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A Conceptual Model for Planning and Management of Areas of Public Space and Meeting in Colombia

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Abstract: A refined investigation of new trends in urban analysis assuming a sustainable design of Areas of Public Space and Meeting (APSM) is a fundamental response to the challenges of inclusive and efficient cities. Even though the APSM are districts regarded as urban structuring systems, there is a lack of territorial planning instruments and conceptual models aimed at explaining their long-term dynamics. Based on these premises, we developed a conceptual model that articulates relevant variables of interest for the planning and management of APSM. The construction of the model includes the review and analysis of the literature and the validation process based on a consultation with a panel of experts on the subject. Our findings demonstrate that the existing research does not address the APSM issue adequately, and the methodologies proposed so far do not lead to accurate and comprehensive analyses of urban complexity in light of sustainability targets. There are only isolated, disjointed, and partial approaches to variables of interest, making it difficult to carry out holistic studies. Our technical and scientific proposal offers a framework for an exhaustive evaluation of these areas. The model has been structured according to the assumptions of urban sustainability and can be applied to diverse urban environments in South America.

Keywords: city life quality; sustainability; public participation; urbanism; regional development

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1. Introduction

The correct morphology and functional articulation of Areas of Public Space and Meeting (APSM), such as parks, squares, sports, cultural venues, and outdoor comfortable areas free of vehicles, are key parts of the structuring systems of consolidated cities [1–3]. Their correct provision and adequate disposal are necessary to mitigate ecological deterioration, preserve environmental quality at large, and improve social welfare and life quality [4–8]. Integral planning and management of these areas demand a joint and articulated approach that evaluates, together, multiple variables of interest capable of assuming the complexity of urban systems [9–12]. The exhaustiveness of the diagnoses and proposals for spatial organization around these spaces is the duty of urban planners and analysts, who should choose relevant variables and analysis for that purpose [13]. The international call for sustainable, inclusive, and participatory urban planning is one of the Sustainable Development Goals (number 11), which highlights the role of cities in achieving sustainable development [14].

The use of the technical and scientific literature could offer enough elements of analysis for an exhaustive evaluation of APSM. From these documents, useful elements for identifying and solving sociospatial conflicts that affect environmental quality and urban life could be identified and even foreseen. For example, there are recent valuable proposals for assessment models based just on a few variables of interest [11,12,15–22] or on a more complex evaluation system [23–30] with relevant positive results; however, in most cases, these findings are neglected by policymakers and urban planners. The lack of a common conceptual model denotes the existence of isolated and disjointed approaches that could negatively affect the efficiency of decision-making processes in urban spatial configurations.

Given the above-mentioned scenario, we propose a conceptual model based on the selection and articulation of relevant variables of interest, proposing key analysis elements that lead to exhaustive diagnoses for an accurate and effective spatial planning of these areas. Such approaches are particularly welcome in South America, especially in some countries where the unstable political situation and the intrinsic vulnerability to environmental changes, such as climate change, pollution, or loss of biodiversity, are consolidated facts. This assumption is based on the hypothesis that the integration and articulation of adequate variables stimulate the production of geographical outputs with policy implications, e.g., improving and optimizing decision-making processes that have an impact on the urban spatial configuration. The configuration of a common conceptual model should pay attention to the inherent logic in planning and management processes. One example is Colombia where there are weak normative guidelines that only contemplate elements of basic analysis leading to incomplete diagnoses or those lacking in rigor [30,31].

Therefore, in this research, the main aim was to design a conceptual model for Colombia considering three precepts/assumptions related to urban sustainability: preservation of the environment, sociospatial justice, and public participation. It has been considered that APSM stand out as structural elements of the models of sustainable cities thanks to their multiple uses and socioecological benefits [32–37]. To achieve this goal, an exhaustive review, classification, and synthesis of the technical and scientific literature focusing on the analysis of these infrastructures was carried out. A preliminary model specification went through a validation process, including an analysis and optimization within an expert panel made up of professionals and researchers in the field of urban and particularly public space planning and management. We hypothesized that this conceptual model could be used to correctly manage and prevent nonfunctional land plans that try to use APSM as articulating areas.

The implementation of the model in the official processes of planning and management of cities would have a favorable impact on the quality of urban life since the approach to the individual variables proposed in our analysis makes it possible to detect sociospatial injustices. The exhaustive diagnoses to which the model leads facilitate the formulation of successful spatial organization proposals capable of solving the detected problems. In addition, the model, by proposing the analysis of variables that depend on community participation, promotes the democratic construction of the city. This is a need that responds to the complexity of contemporary urbanization [38–41].

In the next section of the literature review, the pertinence of the three mentioned precepts is presented. Subsequently, in the methodology section, the different phases of the research are described for a better understanding of the results achieved. In the results section, after presenting the normative situation of APSM in Colombia, the variables used for the analysis are illustrated, having their organization in Figure 2 as the main outcome of this investigation. The manuscript concludes by highlighting some challenges and final remarks, evidencing the originality and novelty of the approach and arguing some (positive and normative) limits of the approach that should be elaborated on more in future studies.

2. Literature Review

2.1. Planning and Management of Public and Meeting Spaces: Urban Sustainability Assumptions

2.1.1. Precept 1. Preservation of the Environment: The Role of Public Green Areas

Free-access public urban green areas are spaces whose surface area is partially covered by vegetation, and some authors classify them into parks, squares, water roundabouts, and, in general, recreation contexts that present such kinds of characteristics [17]. Green areas are part of the key elements of sustainable urban systems as they play an important ecological role associated with the absorption of heat and carbon dioxide, reduction in pollution, control of stormwater runoff, recharge of aquifer mantle, temperature regulation, and biodiversity preservation [19,34]. The environmental, landscape-related, and social benefits provided by these spaces are greater as their size increases [42–45]. Various authors agree in referring to this variable as a fundamental condition for the conservation of diversity and richness of flora and fauna [46,47], a controlling factor for floods and sediment fluxes [48], diversifying the intensity of uses [11], and improving air quality and regulation of a human-favorable temperature [20].

2.1.2. Precept 2. APSM and Sociospatial Justice

A sustainable city should be fair from a social point of view. The principle of social justice in sustainable development implies that citizens, without any kind of discrimination, can aim for quality of life [49]. Regarding the functionality of APSM, the manifestation of inequalities or social injustices is due to the existence of adverse physical–spatial conditions that limit or make it impossible to access, use, and enjoy these infrastructures [29]. Social justice theory is related to spatial justice theory as it addresses concerns about how space is used and how decisions about the use and design of particular spaces are determined [50]. This theory was developed by Edward Soja [51], focusing on spatial justice assumed as the equitable distribution of space, resources, and accessibility. There are exogenous and endogenous injustices, respectively, products of impositions of hierarchical power and decisions related to the unequal distribution of basic urban services [51]. The spatial injustices related to the functionality of these spaces are of an endogenous type, a consequence of erroneous urban planning and management processes. The technical and scientific literature mainly describes the existence of five factors that affect the equitable use of APSM, and they are all related to the theory of social and spatial justice.

