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Measurement Model of Healthy and Sustainable Cities: The Perception Regarding the Sustainable Development Goals

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Abstract: This article aims to verify the sustainability indicators that constitute a model for measuring healthy and sustainable cities and their perception of the sustainable development goals of the United Nations. To achieve this, a systematic literature review was conducted to identify sustainability indicators in healthy sustainable cities and, subsequently, included in a questionnaire. A questionnaire was administered in the city of Florianópolis, and subsequently, the results were analyzed through descriptive statistics. The relationship between these indicators and the United Nations' sustainable development goals was analyzed. A major contribution of this article lies in the methodology used for generating the model comprising indicators derived from the literature and validated through field research involving the local population. A contribution lies in the theoretical contribution involving the construction of a comprehensive framework of relevant articles on the topic of healthy sustainable cities. From a practical standpoint, this research generates actionable knowledge for municipal administrations, thus aiding in the promotion of sustainable development goals.

Keywords: measurement model; healthy sustainable cities; sustainable development goals; sustainability indicators

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1. Introduction

Sustainability is a comprehensive concept that assesses a city's ability to sustain itself. Being sustainable involves the conscientious use of natural resources for construction, production, living, and profit generation while ensuring the continued availability of these resources for future generations [1]. Being fully sustainable is a difficult task for cities, so many adopt actions related to sustainability.

If there are difficulties in making all actions sustainable and being considered sustainable, then one needs to know how sustainable the actions carried out by a specific city are. To determine the level of sustainability, performance indicators can be used, indicators should communicate progress towards an objective, for example, in a city, a certain sustainable action exists, and if yes, at what level of complexity. Furthermore, it is possible to verify the representativeness of that action in relation to others.

Intending to direct states around the world to achieve the goal of making the planet more sustainable for future generations, the United Nations (UN), with 193 countries, created the so-called Sustainable Development Goals (SDGs). The SDGs comprise 17 goals–totaling 169 targets–covering various factors of social and economic development such as poverty, education, health, and the environment, among others.

Among the goals included in the SDGs, is objective 11, UN (2020): "Making cities and human settlements inclusive, safe, resilient and sustainable". Making a city or community sustainable encompasses several factors, having an interconnection with other SDGs due to the aspects that must be taken into account when it comes to urban spaces. Several studies are being carried out to contribute to the SDGs, such as models of healthy, smart, and sustainable cities [2].

The world community must ensure that all members of society can meet their needs (employment, food, health, education, energy, housing, water, and sanitation), now and especially for their future. Bearing in mind that today, global economic systems are interconnected, there is a need for an integrated approach aimed at promoting, in the long run, responsible economic growth. For the conservation of natural resources and environmental heritage as a whole, economically viable solutions need to be developed [3].

To achieve sustainable development, there must be planning in the city aiming at this, since planning decisions affect urban populations, whether in terms of health, safety, or well-being. Residential location, for example, affects social inequality, mobility, and even mortality [4].

However, it is important to emphasize that according to Yang et al. [5], planning for a sustainable city must take into account the resources and conditions of each city, as different regions must take appropriate measures for each reality. Therefore, adapting the indicators for each reality and ascertaining the needs of the population is essential.

The green city takes into account the principles of sustainability. It admits the economic importance of cities, but also of the habitat in which it is inserted, and of human beings and their physical and psychological health. It considers the need to live well today, but to be aware that future generations must also live well. Moreover, it goes beyond future generations of human beings, thinking of all living beings [6].

Several surveys propose sustainability indicators for cities [4,7–9], however, what is the impact that these indicators have on whether a city can comply with the SDGs is an issue to be investigated. Considering that 193 UN Member States have formally adopted the SDGs, it is important to know how much the actions developed by their cities impact the SDGs [2].

Based on this context, the objective of this research is to verify which sustainability indicators make up a model for measuring healthy sustainable cities and their perception of the SDGs. This work is unprecedented when questioning the population of greater Florianópolis about indicators of healthy and sustainable cities, also covering the SDGs. The article presents a methodological contribution by listing a series of indicators and sub-indicators based on the literature and subsequently applying it to the population of a given region. It also contributes to a theoretical aspect by listing a literary framework of articles relevant to the theme of healthy sustainable cities.

2. Theoretical Bases

Many challenges are encountered in the urbanization process [10]. Economic activities degrade the environment by generating waste and pollutants. Population concentration can also give rise to issues such as poverty, unemployment, health, and education, among others. Sustainable development encompasses the three dimensions of economic, social, and environmental that need to be considered in urban management [11].

Sustainable cities are defined as cities that aim to reduce their environmental impacts, aiming for social welfare and economic development [3]. A sustainable city aims to develop responsibly, taking into account the economic, social, and environmental [6]. Even though in some cases there is a predominance of some of the three spheres (environmental, social, and economic), it is recommended that the three dimensions be present as a management priority [12].

According to Wang and Peng [13], in addition to quantifiable physical standards, a city needs to improve the local quality of life, as perceived by residents and, therefore, the importance of listening to their voices cannot be overstated.

With the same intent that Agenda 21 (1992) promoted the principle of a healthy life, the World Health Organization (WHO–1997) proposed the Healthy City (HC) project that focused on sustainable urban development. According to WHO (1998), a healthy city aims to create and continuously improve the physical and social environment, allowing people to support each other towards the development of their full potential. Research projects have been carried out aiming to contribute to sustainable development (social, economic, environmental) and compliance with the SDGs while contributing to the process of managing a healthy, smart, sustainable city [11,14]. Typically, sustainability indicators are used to help measure and assess sustainable performance, whether in organizational settings or in public settings [15].

Ruan, Yan, and Wang [9] propose a new perspective of policy analysis for resource-based cities, analyzing deficiencies in their development process and implementing effective sustainable development policies through indicators: (1) Economic development, (2) Improvement of livelihoods, (3) Resource assistance, (4) Conservation of the ecosystem [9]. Rotmans, Asselt, and Vellinga [7] propose the use of an integrated city planning tool and present how they have improved the various factors that make up a city with the efficient use of resources, facilitating the creation of sectoral policies and other advantages [7]. The tool covers economic, socio-cultural, and ecological areas, which have their own sub-indicators such as resources/materials, work structure, transport infrastructure, demographic structure, knowledge structure, cultural heritage, quality and quantity of natural resources, and biodiversity.

Brito et al. [14] developed a multi-criteria model that facilitated the sustainability assessment of green cities using the multi-criteria decision approach (MCDA). The authors reached the following criteria: people, mobility, water, energy efficiency, biodiversity, waste, governance, and innovation [14].

Deng, Peng, and Tang [16] presented a quick method of comparing and evaluating a city's sustainability performance using four 'Primary Dimensions' and twelve 'Sub-Dimensions': (1) Construction and Facilities (Intensity of land consumption, Energy efficiency, Resource consumption efficiency); (2) Natural Environment (Biodiversity, Environmental energy, Local environment); (3) People's Satisfaction (Healthcare, Accessibility to facilities, Housing costs, Neighborhood and community); (4) Transport system (Public transport and private vehicles) [16].

2.1. Social Dimensions in Cities

Cities are also facing several ecological challenges due to the high consumption of natural energy and resources, the use of land and water, besides climate change, air pollution and congestion, as rapid urbanization requires more intelligent uses of the resources. Thus, social inclusion and ecological sustainability are the two main challenges of the present, once cities are important locations to manage those social, economic and ecologic challenges [17].

