

Grade	Frequency	Percentage	Valid Percentage	Cumulative Percentage	Average	Standard Deviation
Yes	72	17,6	17,6	17,6	1,8240	,38132
No	337	82,4	82,4	100,0		
Result	409	100,0	100,0			

Source: Elaborated by the authors

Table 18 - Participacion on Public hearings and Public decisions

Grade	Frequency	Percentage	Valid Percentage	Cumulative Percentage	Average	Standard Deviation
Very participative	8	2,0	2,0	2,0	3,5061	,72800
Participative	33	8,1	8,1	10,0		
Low participative	112	27,4	27,4	37,4		
Not participative	256	62,6	62,6	100,0		
Result	409	100,0	100,0			

Source: Elaborated by the authors

In addition to public hearings as an important factor for the political dimension, another important point is the right of citizens to come and go. In this way, in 2012 the Federal Government establishes the National Urban Mobility Policy through Law 12,587. This law aims to ...

[...] contribute to the universal access to the city, foster and implement conditions that contribute to the implementation of the principles, objectives and guidelines of the urban development policy, through the planning and democratic management of the National System of Urban Mobility (BRAZIL, 2012, Art. 2).

The law also states that this policy is ...

[...] an instrument of urban development policy dealt with in item XX of art. 21 and art. 182 of the Federal Constitution, aiming integrating the different means of transport and improving the accessibility and mobility of people and cargo in the territory of the Municipality (BRASIL, 2012, Art. 1).

In compliance with Law 12,587 / 12, the municipality of Imperatriz-MA instituted the Municipal Plan of Urban Mobility through Law 1,555 / 14. The Plan, in article 2, aims to "provide broad and democratic access to urban space, prioritizing the means of motorized and non-motorized collective transportation, in an inclusive, sustainable and accessible way" (IMPERATRIZ, 2014, p.1).

Thus, when analyzing Table 19, it was observed that 57.5% of the participants believe that the implantation of bicycle lanes is very necessary and 33% consider it necessary. They argue that this would improve the flow of traffic in the city. However, the average was very low 1.5428 showing that the conditions of the city's bicycle path are precarious.

Corroborating with the opinion of the population, Figure 1 shows the condition of the bike path in the urban stretch on BR-010, which starts at Avenida Bernardo Saião and extends through six neighborhoods until reaching the road that gives access to the Rice Road. It is noted that there is a lack of signage on the site, high scrub, many holes and mud accumulation increased the risk of accidents on the spot.

Table 19 - Bicycle Path Implementation

Grade	Frequency	Percentage	Valid Percentage	Cumulative Percentage	Average	Standard Deviation
Very necessary	235	57,5	57,5	57,5	1,5428	,72677
Necessary	135	33,0	33,0	90,5		
A little necessário	30	7,3	7,3	97,8		
Not necessário	9	2,2	2,2	100,0		
Result	409	100,0	100,0			

Source: Elaborated by the authors

Picture 1 - Urban Bicycle Path Ciclovia in BR-010 road in Imperatriz-MA

Source: The authors' personal files.

Still under the perspective of the Municipal Policy of Urban Mobility, another aspect that deserves attention is the condition of the sidewalks. Table 20 shows that 49.6% of the respondents consider the sidewalks of the municipality to be a little accessible and 34% consider them inaccessible. When analyzing Figure 2, we can notice the poor condition of the sidewalk and this is recurrent throughout the municipality, evidencing the lack of accessibility for the pedestrian. This situation contradicts the objective proposed by the Municipal Urban Mobility Plan (Law 1,555/14), which is to provide the population with more inclusive, sustainable and accessible urban mobility.

Table 20 - Sidewalks evaluation

Grade	Frequency	Percentage	Valid Percentage	Cumulative Percentage	Average	Standard Deviation
Fully accessible	16	3,9	3,9	3,9		
Accessible	51	12,5	12,5	16,4		
A little accessible	203	49,6	49,6	66,0	3,1369	,77702
Unnaccessible	139	34,0	34,0	100,0		
Result	409	100,0	100,0			

Source: Elaborated by the authors

Picture 2 - Sidewalk in Imperatriz-MA

Source: The authors' personal files.

Table 21 shows the treatment of data performed in relation to the Municipal Management Commitment Criterion together with the Population in Combating the *Aedes Aegypti* mosquito.

Table 21 - Combating the *Aedes Aegypti* mosquito

Grade	Frequency	Percentage	Valid Percentage	Cumulative Percentage	Average	Standard Deviation
Excelent	6	1,5	1,5	1,5	3,0220	,71195
Good	81	19,8	19,8	21,3		
Regular	220	53,8	53,8	75,1		
Poor	102	24,9	24,9	100,0		
Total	409	100,0	100,0			

Source: Elaborated by the authors

It was noted that 53.8% of the respondents consider the commitment of Municipal Management together with the Population in Combat to the Mosquito *Aedes Aegypti* regular and 24.9% very bad. After a high number of cases of dengue, zica and chycungunha in the northern region of the country, public authorities carried out several actions to prevent mosquitoes from proliferating, such as: reduction of exposed litter and awareness of the population to avoid the accumulation of water in containers. The population recognizes as positive these actions by the government, as observed in the average of 3.0220, but still needs a greater attention on the part of all the inhabitants of the city of Imperatriz-MA.

4.4 KMO and Factor Analysis

After the analysis of descriptive statistics, we analyzed if the data obtained were adequate for the application of the factorial analysis. Thus, the Kaiser-Meyer-Olkin test (KMO) was used to indicate the degree of susceptibility or the fit of the data to the factorial analysis, that is, what

level of confidence can be expected from the data when treatment using the multivariate method of factor analysis is successfully employed (HAIR et al., 2009).