Factor 1: Accessibility

Factor 1 is related to accessibility, which involves the concept of connection and proximity [28]. The interest in going to a sustainably and accessibly articulated APSM is influenced, among other aspects, by the proximity that exists among these and the places of residence, since this affects distances traveled or access costs [52,53]. Therefore, an analysis of accessibility is key to investigating the spatial distribution of these spaces. The equitable distribution of the APSM means that the inhabitants have similar conditions to access and make use of these spaces [20,29]. Pedestrian access is a key aspect facilitating the public use of such spaces [54], cited by [15].

Factor 2: Satisfaction

Factor 2 points out the level of satisfaction provided by APSM. The different preferences and interests of people toward these spaces can vary according to sociodemographic aspects, such as gender, age, culture, and physical abilities [18,55]. No public space manages to satisfy all the preferences and interests of each resident. Therefore, the strategy focuses on the sum of all the public spaces of a city to satisfy all citizens [4,24]. From planning, it is important to promote the complementary design of these articulating spaces that lead to the diversity of functions [56] and, likewise, conduct diagnostic analyses based on strategic (typological) differentiation [57]. Multifunctional heterogeneous public and meeting spaces should be networking tools that consider the presence of natural elements to provide (i) climatic comfort and natural aesthetics; (ii) varied furniture placed in a planned manner;

(iii) tools for sports activities and children's recreation; (iv) biohealthy modules; and (v) cultural elements, such as monuments, sculptures, and pieces of art [23,25,58,59]. Individual perceptions determine the intention to use a space, being influenced by sociodemographic aspects, such as occupation, socioeconomic status, or social class [18,60]. This aspect has been studied as related to the perception around insecurity [12,61] that, in addition to being stimulated by objective acts of violence and crime, is influenced by external factors to design, such as improper use and bad practices [25,62]. An additional impact was exerted by internal factors related to the design of each public space, such as inadequate lighting, lack of maintenance and cleanliness (see also Factor 4), or the absence of surveillance authorities [12,63,64].

Factor 3: Sufficiency

Factor 3 is related to the public space network that can prove its sufficiency. The lack of the APSM reduces the possibilities of satisfying the recreational needs of citizens and their free choice for spending leisure time, and, therefore, the integration of the population in its city. Likewise, this condition affects the balance between the demands on the natural environment and those socially constructed [24,29]. This possible deficit could be estimated in two ways: (i) by comparing the total urbanized area with the number of spaces available [24] or (ii) by considering the proportion between the existing spaces and the number of inhabitants [21,65].

Factors 4 and 5: Physical Conditions and Distribution

To achieve a sustainable development of APSM, it is necessary to consider their physical conditions. The deterioration of these spaces makes it impossible to provide possibilities of active or passive recreation. Deterioration denotes a qualitative deficit, an element of analysis that must be considered in urban planning and management [21,22]. Regarding Factor 5, the spatial distribution also matters. The United Nations highlights that it is vital to ensure the city-wide distribution of APSM, mainly to avoid inequalities and redistribute benefits [66]. From a spatial perspective, an equitable distribution of APSM is achieved if the population has the possibility of accessing them from anywhere in the city [12,15,20]. From the sociospatial point of view, in addition to physical conditions (Factor 4), proximity and connectivity must prevail over the possibility of having access to a diversified APSM network, capable of offering various entertainment options associated with both active and passive recreation [29].

2.1.3. Precept 3. Public Participation in Planning and Management of APSM

The technical conception of public spaces can be more coherent with their uses if it is not separated from the knowledge derived from the perceptions, experiences, and actions of the users [10,12,67]. Citizen participation should be projected as a basic strategy to solve the difficult situations that arise in large cities [57]. The opinion of the urban population, which is always diverse, allows for investigating the needs concerning people's preferences and interests, the level of satisfaction that existing spaces provide, or the imaginary barriers that condition or limit their use [61,68]. Participatory design is related to the use and belonging in space [69], and for this reason, to have a positive impact on its beneficiaries, it is important to obtain specific knowledge associated with the profile of users, visiting patterns, and activities they conduct and the degree of satisfaction [70]. In this sense, it is important to establish practical mechanisms that allow the recurring collection of the required inputs [19]. Public participation is key to addressing Landscape Quality Objectives, where public space plays an important role. These objectives are understood as inhabitants' goals and aspirations toward their landscapes [71].

3. Methodology

The proposed conceptual model results from the analysis and sequential development of a series of procedures (Figure 1) summarized in 4 phases: (i) identification of problems around the current planning and management of APSM; (ii) conceptualization, which implies the selection and description of variables of interest and the determination of essential analysis elements for the adequate approach of these spaces; (iii) design of the model, referring to the conceptualization represented through its schematization; and (iv) model validation.