Social sustainability is interconnected with social needs, particularly those of vulnerable populations. Social initiatives often require urgent and direct responses. Over the last few decades, the concept of social sustainability has been categorized into two primary groups: (1) limited to corporate policies, and (2) the evolution of social responsibility into social commitment, aiming to serve as a mechanism for action by social movements, Non-Governmental Organizations (NGOs), and civil community associations [18]. Both groups are relevant to social sustainability in cities.

Sokolov et al. [19] carried out an analysis of the main characteristics of smart cities, according to the authors, demographic factors can impact urban development in terms of diversity, availability of resources, and economy. The effects of population growth can be positive (variety of urban environments, infrastructure, transport), and negative (problems with income distribution, intensive use of resources, health problems, pollution). But, as population growth has effects, the reduction in the population growth rate also has effects, such as economic stagnation [19].

The objective of SDG with social sustainability lies in the upgrade of cultures, environment protection and local improvement of communities when defining politics and programs [20]. One of the modes to reach SDG is to increase urban resilience promoting an adequate construction of open spaces as a component of green structure. That way, a good project may bring benefits such as increasing diversity in the city's urban environment, rainwater management, a better hydrologic system and human health support [21].

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Jing and Wang [22] proposed an evaluation system for the sustainable development of resource-based cities, following the approach of complex networks, the evaluation system is composed of the subsystems: Society, Economy, and Environment [22].

Still, according to Jing and Wang [22], the sustainability of the society's subsystems can be considered a goal for sustainable development. After all, the quantity and quality of life of the population affect the economy and the environment.

2.2. Economic Dimensions in Cities

Economic factors influence the sustainable development of the city in terms of innovation, economic growth, and government policies, such as taxes and income distribution. Economic factors can confront social and environmental factors, for example, issues related to consumption and resource preservation [19].

According to Jing and Wang [22], the economic subsystem is the main one in the system, as it provides material products and financial support to the social subsystem aiming at population development, influencing the environment subsystem [22]. Moreover, according to Jing and Wang [22], there is a complex relationship between the three subsystems (social, economic, and social) and this relationship provides support for all human activities, whether due to the demand for resources, information, or even capital [22].

Currently, cities already consume more than 75% of the globally available natural resources, which include primary energy, stocks, fossil fuel, water, and food. Additionally, it is projected that by 2050, this consumption of natural resources may escalate to 90 million tons per year, a significant increase from 40 million tons in 2010 [23]. A major part of anthropogenic cargo on the environment comes from resource extraction, processing and final disposal. Therefore, the way we extract resources is crucial to a sustainable economy. In order to achieve this objective, the entry of resources must be restricted to a secure level of extraction, processed and released back into the environment [24].

In order to reach global sustainability, the existence of a stable and sustainable economy is also required. One of the critical factors of a sustainable economy now lies in the rent and prosperity distribution, because accumulating even more wealth and money is one of the factors threatening global sustainability [25]. Besides this, the world economy and society are in a rapid process of digital transformation. Increasingly, economic benefits generated by a digital economy are becoming a new motor of economic growth and so digital changes in the economy have an enormous impact on environmental sustainability. This technology has been used largely in environmental governance, supporting the reduction in pollution emissions. However, although it has a positive impact on the reduction in pollutants, the digital economy may also lead to higher consumption of energy and potentially more pollution [26]. Economists usually use the Gross Domestic Product (GDP) to summarize economic development and also, GDP per capita, which is GDP divided by the population. However, when analyzing GDP, other indicators should also be analyzed, for example, social welfare indicators. It is also noted that there are problems that can affect social well-being but are not being reflected in GDP, such as pollution and natural disasters [27].

According to Oliveira [28], economic sustainability is related to the generation of wealth and aims to generate greater income distribution. Achieving this objective may provide greater purchasing power for families in reduced purchasing power parity (PPC) conditions, thus providing social well-being [28].

Kourtit, Nijkamp, and Suzuki [29] present and test an advanced methodology, through the Data Envelopment Analysis (DEA) and the Global Power City Index (GPCI), to access and analyze the performance of strategies oriented to economy or sustainability for large urban agglomerations [29]. The main indicators that were gathered were divided between active resources, which include human capital (number of employees) and employment environment (wage level and ease of protection of human resources), healthy living conditions (healthy life expectancy, communities and number of doctors per population), climatic and environmental goals (ecology, levels of pollution and condition of the environment) and urban well-being (vitality of the economy, size and attractiveness of markets).

2.3. Environmental Dimensions in Cities

The environmental dimension was, initially, what represented the concern that arose in relation to the planet. Over time, this concern has evolved towards sustainable development, and together with two more dimensions (social and economic), has come to represent the three pillars of sustainability. Environmental sustainability aims to respect and care for the natural environment, as well as the preservation of natural resources through sustainable development [28].

El Ghorab and Shalaby [3] claim that environmental pollution is one of the main concerns of Egyptian cities, this concern reflects a reality faced in many cities on the planet [3].

Environmental pollution includes air, soil, and water. There are several factors that trigger pollution, such as over-concentration of the population (which demands infrastructure, employment, assistance) and economic activities. In addition, traffic, especially in large cities, becomes a major problem, because, in addition to causing an increase in emissions and polluting the air, it also puts pressure on infrastructure systems [3].

El Ghorab and Shalaby [3] propose to introduce the fundamentals of sustainable development in city planning in Egypt, both to solve structural problems in cities in the region and to improve effectiveness in the implementation of new communities [3]. The approach involves five criteria: (1) Urbanism (land use and architecture, such as demand for housing and services, distribution of land use, urban format, access to affordable and efficiently located housing, open and recreational green spaces, and standards of ecological construction); (2) Public infrastructure and facilities (transportation, energy, and waste management systems); (3) Society (equity and social inclusion); (4) Economy (economic base and employability and private sector development); (5) Environment (air and sound quality).

Meerow (2020), gathers data from analyses, research, and interviews to improve the understanding of green/sustainable infrastructure, talking about the Green Infrastructure Spatial Planning (GISP) model and the 6 criteria it covers: (1) Rainwater management; (2) Reducing social vulnerability; (3) Increased access to green spaces; (4) Reduced effect of urban heat islands; (5) Improve air quality; (6) Increased connectivity between landscapes [30].

3. Materials, Methods, and Techniques

The methodology of this research can be divided into Sections 3.1 and 3.2, which are qualitative stages of the research, where an analysis of the literature is necessary to arrive at the selected indicators and sub-indicators. The Section 3.3 employ a quantitative, conclusive, and descriptive approach.

3.1. Literature Review Procedures

For data collection regarding the construction of the model, a systematic literature review was chosen. For the theoretical framework, articles collected in international databases are used. In the selection of the portfolio, the keywords for the research are defined, which are as follows: Sustainable cities; Green cities; Smart Cities and Sustainable Development in cities. For the search, the Boolean expression used was: (sustainable * AND city) OR (green AND city) OR (city AND environment *) OR (smart AND city). Subsequently, with the arrival of the pandemic of COVID 19, a new search was carried out with the keyword "Healthy Cities" and articles relevant to the topic were included in the sample.