For the interpretation of the obtained result, values close to 1.0 indicate that the method of factorial analysis is perfectly adequate for the treatment of the data. On the other hand, values lower than 0.5 indicate the inadequacy of the method (HAIR et al, 2009). Table 22 shows the results obtained by the KMO test.

Table 22 - KMO Test and Bartlett's sphericity

Kaiser-Meyer-Olkin measure of sample adequacy		,688
Bartlett's sphericity Test	Aprox. Chi Square	615,569
	df	105
	Sig.	,000

Source: Elaborated by the authors

When analyzing Table 22, it was verified that the KMO of the sampling is 0.688, evidencing that the value obtained in this test is adequate for the factorial analysis, which means that the factorial analysis is adequate for the proposed data treatment.

After the KMO analysis, the factorial analysis of the dimensions of sustainable urban development was carried out, which for this study was divided into three dimensions: social, economic and environmental and political, as presented in Table 23.

Table 23 - Factorial Analysis of the Dimensions of Sustainable Urban

Dimensions	Variables	Extraction
Social	SAFETY	,671
	TRAFFIC SECURITY (ROADS AND ROADS)	,544
	HEALTH SERVICE OFFERED BY THE MUNICIPALITY	,494
	EDUCATION	,595
	BASIC SANITATION SERVICES	,447
	SELECT COLLECTION SERVICE	,433
	INTERNET SERVICE AVAILABLE IN THE MUNICIPALITY	,643
Economic and Environmental	JOB OFFERS	,552
	GREEN AREAS AND AREAS OF PRESERVATION	,347
	IMPLEMENTATION OF A SEWAGE TREATMENT STATION	,548
Politics	PUBLIC HEARINGS	,568
	IMPLANTATION OF BICYCLE PATHS	,549
	SIDEWALKS	,639
	FIGHTING THE MOSQUITO AEDES AEGYPTI	,480

Source: Elaborated by the authors

In the social dimension, it was verified that all variables positively and moderately influence the dimension. It stands out for the variable "Security" that presented the largest casual relation with a factorial load of 0.671. Thus, it can be said that the population recognizes that investments in public security are an important factor to promote the quality of life of the inhabitants. On the other hand, the variable 'Service of Selective Garbage Collection' showed the lowest casual relationship of the social dimension with a factorial load of 0,433. It should be

noted that, even with the lowest factor load, the population considers that this service contributes to the insertion of the population in situations of high social vulnerability in the labor market and provides the reduction of waste that is discarded in the environment.

When analyzing the economic and environmental dimension, it was verified that the population recognizes that the job offer is an important variable for sustainable urban development, since it presents a positive and moderate factor load of 0.552. Regarding the environment, the variable with the highest causal relationship was the implementation of a sewage treatment plant with a factorial load of 0.548. The population recognizes that with the implementation of more sewage treatment plants there will be improvements not only in environmental issues, but also a decrease in waste disposal in the city's rivers, as well as improvements in the health area, with a decrease in diseases such as hepatitis.

Finally, it was verified that participation in public hearings, conditions of bicycle paths and sidewalks and the fight against the mosquito *Aedes Aegypti* influence positively and moderately the political dimension. It should be noted that the population recognizes that the improvement of the sidewalk conditions is an important factor for the improvement of mobility and accessibility of the population, since it presented the largest factorial load of the dimension (0.639). Another point worth mentioning is the variable participation in public hearings, since it presented the second largest factorial load (0.568) of the political dimension. The greater the participation of the population in public hearings and decisions, the greater the benefits generated for the city, thus, providing adequate sustainable urban development.

5 Final considerations

Planning a city within the guidelines of sustainable urban development is not an easy task for the public managers of the Brazilian municipalities, as they face great difficulties such as: disordered urban growth, increased pollution, health problems, lack of mobility and accessibility of the population, increase of crimes and among others.

In order to contribute to the area of knowledge, this study had as a guide the following research question: How do the inhabitants of the city of Imperatriz - MA recognize the social, economic, environmental and political dimensions of sustainable urban development?

Thus, the study was based on three dimensions of sustainable urban development in the view of Barbieri and Lage (2001), namely, social, economic, environmental and political dimension.

With regard to the social dimension, the respondents say they feel insecure both in relation to the commission of crimes and in relation to traffic on the streets and highways. In the same dimension, dissatisfaction can be observed regarding the health, education, basic sanitation, selective garbage collection and internet services provided by the municipality, in which an average variance between regular and very poor was obtained.

In the economic and environmental dimension, it is also observed the dissatisfaction of the individuals submitted to the research, since the average of the evaluation of the job offer was predominantly regular; in relation to the number of green areas and preservation areas,

these were considered insufficient, as was also understood by the extreme necessity of the implementation of a Sewage Treatment Station.

As for the political dimension, it was observed that the majority of the population is not informed of public hearings and does not participate in them. Regarding the implantation of bicycle lanes, it was considered of extreme necessity, just as the sidewalks of the city were considered, little accessible. In the same dimension was also analyzed the commitment of the administration and the population to combat the mosquito *Aedes Aegypti* that was considered regular.

In view of the above, it can be concluded that the city of Imperatriz-MA is not within the principles of sustainable urban development by the opinion of the inhabitants. Despite this conclusion and based on the data collected, it is important to highlight that the population is not participatory in the process of building a better and more sustainable city. In this way, the creation of a more sustainable city requires the participation not only of the public power, but also of the population in general.

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