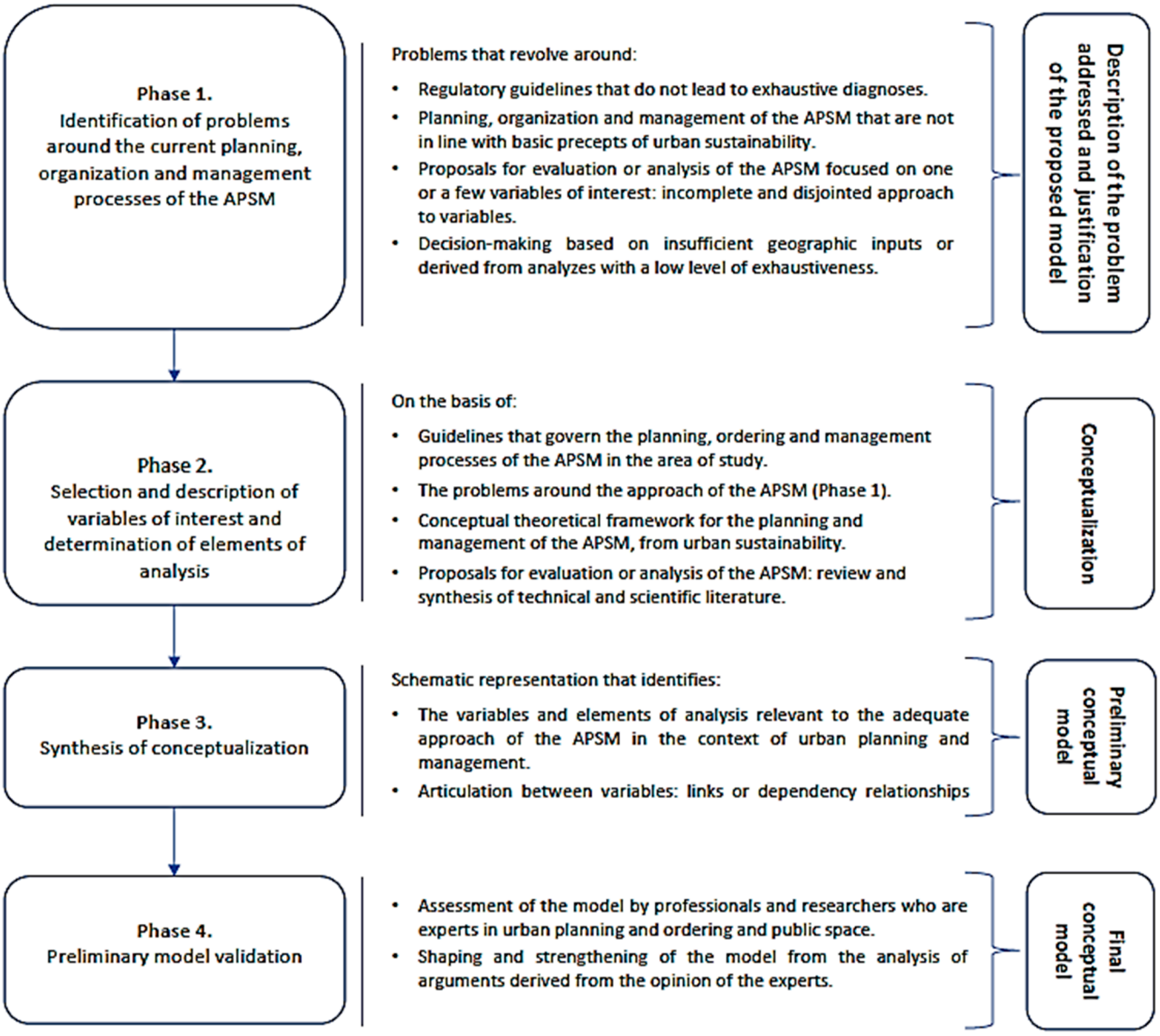

Figure 1. A flowchart explaining the development of the conceptual model for Planning and Management of APSM in Colombia.

The construction of the model is based on an exhaustive process of review and synthesis of the technical and scientific literature. Various documents consulted on different websites and scientific databases were reviewed and analyzed, including the current official regulatory standards of the country, scientific articles, books, reports of academic events, websites of governmental and nongovernmental organizations, research institutes, universities, and urban observatories on the study of public spaces. A summary description of the

literature was carried out according to the following purposes: (i) the construction of the conceptual and theoretical framework that supports the selection process of relevant variables of interest for sustainable planning and management of APSM; (ii) the identification of problems linked to the current processes of planning, organization, and management of APSM, emphasizing two main aspects: the evaluation of the guidelines established in the regulation of the study area (Colombia) and the proposals for the analysis of these important urban pieces; (iii) the identification of relevant variables of interest for the right planning and management of APSM; and (iv) the determination of specific elements that lead to the elaboration of exhaustive diagnoses and to the formulation of proposals for the spatial organization under the approach of urban sustainability.

Based on the foregoing, the development of the model considered the following premises: (i) The methodological guidelines established in the official regulations, Decree 1504/1998, which regulates the management of public spaces within the territorial planning of Colombia. This decree suggests the obligatory implementation of quantitative and qualitative indicators in order to support the diagnoses that are elaborated within the frame of official instruments of territorial planning; (ii) The conceptual model should highlight the omission and disarticulation of variables of interest, causing a lack of information to support the decision-making processes that affect the urban spatial configuration [30,31]; (iii) The conceptual and theoretical framework built under the urban sustainability approach, which takes into account the three basic precepts established as structuring axes of the proposed modeling (conservation and preservation of the environment, sociospatial justice, and citizen participation); and (iv) The variables and elements of analysis exposed in the evaluation of APSM, giving greater relevance to those that are in accordance with the aforementioned sustainability precepts.

Finally, the first draft of the model was presented to a group of professionals in the field of study and experts on urban planning and public spaces through a focus group made up of 6 participants (see Appendix A). The experts exposed the arguments that led to the optimization of the conceptualization. The identification of the participants was carried out through social research networks and directly through visits to the offices of municipal administrations. Among the selection criteria, academic training (basic profession and specialties) and research experience related to the research topic of the study area were considered. The purpose of the presentation to the experts was to promote a debate around aspects related to the design, relevance, and applicability of the model.

4. Results and Discussion

4.1. Planning and Management of the Public and Meeting Spaces in Colombia

4.1.1. Current Guidelines to Obtain a Theoretical Framework from Colombia

The norm that informs the planning and management of APSM in Colombia is the Decree 1504/1998. It proposes a general inventory of the constituent elements of the public spaces based on a typological classification according to the scale or area of influence as follows: (i) structural elements of general, national, departmental, metropolitan, municipal, or district influence and (ii) elements at the municipal, local, zonal, and neighborhood levels within the municipality.

This document also proposes the implementation of the effective public space coverage indicator (composed of green areas, parks, and squares) per inhabitant, also known as Public Space Per Capita, and the quantitative deficit indicator of effective public space, which emphasizes the number of spaces a city requires, depending on the number of inhabitants and concerning the reference index established as a goal. The document also raises the estimation of the qualitative deficit of effective public space, an indicator associated with inadequate conditions for the use and enjoyment of these infrastructures with special emphasis on situations of inaccessibility due to conditions of deterioration, insecurity, or physical impossibility of access.