Following this first stage, a filtering process was used to exclude all duplicate articles. A second filtering process was used for the title alignment, thus, all titles not aligned with the theme were excluded. The third filter process was performed according to the representativeness of the article (number of citations) through Google Scholar where all articles with more than one quote were selected. Articles without a quote were read from the publications of the year 2020 only, articles prior to the current year without a quote were excluded from the selection. The next step was to read the abstracts manually to verify the representativeness of the articles. Table 1 shows the bank of articles collected on Healthy Sustainable Cities, from 2010 to 2020. However, the references of the selected articles were consulted and so, in the sample, there is an article from the year 2000.

Table 1. Bank of articles collected on Healthy Sustainable Cities.

Authors	Magazine
Rotmans et al. [7]	Environmental Impact Assessment Review
Rosales [8]	Procedia Engineering
Bao and Toivonen [31]	Journal of Science and Technology Policy Management
El Ghorab and Shalaby [3]	Alexandria Engineering Journal
Anand, Rufuss, Rajkumar, and Suganthi [32]	Energy Procedia
Brilhante and Klaas [33]	Sustainability
Giles-Corti et al. [4]	Health Policy
Silva, Santos, Maier, and Rosa [34]	Management Magazine
Su et al. [35]	Ecological Indicators
Deng et al. [16]	Cities
Sokolov et al. [19]	Technological Forecasting and Social Change
Alyami [36]	Ieee Access
Yang et al. [5]	Resources Policy
Ruan et al. [9]	Cities
Wang and Peng [13]	Mathematics
Steiniger et al. [37]	Cities
Li and Yi [11]	Journal of Cleaner Production
Kourtit et al. [29]	Science of the Total Environment
Jing and Wang [22]	Journal of Cleaner Production
Brito et al. [14]	Journal of Cleaner Production
Haase et al. [38]	Ambio
He et al. [39]	Aerosol And Air Quality Research
Juhola [40]	Urban Greening
Kaklauskas et al. [41]	Cities
Langellier et al. [42]	Health & Place
Laufs, Borrion and Bradford [43]	Sustainable Cities And Society
Macke, Sarate and Moschen [44]	Journal Of Cleaner Production
Meerow [30]	Cities
Mueller et al. [45]	Environment International
Pinochet et al. [46]	Revista de Gestão
Subadyo, Tutuko and Jati [47]	International Review For Spatial Planning And Sustainable Development
Taecharungroj, Suksaroj and Rattanapan [48]	Journal Of Place Management And Development
Vukovic, Rzhavtsev and Shmyrev [49]	International Review

Source: Made by the authors (2023).

These selected articles will be the basis for composing the indicators and the sub-indicators. However, other articles selected in the database will compose this research and support these indicators.

3.2. Indicator Elaboration Procedures

To develop the indicators, as shown in Figure 1, the indicators cited in the literature (articles presented in the previous topic) were identified, and all indicators were tabulated, verifying which ones were the most cited. These gave the indicators a name. Then, the sub-indicators were checked and tabulated according to the authors. In the next step, the sub-indicators related to each selected indicator were grouped, forming a set of sub-indicators for each indicator.

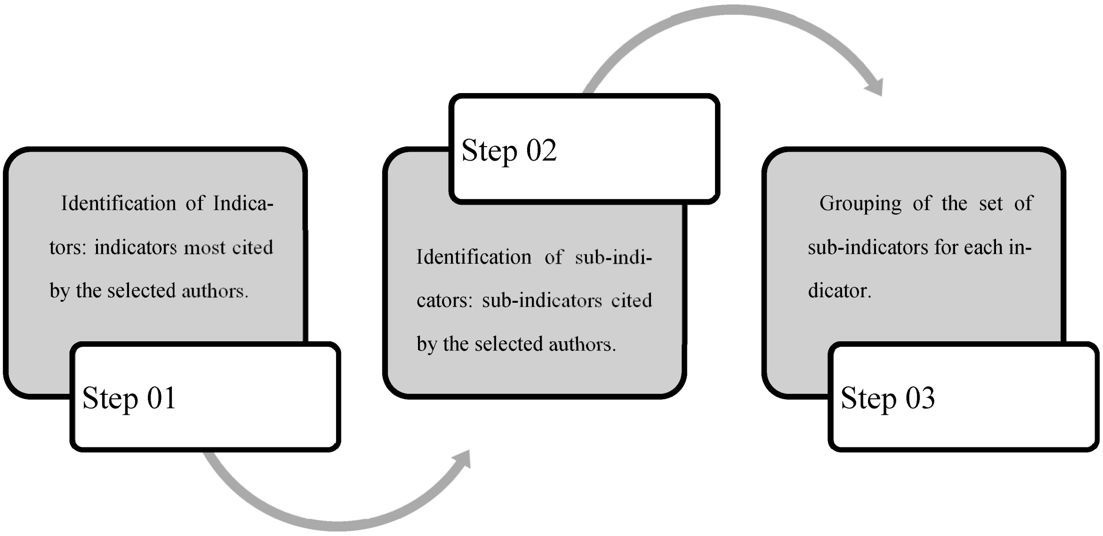

Figure 1. Indicator elaboration procedures. Source: Made by the authors (2023).

The indicators selected according to this methodology form three dimensions: (1) Social Indicator, with 24 sub-indicators; (2) Economic Indicator, with 19 sub-indicators; and (3) Environment Indicator with 14 sub-indicators. In addition to these indicators and sub-indicators, the SDGs were included in a fourth dimension.

3.3. Data Analysis

The research was carried out with data collected via survey using the Google Forms tool and analysis via descriptive statistics and partial least squares structural equation modeling technique. In this type of research, the procedure is quantitative where the data collection uses standardized methods and generates numerical data, which can be analyzed using graphs and statistical techniques. For the authors, the quantitative approach makes it possible to formulate hypotheses, which can be tested (contributing to the development of the theory) or examined in future research. The research is conclusive, as it seeks to test specific hypotheses and examine relationships. It is also descriptive, as it seeks to describe characteristics of a particular phenomenon for the purpose of establishing relationships between existing variables. The initial literature search concentrated on models that approached the research topic and that had already been empirically tested. The dimensions listed in the present study were identified, translated, analyzed, and adapted from these existing models while aiming at compatibility with the theme and context of the current research. Thus, the first version of the survey questionnaire comprised seventy-four questions on the four dimensions and, subsequently, was pre-tested. This was executed using a group of experts (composed of researchers, and professionals in the field of sustainability) who reviewed the initial questionnaire and provided feedback on the ease of comprehension, consistency, and adequacy of the sequence of items which in turn led to some specific changes.

The survey questionnaire was submitted to a sample of the population in Florianópolis using Google Forms. The objective was to assess the sustainability priorities of the population. Florianópolis is a coastal city in southern Brazil. Known as a smart city, it has a population of 508,826 inhabitants and a significant portion of the city's territory comprises an island. This data collection took place between 27 June and 18 August 2020, online, via the Google Forms tool with dissemination in social media and by email. The questionnaire used is in the Supplementary Materials. After receiving the completed questionnaires, a verification/validation process was carried out which resulted in a total of seventy-five valid questionnaires in the study. Despite the non-probabilistic sampling, this can be considered a homogeneous group having at least one common characteristic, i.e., as residents of greater Florianópolis (as recommended [50,51]). Finally, the collected data was inserted into Excel spreadsheets and analyzed using descriptive statistics, with support from the SmartPLS software, version 3.