4.1.2. Problems Surrounding the Analysis of APSM

One of the main issues related to the APSM approach in Colombia is the absence of guidelines that contribute to the formulation of adequate standards for planning and management of these spaces on the urban scale, beyond what is provided in the Decree 1504/1998 [31]. The National Policy on Public Space, established through the document named 'Conpes 3718/2012', highlights the irregular ways in which the qualitative and quantitative deficits of public space are addressed, two of the main elements of analysis that the regulations proposed. The first is because it is approached in a perceptive manner, without emphasizing the factors (or conditions) that generate the deficit and the consequences that derive from the impossibility of using APSM. The second is because during its approach, various irregularities are incurred, among them stand out the "lack of precision in the application of concepts established by the norm; inadequate methodologies and measurement instruments; technical and technological weaknesses (GIS) for measurement; imprecision of the information related to cession areas destined to public space" [31], page 9. It is also evident that the elements of the analysis proposed by the Decree 1504/1998 (described in Section 4.1.1), when contrasted with the basic precepts of urban sustainability (described in Section 2), prove to be insufficient to achieve exhaustive diagnostic analyses that lead to the formulation of successful proposals for the spatial organization that mitigate or eradicate the problems identified in urbanized territory.

4.2. Variables of Interest and Elements of Analysis for the Planning and Management of the APSM

4.2.1. Variable 1: Diversity

The first variable was diversity, which is expressed through strategic typological classifications. In this sense, three classification proposals that lead to different types of analysis were considered here.

Strategic Classification 1

This classification was established based on activities or general uses that can be developed in APSM, taking account of the physical features associated with the design (Table 1). The classification allows questions about the level of general satisfaction of preferences or interests of the population, concerning the possibility to exercise active or passive recreation following the classification of Garnica and Jiménez [29].

Table 1. Classification criteria and categories according to their internal composition and function they provide to local communities.

Category/Scenario	Function	Description
Sport	Leisure and active recreation	Surface intended solely for the exercise of the sports activity of the community (soccer, baseball, basketball, shuffleboard, etc.)
Children	Leisure and active recreation	The surface is intended, due to its constituent elements (children's equipment), solely for the exercise of recreational activity for children.
Stay	Leisure, passive recreation, meeting, and harmony	Surfaces are made up of environmental elements, such as trees or grass, and equipped with furniture, such as benches, intended for passive activity.
Biohealthy scenarios	Leisure and active recreation	Surfaces are equipped with machines or special instruments for the improvement of the health and physical condition of people.

Source. Modified from Garnica and Jiménez [29] (p. 264).

This classification allows the estimation of the percentage of urban public space (% PUPEsc: stay, children's, sports, and biohealthy) concerning the totality of public and meeting spaces existing in the urban area through the following formula:

$$\% \text{ PUPEsc } = \frac{\text{\# total APSM Esc } (i)}{\text{\# total APSM}} \times 100 \quad (1)$$

% PUPEsc = Percentage of the presence of certain scenarios of the urban public space.

total APSM = total number of existing public and meeting spaces in the study area (city, community, neighborhood, or any other planning unit or urban action defined in the planning instrument).

total APSM Esc (*i*) = total number of APSM per scenario (stay, child, sports, or biohealthy).

Notably, the probability that the sum of all the individual % PUPEsc (% children's scenarios + % sports scenarios + % stay scenarios + % biohealthy scenarios) is equal to 100 % is very low since, in the cities, many units of public space usually provide more than one service to society. The percentage of the presence can be 100 % only when all APSM have the presence of a single type of scenario. The % PUPEsc helps to identify the segments of the population that would be benefiting to a greater or lesser extent concerning the provision of these articulating spaces. Greater diversity indicates a greater chance that different preferences and recreational interests will be satisfied.

Strategic Classification 2

This determines an influence level or scale based on the representativeness or particularity that each APSM has within the set of existing public and common spaces in the urbanized area (Table 2). The analysis proposed from this perspective is based on the potential of spaces with unique characteristics as recipients of users from distant places [29].

Table 2. Classification criteria and categories according to scale or area of influence associated with the representativeness and particularity of the spaces.

Scale or Influence	Description
Municipal/regional	Large dimension and high urban and environmental values, icons of a city, which meet the needs of the local population and residents from other distant locations. They are not abundant or predominant in urban area.
Zonal	Variable dimension, equipped with common areas suitable for urban planning, with furniture and unusual internal components among existing public spaces. They are not abundant or predominant. That is why they are visited by people from distant towns or neighborhoods.
Local/neighborhood	Small size, intended for recreation, meeting, and community integration. They cover the needs of neighborhoods. They present similar characteristics to most of the existing public spaces in the city. They are generally distributed throughout the urban area.

Source. Modified from Garnica and Jiménez [29] (p. 264).

The receiving public and meeting spaces of the distant population need special amenities, such as public restrooms, parking for bicycles, and motorized vehicles. This constitutes a criterion for evaluating the quality of urban public space.

Strategic Classification 3

This was established according to the size or surface area. In the study area, the classification used by the Bogotá Public Space Observatory of the Administrative Department of the Public Space Ombudsman DADEP stands out, which establishes scales or areas of influence according to the surface of the spaces (Table 3). This approach maintains a relationship with the guidelines established in the Regulatory Decree 1504/1998, which suggests the inventory and classification of public spaces according to the scale or area of influence, but without describing or specifying the characteristics of the categories that compose it.

Table 3. Classification criteria per scale or area of influence associated with the surface of the spaces.

Scale	Description
Metropolitan	Area greater than 10 ha
Zonal	The area between 1 and 10 ha
Neighborhoods [1]	Area smaller than 1 ha
Pocket [2]	Area smaller than 1000 m^2

Source: Self elaboration in base to the report entitled Administrative Department of the Public Space Ombudsman DADEP [27]. Observatory of the Public Space of Bogotá. [1] Neighborhood spaces are known as free areas intended for recreation, meeting, and community integration to meet the needs of neighborhoods. They are generically called parks, green areas, or assignments for parks. [2] Pocket ones cover the needs of neighborhoods or groups of houses around the infrastructure.

The surface of the articulating public and meeting spaces is related to the intensity and diversity of the offered uses [11], and, likewise, it is linked to a greater possibility of environmental benefits being granted [46–48]. Therefore, the surface constitutes the first criterion for evaluating the functionality of these public infrastructures. Large spaces tend to be few in cities, which is why they wield more influence. Given that they are spaces that potentially receive users from distant places, they require special internal amenities. This constitutes a second criterion for evaluating the quality of spaces.

4.2.2. Variable 2: Physical Condition or State of Conservation

This quality determines, limits, or restricts the use of public and meeting spaces, generating different levels of dissatisfaction within the population, mainly those who live in the surroundings. The impossibility of using these spaces makes it necessary to move to others in a good state of conservation, affecting access costs, whether in time or distance traveled and even in terms of economic expenses. The influx of people to other APSM, due to the poor conservation of some of them, would lead to overuse, affecting the development of recreational activities that can be performed. The norm that regulates the management of public space in the Territorial Planning Plans of Colombia contemplates the assessment of the qualitative deficit of public space, referring to the inadequate conditions for its use, in turn emphasizing situations of inaccessibility among which are the conditions of deterioration. This rule does not specify how to address the qualitative deficit.

Based on the above-mentioned issues, Jiménez and Garnica proposed a methodology that allows the estimation of this deficit, facilitating not only its approach but also its reporting and interpretation based on the detection of sociospatial problems or conflicts [22]. The proposed methodology was called "Individualized Qualitative Deficit of public space" (IQD) and is based on the design of a format for the exhaustive collection of data in the field, related to the conditions that generate deficits specified in the guide standard. Considering that the internal characteristics of these spaces vary according to their typology, the methodology considers the prior characterization of each unit of public space according to the strategic typological classification. This classification is based on the internal composition and the function it provides to local communities (Table 1), and it is also related to the scale or area of influence (Tables 2 and 3). The IQD is expressed in percentage values, which are then grouped into ranges that are associated with qualitative

categories that allow the spatial representation of the deficit through a thematic map that uses the technique of a color palette to illustrate the phenomenon.

4.2.3. Variable 3: Sufficiency of the APSM

This variable is evaluated according with the number of inhabitants. This is known as Coverage of Public Space or Effective Public Space Per Capita, a guideline established in current regulations. From this perspective, reference indexes were considered that vary according to the source that proposes them or the region of the world where they are applied. The World Health Organization (WHO) and UN-Habitat of the United Nations have established a minimum and desired index of 9 and 15 m^2 per inhabitant, respectively. In Colombia, 15 m^2 per inhabitant was established as a minimum standard of effective public spaces [21]. This reference threshold, whatever the source, is the main element for estimating the quantitative deficit of public space (QuD), which is carried out using the following formula:

$$QuD = MIEPS - EPSPer \quad (2)$$

QuD = Quantitative Deficit
MIEPS = Minimum Index of Effective Public Space (15 m^2 / inhabitants)
EPSPer = Effective Public Space Per Capita resulting from the relationship between the amount of existing public space and the number of inhabitants

The quantitative deficit estimation focuses on the analysis of the amount of public space required by a city, expressed in surface units. It constitutes a key variable for urban planning. However, it does not emphasize the optimal location of the required spaces or their typology. Regarding the sufficiency of green areas, for the scope of the study, the standard guidelines do not suggest the implementation of a particular indicator and, therefore, do not relate to a specific reference index. However, tools that support decision-making processes, such as the Public Space Observatory of Bogotá (Administrative Department of the Public Space Ombudsman, DADEP), consider the "elements that within the public space system include green spaces such as parks, green areas, and the main ecological structure" [28], page 16, using the following formula:

$$GPS = \sum MES + \sum Green\ Areas + \sum Parks \quad (3)$$

Number of inhabitants
GPS = Green Public Space
MES = Main Ecological Structure

The Green Public Space (GPS) indicator considers not only urban public green areas of free access but also other spaces provided with vegetation, which are not conditioned for the free access and enjoyment of the population, although they are of a public nature and also of environmental significance. DADEP establishes tolerance values to evaluate the deficit of green areas, which range from 10 m^2 (the minimum value) to 15 m^2 (the desired value) per inhabitant, taking advantage of the recommendations established by the World Health Organization [29].

4.2.4. Variable 4: Size of APSM

To evaluate the size of APSM, there is no standardized figure that suggests the ideal minimum size and type of green areas that make up cities. However, in the literature, the larger the area, the greater the probability of obtaining benefits related to environmental and ecological contributions. Likewise, a larger area leads to greater intensity and diversity of the uses that satisfy recreational needs. Proposals on the minimum size that these spaces require to grant multiple benefits are variable. Natural England recommends that all citizens have the possibility of accessing a natural green space with a minimum area of 2 hectares [72]; Sukopp, who emphasizes the environmental and ecological benefits, specifies 10 hectares as the minimum reference value [73]; the Green Plan of Valencia sets a minimum area of 5 hectares for a park on an urban scale [74]; the World Health Organization

recommends the presence of green spaces of 1 hectare [24]. The ideal minimum surface area value established at 5000 m^2 by Reyes and Figueroa can be highlighted, which is well-suited to the context of Latin American cities [11].

4.2.5. Variable 5: Proximity to APSM

There is no standard value regarding the ideal minimum distance for accessing public and meeting spaces from anywhere in an urbanized area, especially from residential locations. The proposals for minimum distances range from 250 to 900 m, showing that the larger the surface of the infrastructure, the greater the minimum reference distance [11,24,27,29,72,75–78]. The minimum reference values most used in the analysis of proximity to public space are 300 and 400 m. The regulations that govern the planning and management of the urban landscape in the study area do not consider the implementation of an accessibility analysis of these spaces based on proximity. Studies applied at the local level, which highlight the importance of incorporating this element of analysis in urban territorial planning processes, establish reference values equal to (or close to) those referred in the literature as a minimum distance: (i) Garnica and Jiménez established a value of proximity between the places of residence and the public space units of no more than 300 m, justified by the vulnerability of certain types of users (particularly children and elderly) to make long journeys [29]; (ii) the Public Space Observatory of the city of Bogotá takes a distance of 250 m as a reference to measure the accessibility to spaces smaller than 1 ha and 500 m to those larger than 1 ha [27]; (iii) Mayorga accepts the hypothesis that the maximum time that public space must be accessed on foot is fifteen minutes, considering the average speed of a person to be 5 km/h. [15]. This represents a distance close to 1000 m.

4.2.6. Variable 6: Adequate Distribution in the Urban Area

This variable is determined by the optimal location of each APSM. An adequate arrangement of these infrastructures implies the manifestation of good accessibility to them, which is given by a reduction in access costs (preferably pedestrian access) and the possibility of accessing diverse spaces capable of satisfying different needs or recreational interests. The articulation of the accessibility and diversity variables constitutes the bases of the concept of spatial distribution based on equity formulated by Garnica and Jiménez [29]. These authors frame diversity in the strategic typological classification established according to activities or general uses that can be developed, taking into account the physical features associated with the design (Table 1). This is related to four categories called 'scenarios': sports, children, stay, and biohealthy. In this sense, the authors refer to an equitable distribution of the public and meeting spaces in an urbanized area when all the inhabitants have the possibility of accessing the different scenarios on foot from their places of residence, without walking for long distances. In short, the variable referred to as the distribution of the APSM, is based on proximity and diversity variables (see 4.2.1. and 4.2.5.) seeking to identify sectors within cities where the same conditions related to the quality of urban life do not exist due to the inadequate spatial distribution of these infrastructures.