Therefore, the quantitative approach aims to quantify and gather numerical data, and in the case of this article, the indicators were assessed, generating numerical data. The conclusive research was applied in this work at the evaluation stage, where the decision-maker (researched person) assesses each indicator as very relevant, relevant, indifferent, irrelevant, or very irrelevant to them. The objective of generating numerical data and evaluating each of the indicators was to verify which sustainability indicators constitute a measurement model for sustainable and healthy cities and their impacts on theSDGs.

4. Presentation and Analysis of Results

Seventeen articles were analyzed between the periods from 2010 to 2020, related to the addressed theme, according to keywords described in the methodology. And, afterward, an article from the year 2000 was included, as it is a relevant reference for one of the articles in the sample. From these articles, a healthy sustainable city model was formulated with indicators on the dimensions of sustainability (social, economic, environmental). Table 1 shown in the methodology presents the articles that were used for this study. In the second moment of the research, Partial Least Squares (PLS) analysis was carried out with the evaluation of the model, regarding the validity, reliability, and evaluation of the structural model.

To conduct these analyses, a survey questionnaire was administered to a sample of the population in Florianópolis using Google Forms. The objective was to assess the sustainability priorities of the population. Florianópolis, a coastal city in southern Brazil, is known as a smart city and has a population of 508,826 inhabitants. It is worth noting that a significant portion of the city's territory is comprised of an island.

We tried to select for the sample of inhabitants of the city, people with different levels of education and income, people with different interests in the city and different specialties, therefore, there are people who understand sustainability and others who are not familiar with the topic. In our sample, 88 respondents were collected. The sample is not statistically representative, as the sampling was intentional.

4.1. Healthy Sustainable City Model

The healthy sustainable city model is composed of 3 indicators that represent the dimensions of sustainability, they are (1) Social dimension in cities, with 24 sub-indicators; (2) Economic dimension in cities, with 19 sub-indicators; and (3) Environmental dimension in cities, with 14 sub-indicators.

A strategic map of the Social Indicator is presented in Table 2, which includes the indicator's description, sub-indicators, and the authors who supported each indicator and sub-indicator.

Table 2. Strategic Map of the Social Indicator.

1	Indicator	Social Indicator
	Description	Investments and appreciation in the social welfare of the inhabitants of the city.
	Authors	[3–5,7–9,11,13,16,19,22,32–35,37,39,52]
1.1	Sub-indicator	Access to farmers' market
	Description	Availability to purchase agricultural products.
	Authors	[39]
1.2	Sub-indicator	Access to high-quality education
	Description	Availability of high-quality schools to the population.
	Authors	[5,7,8,11,22,37]
1.3	Sub-indicator	Access to housing
	Description	Safe and quality housing for the population.
	Authors	[7,16]
1.4	Sub-indicator	Informal settlement area
	Description	Residential areas where residents do not own the land or housing where they live.
	Authors	[8,37]
1.5	Sub-indicator	Defending against the impact of natural and man-made disasters
	Description	Security in relation to natural and climatic disasters and also man-made disasters, whether due to irresponsibility or violence.
	Authors	[7,8]
1.6	Sub-indicator	Population density
	Description	Distribution and growth of a population. [11,19,22,32]
	Authors	(Brilhante & Klaas, 2018 [33]; Giles-Corti et al., 2020 [4]; Rotmans et al., 2000 [7]; Su et al., 2019) [35].
1.7	Sub-indicator	Social Equity
	Description	A set of practices that aim to eliminate exclusion and inequality.
	Authors	[3,7,8,32,37]
1.8	Sub-indicator	Employment structure
	Description	How jobs are structured in the city.
	Authors	[4,7,32]
1.9	Sub-indicator	Life expectancy
	Description	The approximate number of years of life for a group of individuals born in the same year provided that the same conditions are maintained since birth.
	Authors	(Brilhante & Klaas, 2018) [33]
1.10	Sub-indicator	Preservation of Cultural Identity
	Description	Preservation of the population's practices, knowledge, and cultural heritage.
	Authors	[7]
1.11	Sub-indicator	General price index to the consumer
	Description	Variation in prices of a set of goods and services.
	Authors	[7,11,22,35]
1.12	Sub-indicator	Knowledge infrastructure
	Description	Available infrastructure for services related to knowledge.
	Authors	[7]
1.13	Sub-indicator	Population education
	Description	Time spent by the population in the school period.
	Authors	[5,7,8,11,22,35]
1.14	Sub-indicator	Income level
	Description	Amount rewarded to a person or population for their services.
	Authors	[7,9,32]
1.15	Sub-indicator	Community Project
	Description	Set of practices carried out in favor of a specific community of a population.
	Authors	[39]
1.16	Sub-indicator	The average salary of employed staff and workers
	Description	The average amount of money received by workers and employees from a population for their services.
	Authors	[11]
1.17	Sub-indicator	Overcrowding of families
	Description	Families with homes that do not properly support the number of residents in it.
	Authors	[37]

Table 2. *Cont.*

1	Indicator	Social Indicator
1.18	Sub-indicator	Unemployment rate
	Description	The number of people in a population who are unemployed.
	Authors	[3,5,8,9,11,33–35]
1.19	Sub-indicator	Child mortality rate
	Description	Percentage of child deaths in the first year of their lives.
	Authors	[9,34].
1.20	Sub-indicator	Accident mortality rate
	Description	Percentage of people killed by accidents.
	Authors	[9,34].
1.21	Sub-indicator	The natural population growth rate
	Description	Difference between births and deaths.
	Authors	[11,22,33,34]
1.22	Sub-indicator	Urban vulnerability
	Description	Vulnerable urban area.
	Authors	[8,39]
1.23	Sub-indicator	Total Internet penetration
	Description	Percentage of the population with internet access.
	Authors	[33,37]
1.24	Sub-indicator	Municipal services assistance
	Description	Services that support the needs of a population.
	Authors	[7,13,16]

Source: Made by the authors (2023).

The preservation of cultural heritage also represents social sustainability due to its role in the construction of societies and the relationship between the preservation of historical and cultural heritage with the environment as a whole. The care of a population with these assets may depend on how much a population identifies with them. Therefore, if the populations incorporate measures to face pollution, deforestation, and global warming, among other problems, into their daily experiences, these measures will become more efficient [53].

Figure 2 presents the results of the classification carried out by the sample of the population of Florianópolis regarding the relevance of the social indicator.

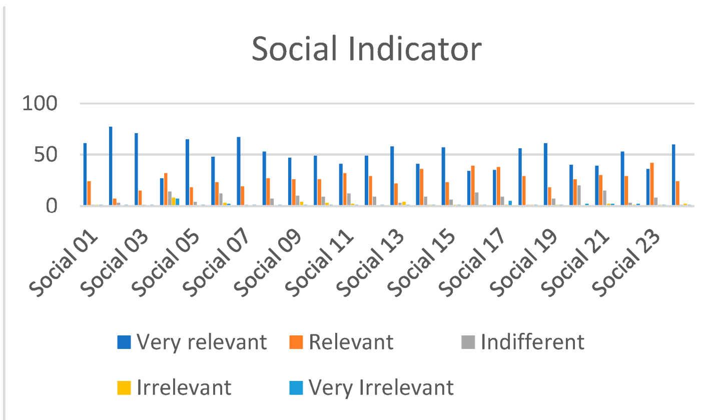

Figure 2. Social Indicator. Source: Made by the authors (2023).