4.3. Variables of Interest for Urban Management: Monitoring of the Functionality of APSM

Urban dynamics highlight the need to incorporate the analysis elements implemented from updated data into urban management processes. Modeling these elements contributes to the timely detection of sociospatial injustices that can manifest themselves timelessly in certain circumstances or conditions. The monitoring and control that demands the evaluation of the functionality of APSM exalt the role of citizen public participation as a method for recurrent data collection. This is a critical issue considering that the users have a deep knowledge of these spaces, which is the result of their experiences and activities carried out in these places. Following the order of the variables, those that are of interest within the context of urban management, whose approach is key to guaranteeing the functionality of APSM for Colombia, are presented and described below.

4.3.1. Variable 7: Perception of Insecurity

This is a key variable to inquire about the limitation of the use of certain spaces. Urban management and control processes should focus on continuous monitoring of the factors that generate or stimulate a feeling of insecurity so that actions can be planned and implemented to guarantee the full availability of these spaces for their use and enjoyment. Some of the factors that stimulate the feeling of insecurity, on which the recurring data collection should focus, are the objective acts of violence and crime witnessed, evidence of improper use and bad practices contrary to the rules of good conduct, deterioration of the amenities and furniture or internal components of the infrastructure and the poor appearance of its surroundings, and the absence of the State concerning security guarantees and cleanliness.

4.3.2. Variable 8: Satisfaction and Preference for the Use of APSM

Although it is difficult to satisfy the preferences and interests of each citizen, it is important that territorial planning and management aim to ensure that, at least, the whole of the public and meeting spaces achieve a positive level of satisfaction. In addition to taking as a reference the level of satisfaction that the existing public and meeting spaces have, the participatory design of these areas should consider the preferences of the users within the local community. This is the starting point to avoid future dissatisfaction regarding these areas.

4.3.3. Variable 9: Sociodemographic Profile of Users

This issue constitutes an input to analyze the behavior of other variables of interest, such as the perception and level of satisfaction. The recreational interests that influence the preferences for use of these infrastructures can vary according to specific characteristics, such as age, gender, socioeconomic level, and schooling [18,55]. Even aspects such as occupation can determine the intention, frequency, and time of use of these spaces.

4.3.4. Variable 10: Difficulty and Cost of Access

This variable refers to distances or travel times involved in moving to APSM or the economic expenses related to the use of motorized means of transport. They are obtained from the modeling of data associated with two other variables of interest, such as the place of origin and the modes of transport used for accessing these areas. Knowing the difficulties of access (in relation to distances and travel times) and the expenses of the users who visit these spaces allows us to investigate people's willingness to go to those spaces according to their recreational preferences. Likewise, it helps to estimate the real area of influence of the infrastructures visited and define or validate its representativeness concerning other issues distributed in the urbanized area.

4.3.5. Variable 11: Individualized Qualitative Deficit (IQD)

This is an indicator that should be monitored by urban managers to continuously assess the state of conservation of APSM. In cities, these infrastructures are exposed to multiple factors (natural or anthropogenic) that affect their physical deterioration and hinder or limit their public use. The IQD focuses on the analysis of inadequate conditions for the use and enjoyment of the APSM, with special emphasis on situations of inaccessibility due to conditions of deterioration, insecurity, or physical impossibility of access. Based on the recurrent in situ collection of data on the conditions that generate qualitative deficit (mentioned in the explanation of variable 2), this indicator makes it possible to calculate percentages of deficit for each APSM. The measuring process is associated with qualitative categories that determine a degree of deficit: null deficit, very low, low, moderately high, very high, and total deficit. The IQD should be measured in the temporalities that allow the timely identification of sociospatial injustices related to the functionality of the APSM.

4.4. A Focus Group for the Identification of Variables

Based on the arguments raised by the expert panel (Appendix A), three new elements of analysis were incorporated into the model, each one being associated with some of the variables of interest already identified. The first one is the 'percentage of naturalness', focusing especially on APSM categorized as public green areas. The condition of naturalness is key so that "all cycles are fulfilled, especially the water cycle, which also helps us generate permeability towards the ground" (Expert 1). The impact of this percentage is influenced not only by the physical characteristics of the space associated with nature but also by the size or surface area. The second one is 'universal accessibility', understood as a condition that affects the quality of spaces. According to the opinion expressed, the dissatisfaction that public and meeting spaces can generate depends on how optimal the equipment or conditioning of these infrastructures is. This implies thinking about the specific needs of the type of special population, such as the disabled and the elderly (Expert 3). This element complements the variable of interest 2, related to the state of conservation of these spaces, on which the estimation of their qualitative deficit of them depends. The third element focuses on the 'identification of public and meeting spaces located in residential areas with enclosures'. These are only functional areas for their residents. The enclosure acts as a barrier that affects or limits pedestrian accessibility on foot toward these spaces. It prevents the free movement of people who live inside it to other areas outside of it (Expert 1) and in some cases, it may increase access costs. In addition, it restricts access to people who live in other areas of the city.

4.5. A synthesis Model for Planning and Management of APSM in Colombia

The proposed model (Figure 2), represents a summary representation of the interpretative model that brings together all the variables of interest for sustainable planning and management of APSM of a city and the respective elements of analysis that derive from them. In the model, variables were listed according to the logical order in which they should be addressed based on the urban analysis. The links or dependency relationships that exist between some variables and the factors determining their appearance order were also represented. Additionally, the variables were classified into three groups according to the stage of the approach. The first group is characterized by those of interest in the context of urban planning and management. They correspond to variables whose elements of analysis should be addressed by urban analysts during the design and formulation of territorial planning instruments on which land-use planning is governed. Group 2 poses their interest in the context of urban management. They are variables whose analysis elements support the monitoring and control of the functionality of the APSM. Its implementation depends on the recurrent collection of data, mainly provided by citizens, especially by users of these infrastructures. Finally, Group 3 is based on the context of urban planning and management. They correspond to variables whose elements of analysis are relevant, both for urban planning and ordering and for urban management around the functionality of the spaces.

The variables and elements of analysis were also distinguished within the scheme by using different colors to highlight the relationship they present with the three precepts of urban sustainability on which their selection process was based: preservation of the environment (green), sociospatial justice (red), and public participation (blue).