Participants were asked in the questionnaire to classify each indicator according to relevance. It was perceived through the social indicator, that in general, all indicators were considered with some level of relevance. Sub-indicator 2, access to high-quality education, stands out, and obtained the highest number of Very Relevant. This may demonstrate the population's concern regarding this issue. Additionally noteworthy is sub-indicator 20, Accident mortality rate, with the highest number of Indifferent. Indicator 4, Informal settlement area, with the highest number of Very irrelevant. These results may have occurred due to a lack of knowledge about the municipality's data in relation to these topics, or even because it had little effect on the respondents' daily lives.

Table 3 shows the strategic map of the Economic Indicator, including the description of the indicator and the sub-indicators, as well as the authors who supported the indicator and the sub-indicators.

Table 3. Strategic Map of the Economic Indicator.

2	Indicator	Economic Indicator
	Description	Economic development and growth of a city.
	Authors	[3,5,7–9,11,19,22,29,32–35,39]
2.1	Sub-indicator	Market attractiveness
	Description	The attractiveness of the market in a city.
	Authors	[29]
2.2	Sub-indicator	Economic development
	Description	Level of economic development of a market.
	Authors	[3,5,29]
2.3	Sub-indicator	Gross Domestic Product (GDP)
	Description	Sum of goods and services produced in a region, over a given period.
	Authors	[9,11,22,34,35]
2.4	Sub-indicator	Gini Index
	Description	Degree of income concentration in a given population.
	Authors	[8,33]
2.5	Sub-indicator	Business parks
	Description	Spaces that facilitate business.
	Authors	[5,7,19]
2.6	Sub-indicator	GDP per capita
	Description	GDP divided by the number of inhabitants.
	Authors	[32–35]
2.7	Sub-indicator	Contingent Plan
	Description	Presence of plans to mitigate or prevent losses.
	Authors	[39]
2.8	Sub-indicator	The proportion of primary industry
	description	Percentage of the primary industry present in a city.
	Authors	[5,11,22]
2.9	Sub-indicator	The proportion of secondary industry
	Description	Percentage of the secondary industry present in a city.
	Authors	[5,11,22]
2.10	Sub-indicator	The proportion of tertiary industry
	Description	Percentage of the tertiary industry present in a city.
	Authors	[5,11,22]
2.11	Sub-indicator	The proportion of expenses with science and technology
	Description	Percentage of money spent on science and technology in a government.
	Authors	[11]
2.12	Sub-indicator	The proportion of education expenses
	Description	Percentage of money spent on education in a government.
	Authors	[11]
2.13	Sub-indicator	The proportion between available annual urban family income and rural family income
	Description	Comparison of the gain of urban families with that of rural families.
	Authors	[7,9,35]
2.14	Sub-indicator	Economic reserves
	Description	Amount of money that is saved.
	Authors	[7,22]
2.15	Sub-indicator	Market size
	Description	Market structure at a given location.
	Authors	[29]

Table 3. *Cont.*

2	Indicator	Economic Indicator
2.16	Sub-indicator	The regional revenue growth rate
	Description	Percentage of the increase in monetary inflow in a region.
	Authors	[22]
2.17	Sub-indicator	GDP growth rate per capita
	Description	Percentage of GDP growth per capita.
	Authors	[11,35]
2.18	Sub-indicator	Export rate to GDP
	Description	Percentage of exports made for GDP.
	Authors	[35]
2.19	Sub-indicator	Foreign investment rate in relation to GDP
	Description	Percentage of foreign investment to GDP.
	Authors	[11,35,39]

Source: Made by the authors (2023).

As for GDP per capita, when this percentage increases, economic well-being also tends to increase. Still, according to Sachs (2017), the wealthier countries (where GDP per capita is higher), also tend to have greater material well-being, as they have higher levels of consumption. However, as already mentioned, GDP and GDP per capita should be analyzed together with other indicators [27].

The Gini Index has its own calculation and interpretation methodology, ranging from 0.0 to 1.0. The result 0.0 indicates the absolute equality of income of a population. The 1.0 result indicates absolute inequality in a population. Generally, the data shows results between these values (0.0 and 1.0) when applied in real companies [27].

Figure 3 presents the results of the classification carried out by the sample of the population of Florianópolis regarding the relevance of the economic indicator.

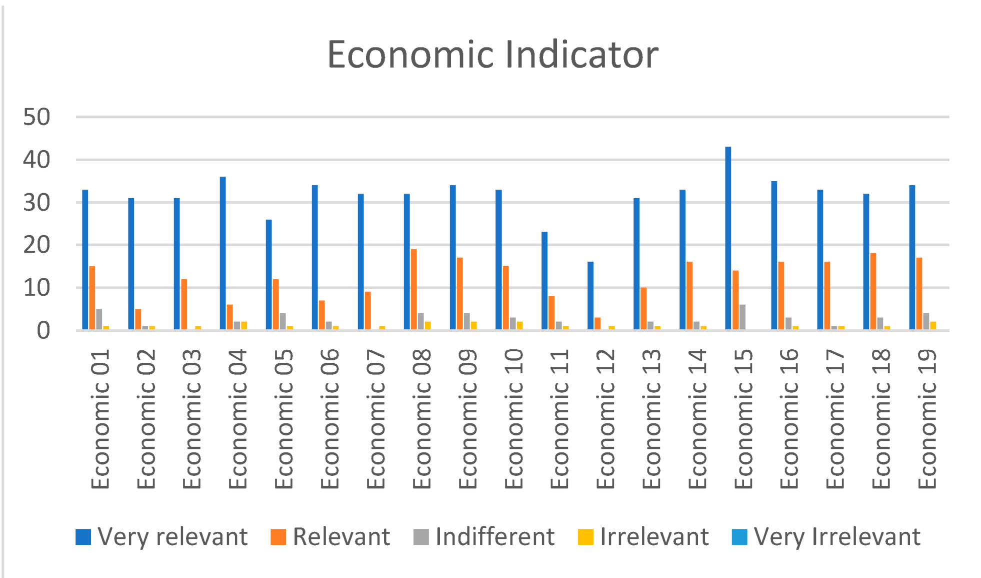

Figure 3. Economic Indicator. Source: Made by the authors (2023).

Regarding the Economic indicator, all indicators received a high rating of Very Relevant. Sub-indicator 15, Market Size, was the indicator with the highest number of Very Relevant, but also the indicator that received the highest number of Indifferent, demonstrating that the sample had people with different interests. None of the indicators were classified as Very Irrelevant by any respondent.

Table 4 presents the strategic map of the Environmental Indicator, including the description of the indicator and the sub-indicators, as well as the authors who supported the indicator and the sub-indicators.

Table 4. Strategic Map of the Environmental Indicator.

3	Indicator	Environmental Indicator
	Description	Investments and valuation of environmental issues in a city.
	Authors	[8,9,11,16,22,29,31–36]
3.1	Sub-indicator	The proportion of investment in environmental protection in relation to GDP
	Description	Investment aimed at environmental protection related to GDP.
	Authors	[35]
3.2	Sub-indicator	Per capita green area
	Description	The number of forest areas.
	Authors	[11,22,34,35]
3.3	Sub-indicator	The proportion of urban areas
	Description	Percentage of urban areas in a city.
	Authors	[11,34,35]
3.4	Sub-indicator	Solid waste emissions
	Description	Amount of solid waste emissions in a city.
	Authors	[11]
3.5	Sub-indicator	Total main pollutant emissions
	Description	Total amount of major pollutants.
	Authors	[9,11,22,29,32–34,36]
3.6	Sub-indicator	Ecological footprint
	Description	Pressure of consumption by a citizen or population under the environment.
	Authors	[8,32,36]
3.7	Sub-indicator	Proportion of treated consumer waste
	Description	Proportion of treated waste.
	Authors	[7,11,22]
3.8	Sub-indicator	Quality of urban life
	Description	Effectiveness and satisfaction with the lifestyle provided in the city.
	Authors	[7,8,32].
3.9	Sub-indicator	Soil quality
	Description	Quality of the city's soil.
	Authors	[7]
3.10	Sub-indicator	Preservation of biodiversity
	Description	Actions taken to preserve the diversity of fauna and flora in a city.
	Authors	[7,16,29,31]
3.11	Sub-indicator	Green coverage ratio of built areas
	Description	Effort in the afforestation of the city.
	Authors	[11]
3.12	Sub-indicator	Forest coverage rate
	Description	Percentage of forests belonging to a municipality.
	Authors	[35]
3.13	Sub-indicator	Household waste treatment fee
	Description	Amount of household waste treated.
	Authors	[35]

Source: Made by the authors (2023).

The Environmental indicator was also verified among the population (sample) of Florianópolis in order to verify which sub-indicators were considered relevant. Figure 4 presents the results of the classification carried out by the sample of the population of Florianópolis regarding the relevance of the environmental indicator.

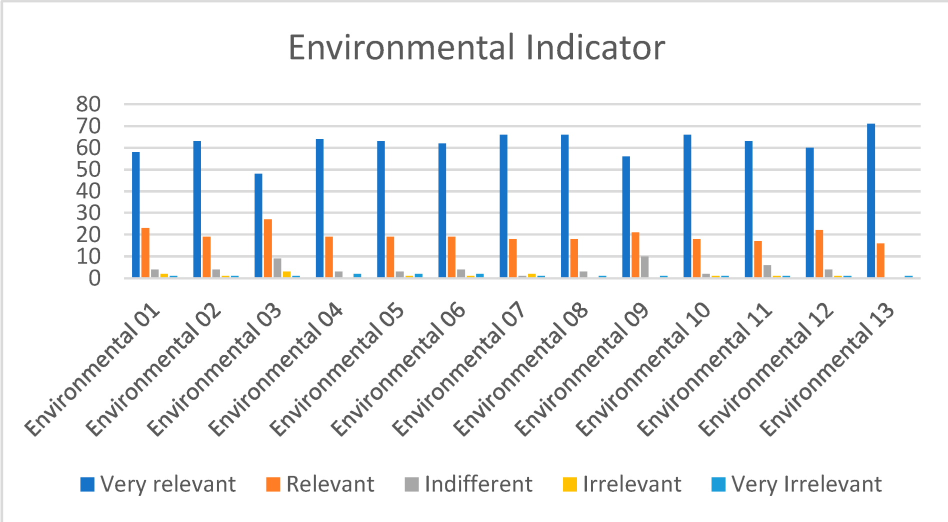

Figure 4. Environmental Indicator. Source: Made by the authors (2023).

The environmental indicator also received a large number of Very Relevant in all sub-indicators, but the highest ranked sub-indicator is 13, Household waste treatment fee. It is noted that, in the city of Florianópolis, new systems were implemented for the separation and collection of domestic waste, with entire condominiums joining in together with advances in selective collection. Therefore, this theme becomes a part of people's daily lives and, naturally, there is an expectation of the population for the correct treatment of household waste. Still, at least ten people considered sub-indicator 9, Soil quality, as Indifferent. Possibly, the reason for this is that the city's economy is related to information systems, services and tourism, and is on an island where there are many fishermen with seafood production interests rather than agricultural use of the available land. This indicates that only a small number of people engage in planting activities in Florianópolis, and those who do mostly maintain small gardens or isolated farms. The SDG was also verified among the population (sample) of Florianópolis in order to verify which sub-indicators were considered relevant. Figure 5 presents the results of the classification carried out by the sample of the population of Florianópolis regarding the relevance of the SDG.

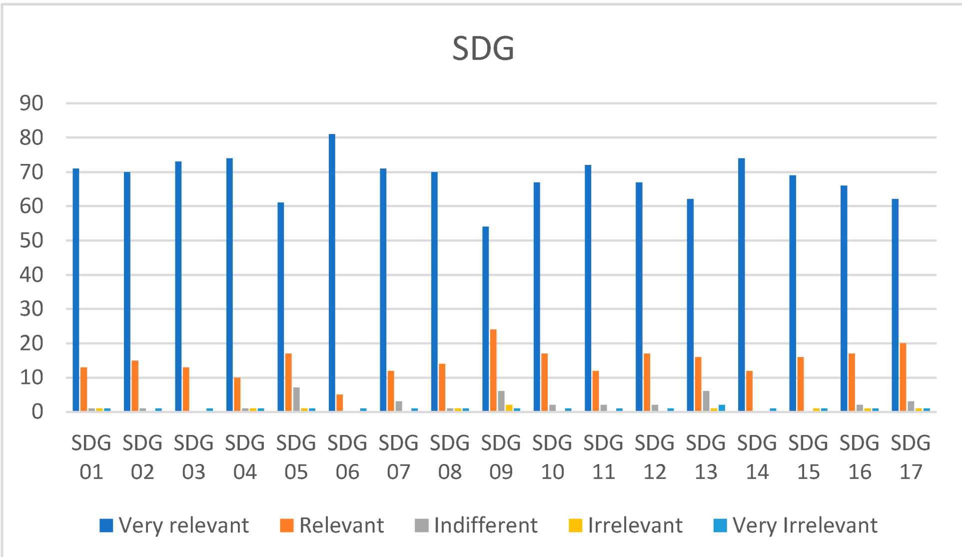

Figure 5. SDG Indicator. Source: Made by the authors (2023).

It is highlighted that some SDGs were considered very irrelevant by at least one person. SDG 9 was deemed irrelevant by two individuals. SDG 14 stands out as well, being considered very relevant by 74 people and relevant by 12 people. SDG 14 refers to life below water, considering that Florianópolis is largely an island, so the population is likely concerned about the sea.

4.2. Validation of the Healthy Smart Sustainable Cities

The implementation of Healthy Smart Sustainable Cities requires a series of actions aimed at sustainable development. The SDG presents objectives to assist in the management of these actions. In addition, the literature presents several models for the sustainability of cities. After the application of the methodology already presented, these models generated a new model of Healthy Smart Sustainable Cities, validated by a certain portion of the population.

To validate the model with the population, a questionnaire was made available to city residents. With these results, a descriptive analysis took place, making it possible to assess the relevance of each indicator and sub-indicator. Table 5 presents the descriptive analysis of the social sub-indicators.

Table 5. Descriptive Analysis of the Social Sub-indicators.