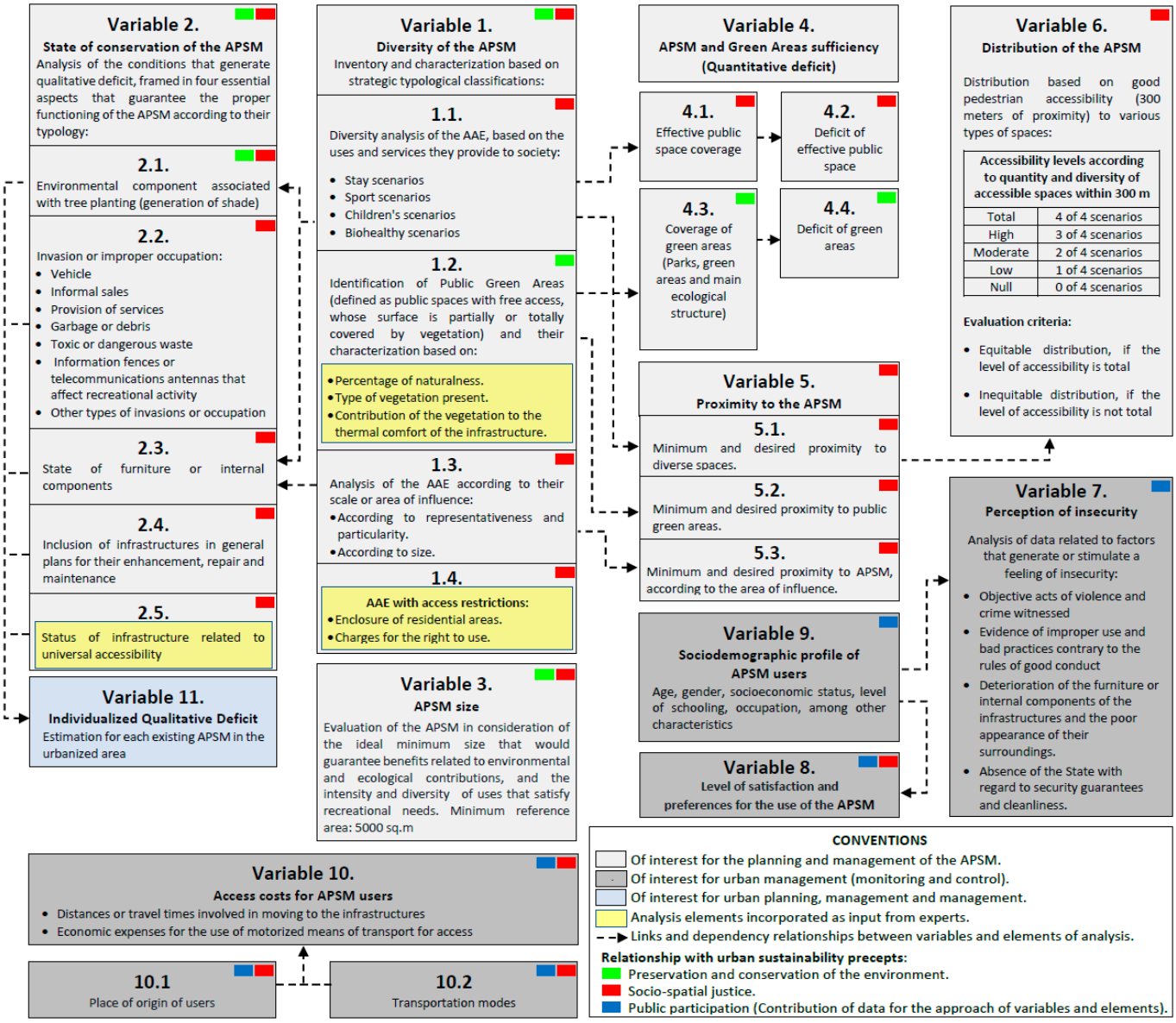

Figure 2. Schematic representation of the conceptual model for the planning and management of APSM. **Note**: Reading and interpretation of the schematic model should be carried out considering the numbering previously established for each variable and element of analysis, which corresponds to the logical order of implementation.

4.6. Challenges and Final Remarks

The relevance and pertinence of the proposed model are due to its ability to ensure that urban analyses around the planning and management processes of APSM reach the level of exhaustiveness required by the urban sustainability approach. This seeks to respond to the challenges embodied in the global goals and targets for sustainable development [24]. The model tackles and proposes a solution to the main problems around the analysis of these infrastructures, referring to the lack of integration of the multiple variables of interest, which have been addressed in the technical and scientific literature individually or jointly, by evidencing a disarticulation among them [11,12,15,17–20,23,25–27].

Consequently, we considered that the applicability of this model is projected to the articulating public and meeting spaces of urban areas not only in Colombia but also in other developing countries over the world. The proposed model is critical in the particular case of our study area given the weakness and ambiguity of the current analysis proposals

for the planning and management of these spaces. The opinion of the panel of Colombian experts in the field who took part in the validation process supports the functionality of the model because they define it as an interesting and well-developed tool (Experts 1 and 5), "that all cities need" (Expert 4). They consider that it is a model that is easy to operate and apply in the field, which helps to "have accurate data and make decisions" (Expert 6). In this sense, the promotion of the functionality of this model is crucial, not only as guidelines for urban planners and managers but also as the basis for the design and implementation of a future public space observatory. This observatory could work as a helpful tool for data collection and could also present useful information for decision-making; these inputs could serve scholars, the public administration, and society at large (Experts 1, 4, 5, and 6). It is noteworthy that the model contemplates the inclusion of society in the processes of planning and managing public spaces, opening the way to community participation. This is a challenge for city planners and managers since they need to find ways that allow the articulation of all the emerging voices thanks to the participatory process and, even more so, by having to respond to the dynamic citizen demands, forcing government entities to strengthen the capacities of action and reaction (Expert 4).

The model identifies various variables of interest for the adequate approach of the public and meeting spaces in the planning and management processes of any city or urbanized area. However, in this work, the selection of analysis elements associated with such variables was focused on the specific needs of the study area and was also in line with the regulatory guidelines that govern planning and management processes, whose implementation is strictly mandatory. Nevertheless, the characteristics of the selected variables allow the model to be open to additional analysis elements relevant to the approach to articulating public and meeting spaces, regardless of the study area. This would further guarantee the exhaustiveness of the analyses that support decision-making processes that have repercussions on the spatial configuration of cities.