Indicator Social	Cronbach's Alpha	0.938	Composite Reliability	0.944	rho_A	0.942
Sub-Indicators	**Maximum**	**Minimum**	**Median**	**Mode**	**Mean**	**Standard Deviation**
1.1	5	1	5	5	4.594	0.674
1.2	5	1	5	5	4.802	0.591
1.3	5	1	5	5	4.75	0.580
1.4	5	1	4	4	3.760	1.185
1.5	5	1	5	5	4.646	0.664
1.6	5	1	5	5	4.281	0.948
1.7	5	1	5	5	4.698	0.600
1.8	5	1	5	5	4.5	0.725
1.9	5	1	5	5	4.323	0.900
1.10	5	1	5	5	4.333	0.854
1.11	5	1	5	4	4.25	0.833
1.12	5	1	5	5	4.427	0.750
1.13	5	1	5	5	4.521	0.833
1.14	5	1	5	4	4.333	0.777
1.15	5	1	5	5	4.469	0.781
1.16	5	1	4	4	4.198	0.789
1.17	5	1	4	4	4.062	1.003
1.18	5	1	5	5	4.573	0.692
1.19	5	1	5	5	4.542	0.807
1.20	5	1	5	4	4.177	0.940
1.21	5	1	5	4	4.156	0.921
1.22	5	1	5	5	4.458	0.807
1.23	5	1	4	4	4.271	0.747
1.24	5	1	5	5	4.583	0.721

Source: Made by the authors (2021).

As can be seen in Table 5, the sub-indicators were considered relevant by the specialists, therefore, all sub-indicators were kept. We highlight sub-indicator 1.2 of the Social, referring to Access to high-quality education (4.80) as the best -valuated sub-indicator, followed by sub-indicator 1.3 of the Social, referring to access to housing (4.75).

Additionally noteworthy are the sub-indicators with the lowest average among the sub-indicators: sub-indicator 1.4 of the Social, referring to Informal settlement area (3.76), as well as sub-indicator 1.21 of the social indicator, referring to the natural population growth rate (4.16).

Table 6 presents the descriptive analysis of the economic sub-indicators.

Table 6. Descriptive Analysis of the Economic Sub-indicators.

Indicator Economic	Cronbach's Alpha	0.947	Composite Reliability	0.953	rho_A	0.949
Sub-Indicators	**Maximum**	**Minimum**	**Median**	**Mode**	**Mean**	**Standard Deviation**
2.1	5	1	4	4	4.073	0.920
2.2	5	1	5	5	4.448	0.738
2.3	5	1	5	4	4.323	0.774
2.4	5	1	5	4	4.287	0.850
2.5	5	1	5	4.5	4.25	0.918
2.6	5	1	5	4	4.333	0.790
2.7	5	1	5	4.5	4.364	0.756
2.8	5	1	4	4	3.979	0.951
2.9	5	1	4	4	4.010	0.935
2.10	5	1	4	4	4.094	0.918
2.11	5	1	5	5	4.406	0.841
2.12	5	1	5	5	4.677	0.657
2.13	5	1	5	4	4.271	0.852
2.14	5	1	4	4	4.146	0.858
2.15	5	2	4	4	3.979	0.846
2.16	5	1	4	4	4.083	0.866
2.17	5	1	4	4	4.167	0.829
2.18	5	1	4	4	4.042	0.893
2.19	5	1	4	4	3.969	0.967

Source: Made by the authors (2020).

As can be seen in Table 6, Economic Sub-indicators, we highlight sub-indicator 2.12 of the Economic, referring to the proportion of education expenses (4.68) as the most highly ranked sub-indicator, followed by sub-indicator 2.2 of the Economic, referring to the Economic development (4.45).

Additionally noteworthy are the sub-indicators with the lowest average among the sub-indicators: sub-indicator 2.8 and 2.5, of the Economic, referring respectively to the proportion of primary industry (3.98) and Business parks (3.98), as well as sub-indicator 2.9 of the Economic indicator, referring to the proportion of secondary industry (4.01). Table 7 presents the descriptive analysis of the environmental sub-indicators.

Table 7. Descriptive Analysis of the Environmental Sub-indicators.

Indicator Environmental	Cronbach's Alpha	0.938	Composite Reliability	0.946	rho_A	0.940
Sub-Indicators	**Maximum**	**Minimum**	**Median**	**Mode**	**Mean**	**Standard Deviation**
3.1	5	1	5	5	4.521	0.767
3.2	5	1	5	5	4.594	0.719
3.3	5	1	5	5	4.333	0.866
3.4	5	1	5	5	4.604	0.747
3.5	5	1	5	5	4.552	0.819
3.6	5	1	5	5	4.552	0.806
3.7	5	1	5	5	4.635	0.712
3.8	5	1	5	5	4.667	0.643
3.09	5	1	5	5	4.458	0.794
3.10	5	1	5	5	4.646	0.680
3.11	5	1	5	5	4.573	0.750
3.12	5	1	5	5	4.562	0.723
3.13	5	1	5	5	4.75	0.562

Source: Made by the authors (2020).

As shown in Table 7, Environmental Sub-indicators, we highlight sub-indicator 3.14 of the Environmental, referring to Household waste treatment fee (4.75) as the best-evaluated sub-indicator, followed by sub-indicator 3.9 of the Environmental, referring to the quality of urban life (4.67).

Additionally noteworthy are the sub-indicators with the lowest average: sub-indicator 3.3 of the Environmental, referring to the proportion of urban areas (4.33), as well as sub-indicator 3.10 of the Environmental indicator, referring to the Soil quality (4.46).

The analysis related to the SDGs was also verified, according to the validation of the population. Table 8 presents the descriptive analysis of the SDGs.

Table 8. Descriptive Analysis of the SDGs.

Indicator Economic	Cronbach's Alpha	0.947	Composite Reliability	0.953	rho_A	0.949
Sub-Indicators	**Maximum**	**Minimum**	**Median**	**Mode**	**Mean**	**Standard Deviation**
SDG 1	5	2	5	5	4.781	0.533
SDG 2	5	2	5	5	4.767	0.540
SDG 3	5	2	5	5	4.808	0.490
SDG 4	5	1	5	5	4.794	0.645
SDG 5	5	1	5	5	4.507	0.818
SDG 6	5	2	5	5	4.904	0.414
SDG 7	5	2	5	5	4.753	0.572
SDG 8	5	1	5	5	4.726	0.692
SDG 9	5	1	5	5	4.493	0.884
SDG 10	5	2	5	5	4.671	0.602
SDG 11	5	2	5	5	4.753	0.572
SDG12	5	2	5	5	4.699	0.593
SDG 13	5	1	5	5	4.520	0.852
SDG 14	5	2	5	5	4.794	0.499
SDG 15	5	1	5	5	4.699	0.681
SDG 16	5	1	5	5	4.630	0.736
SDG 17	5	2	5	5	4.644	0.632

Source: Made by the authors (2020).

As shown in Table 8, SDG, we highlight indicator SDG 6, Clean Water and Sanitation (4.90) as the best-evaluated indicator, followed by indicator SDG 3, Good Health and Well-being (4.80). Additionally, noteworthy are the indicators with the lowest average: indicator SDG 9, Industry, Innovation and Infrastructure (4.49), as well as indicator SDG 13, Climate action (4.49).

Florianópolis is known as a city that focuses on well-being but has some issues to address regarding sanitation. We can infer that for these reasons, the population considered SDG 3 and SDG 6 as the most relevant, on average.

As for SDG 9, it might have been considered less relevant because the city's economy is not industrial-focused; Florianópolis relies on tourism and information technology. Regarding SDG 13, while it is important in all cities worldwide, it might not be a top concern for the population since Florianópolis is a coastal city in southern Brazil with humid air and mild climates.

The analysis was also carried out for the indicators, based on the evaluation of the sub-indicators. Table 9 shows the descriptive analysis resulting from the responses to the indicators.

Table 9. Descriptive Analysis of the Indicators.

Indicator	Maximum	Minimum	Median	Mode	Mean	Standard Deviation
Social Indicator	5	1	5	5	4.404	0.838
Economic Indicator	5	1	5	4	4.205	0.870
Environmental Indicator	5	1	5	4	4.248	0.891

Source: Made by the authors (2020).

Table 9 shows that among the social, environmental, and economic indicators, the social indicator obtained a higher average, while the economic indicator obtained a lower average. This result reflects the opinion of the surveyed individuals in the city of Florianópolis and should not be generalized.

4.3. Discussions of the Results in Relation to the Theory

The Social, Economic, and Environmental indicators, together, form the dimensions of sustainability. They are complementary and interconnected and are reflected in the SDGs. These dimensions are influenced by many factors such as population density, infrastructure (employment/knowledge/housing/assistance), and natural resources. Understanding the interrelation of these dimensions with these diverse factors is effective in the search for social harmony, economic development, and environmental protection [22].

The implementation of healthy sustainable cities requires a series of actions aimed at sustainable development. The SDGs present objectives and indicators to assist in the management, evaluation, and control of these actions. In addition, the literature presents several models for the sustainability of cities. After the application of the methodology already presented, these models generated a new model of healthy sustainable cities, that was validated by a certain portion of the population.

According to Jing and Wang [22], the population density, green infrastructure, health, GDP, and environmental pollution (air, soil, and water) indicators were the factors that most boosted the sustainable development of Shuozhou in different periods of development.

Actions aimed at sustainable development can influence economically, socially, and environmentally. El Ghorab and Shalaby [3] affirm that the distribution of land use is relevant to reduce distances, since making the city compact even helps to reduce private cars, and thus reduces traffic and emissions. Furthermore, economical housing and housing with an efficient location meet the demand of all income classes of the population of the city. If the houses are close to the workplace, it saves time, transportation costs, and reduces emissions making the air cleaner, consequently reflecting on the population's health. Regarding the social indicator, we have sub-indicator 2, access to quality education, which is both the sub-indicator with the highest number of "Very Relevant" responses and the highest average score (4.80). The city is responsible for primary education (ages 6 to 14) and also provides daycare services for younger children. According to the IBGE [54], the enrollment rate for ages 6 to 14 in Florianópolis is 98.4%, compared to the rest of Brazil, where the city ranks at 1440.

Brazil conducts an annual assessment of education, measured by the Basic Education Development Index (IDEB). The city has a score of 5.8, ranking at position 1972 in the country IBGE [55]. It is worth noting that these data pertain to public schools since the city has numerous private schools as well.

From this information, one can understand the population's concern regarding education, as the city aspires to be a smart city. This educational concern is also reflected in the economic indicator, where the highest-rated sub-indicator, with an average score of 4.68, is sub-indicator 12, corresponding to the proportion of expenses allocated to education. In this regard, the municipal government allocates approximately 30% of its budget to education [56].

Regarding the environmental indicator, the most relevant sub-indicator was 13, which pertains to the household waste treatment rate, with the highest average among the sub-indicators (4.75). This was followed by sub-indicator 8, concerning urban quality of life. These two sub-indicators are closely related. Florianópolis being an island, waste treatment must be conducted in a manner suitable to this unique circumstance. The city has a concession agreement with a publicly owned mixed economy company, publicly traded and regulated by the Companies Act. This company is responsible for water and sanitation in a significant portion of the city.

When analyzing priorities related to the SDGs, the results align with the assessment carried out in the city model. The SDG with the highest average is SDG 6, concerning

Clean Water and Sanitation (4.90), followed by SDG 3, focusing on Good Health and Well-being (4.80).

It is not surprising that the Social indicator is better known by the population, given that it addresses basic requirements for practical life, such as access to housing, employment structure, knowledge infrastructure, and municipal service assistance. We can infer that this result did not demonstrate which sub-indicators were important for achieving all SDGs, but it showed which sub-indicators were important to the people who responded to this survey. It is challenging, although not impossible, for a person to be concerned about preserving the environment when they need to worry about where they will live, where they will work, and what they will eat.

These results do not change the fact that economic growth and the environment are important for the city of Florianópolis and that the Social, Economic, and Environmental indicators are interconnected, as demonstrated by the literature and the analysis conducted in this research. Additionally, we can infer from the results that public policies need to be expanded to promote the SDGs in the city of Florianópolis. This result is also supported by the research of Ruan, Yan, and Wang [9], where studies demonstrate that urban planning and government policies focused on sustainability become relevant tools for monitoring sustainability in cities.

5. Final Considerations

The objective of this research is to verify which sustainability indicators make up a model for measuring healthy sustainable cities and their perceptions of the SDGs. In the qualitative stage, indicators for three dimensions were obtained as a result, these being: Social Indicator (with 24 sub-indicators); Economic Indicator (with 19 sub-indicators); and Environment Indicator (with 14 sub-indicators). At this stage, it was possible to notice that there are authors who give different names to a given indicator that represents the same thing. Some authors allocate a given sub-indicator to different indicators, so it was necessary to tabulate in order to group similarities.

In the quantitative stage of the research, a survey was conducted with residents of the greater Florianópolis in order to collect the population's perception of what is important in a healthy sustainable city. Subsequently, descriptive statistics. The main results of the research include the proposal of a model for a healthy and sustainable city, with indicators and sub-indicators validated by a portion of the population. An analysis was also conducted regarding what respondents considered most relevant for the city of Florianópolis, revealing the priorities and major concerns of the population. The social indicator showed that the population considers education to be of great importance for the city. Similarly, the economic indicator reinforces this concern about the city's education. In terms of the environment, clean water and sanitation were considered a priority. This aspect was further emphasized when it comes to the SDGs, as the population viewed SDG 6, related to Clean Water and Sanitation, as the most relevant on average.

This research contributes to the literature by aiming to validate sustainability indicators among the population of Florianópolis. Moreover, it provides insights to city managers regarding the indicators that hold the most relevance for the population. Additionally, as the city model needs to be tailored to each specific context, this research can serve as a useful tool for other managers to apply similar questionnaires to populations in different municipalities. This would help determine which indicators are relevant to their respective populations.

Studying the impact of indicators on the SDGs is crucial in order to adjust the model for municipal managers, enabling them to assist their countries in fulfilling their commitment to the SDGs. The results suggest that there are limitations in the population's knowledge concerning the SDGs. This could be attributed to factors such as limited access to information, restricted internet availability, and insufficient dissemination efforts within the city. However, these findings underscore the ongoing need for municipal managers to work towards the SDGs, emphasizing the importance of promoting awareness and engaging the population in sustainability initiatives. Prioritizing public policies that align with sustainability and the SDGs is essential.

As a limitation of this research, there is the literature that supported this research, as well as the method of collecting the literature. And also, the methodology adopted for data analysis. Additionally limiting are the analyzed indicators, because this research focused only on social, economic, and environmental indicators (three pillars of sustainability).

As suggestions for future work, it is suggested to investigate alternative models of sustainability indicators such as the water-energy-food nexus and healthy sustainable smart cities; the generation of waste and healthy sustainable smart cities; urban mobility and population health and healthy sustainable smart cities. Another suggestion for future studies would be to replicate the final model in other cities to deepen the relationship between sustainability and healthy sustainable smart cities. Finally, it is believed that, with the deepening of studies on healthy sustainable cities, it will be possible to feedback on the scientific development process and generate knowledge that can be applied in municipal administrations, helping to promote the goals of sustainable development.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/su152015004/s1.

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