In the technical and scientific literature, however, there are other frameworks aligned with the precepts of urban sustainability, and they are associated with some of the variables of interest that make up the proposed model [15,19,79]. In the conceptualization proposed in this research, the variable diversity includes a series of analysis elements expressed through strategic typological classifications, one of which is established based on the size or surface area of the public and meeting spaces. From this perspective, the DADEP proposal was taken as a reference, since it was adapted to the context of the study area (Table 3), adhering to the regulatory guidelines [27]. However, from this particular approach, other classification proposals differ from the previous one, and that can also be used as an element of relevant analysis: (i) Gómez uses a scale for segmentation [17] that coincides with the one described by Salvador Rueda [80] and the one used in the Valencia Green Plan [64]. This scale establishes five types of spaces differentiated by area ranges. (ii) Flores and González [81], based on SEDESOL [82] and Salvador [74], proposed categories based on established surface ranges, which in turn are associated with the characteristics of the spaces (services they offer and features related to internal equipment) and the social goal, emphasizing the number of people who benefited.

Regarding the state of conservation, it should be clarified that the conceptualization proposed emphasizes four essential aspects that guarantee the functionality of these spaces. However, it does not consider universal accessibility as another equally relevant aspect, being largely considered in models of inclusive cities. The necessary incorporation of this new analysis element in our logical model brings implications to the methodological proposal for the estimation of the individualized qualitative deficit of public space adapted to the study area [22].

Regarding the variable sufficiency, the proposed conceptualization focuses on the indicator 'Effective Public Space Coverage', which emphasizes the surface of spaces based on the number of inhabitants. This constitutes one of the specific guidelines of the regulations that rule the approach to public space in the instruments of territorial planning. However, another perspective to address the analysis of this sufficiency is the comparison

between the total urbanized area and the number of available spaces. In this line, it should be underlined that the reference index established by the UN-Habitat public space program suggests that 15% of the entire urban area should be designated for open public spaces, whether as green areas or not [24].

Finally, it is also pertinent to highlight the relevance of variable distribution, whose analysis is proposed in the conceptualization based on equity, determined from the analysis articulated around three key variables: proximity, accessibility, and diversity. The distribution proposal formulated by Jiménez and Garnica, accepts those criteria, which is why it was established as the main element of analysis that supports the approach of this variable [29]. However, other proposals also analyzed the distribution of public spaces based on equity, according to the variables of proximity and accessibility, but without including diversity. Mayorga determined the distribution concerning the coverage of available spaces for the population (area per inhabitant) [15]. Castelao et al. took into consideration the number of people residing within an established area of proximity [19]. Regardless of the focus of the analysis, equitable distribution of the articulating public and meeting spaces does not guarantee the public use of these infrastructures, since it depends on other conditions that determine the availability of use. In other words, the equity in the distribution of these spaces is affected to the extent that the implementation of other elements of analysis derived from the variables of interest reveals irregularities in the urban geospatial configuration.

The model has tackled and solved the weaknesses shown by the regulations that rule the management of APSM in Colombia (found in different land-use plans, as described in Section 4.1.2). Therefore, the model can be considered as a reference frame for the updating and reformulation of public policies related to the planning and management of public spaces. The model could also work as a framework for the design and implementation of an Urban Public Space Observatory that recurrently collects relevant data. This future observatory will present useful information for decision making, which could ensure a more functional management of these spaces. Finally, it is necessary to emphasize that although the variables that make up the model ensure its applicability to any urban environment, the elements of analysis that support these variables were selected based on Colombian reality. Additional elements of the analysis could be incorporated into the model before its implementation in other geographical contexts. Furthermore, the diversity and complexity of APSM in any context and the dependency on the willingness of public authorities could be a handicap to the implementation of the proposed model.

5. Conclusions

The conceptual model proposed in this article seeks to strengthen decision-making processes related to the planning and management of urban spaces concerning the APSM approach. The model was designed according to the problems and deficiencies linked to the current guidelines that govern or guide these processes in Colombia. However, we consider that the relevance and applicability of the proposed model are also projected to other urban areas since it is made up of fundamental precepts of urban sustainability that respond to the challenges implicit in the global goals and objectives of sustainable development. To guarantee the functionality and the applicability of the model in the study area, it is necessary to restructure the official guidelines related to the processes of planning and management of APSM. Nowadays, decision makers only consider those elements of analysis stipulated in the current and weak official guidelines.

In the Colombian context, the analysis proposals around these important infrastructures do not lead to the exhaustiveness that the urban sustainability approach demands. In this sense, the model constitutes the first step in promoting strengthened regulations that rule the approach of these spaces in terms of sustainability. In the future, the model should be complemented (or adjusted) according to the new or improved methodological proposals focused on the analysis of urban spaces, which contributes to the clear and timely identification of sociospatial injustices related to the functionality of APSM. Likewise, it is

considered necessary to promote the design of interactive geoinformation mechanisms that enable and facilitate the adequate and recurrent collection of the data required to plan and manage these areas, mainly those that depend on public citizen participation.

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Appendix A

Table A1. Description of the members of expert panel who took part in the validation process of the proposed conceptual model.

Participant	Professional Profile	Experience in the Field of URBAN (and Public Space) Planning and Management
Expert 1.	- Professional in architecture - Specialist in public space - Master's in urban and regional planning	In consultancy for more than 10 years in private projects of public spaces and landscaping. Expert contractor in public space for the formulation of land management plans.
Expert 2	- Professional in architecture. - Master's in urban design. - Master's in urban and territorial development.	Specialized professional for the area of public spaces in a planning secretariat of a territorial entity. University professor in the area of urban planning. Participation in interdisciplinary teams for the formulation of land management plans.
Expert 3	- Professional in sociology. - Specialization in urban sociology. - Master's in urban and regional planning.	Work in social and environmental management during the execution of public space projects, green areas, zonal parks, and metropolitan parks. Participation in the creation and implementation of a Public Space Observatory. Participation in the process of formulation and adoption of public space policies. Academic coordinator in the Master's program in architecture. Professor of urban planning in the Master's program in sustainable design. Participation in interdisciplinary teams for the formulation of land management plans. Participation in the implementation of an observatory of urban and social dynamics.
Expert 4	- Professional in architecture. - Specialist in public management. - Specialist in urban environmental management. - Master's in social work.	Participation in the development of regulations for the zonal planning units during the adoption of a territorial ordering plan. In the projection of master plans for parks, squares, and other types of public spaces. Participation in a research exercise on appropriation, development, and self-construction of spaces for recreation and sports for a group of adolescents and young people. Participation in interdisciplinary teams for the formulation of land management plans.

Table A1. *Cont.*

Participant	Professional Profile	Experience in the Field of URBAN (and Public Space) Planning and Management
Expert 5	- Professional in architecture. - Specialist in regional urban planning. - Master's in environment and development. - Ph.D. student in Engineering	The research focused on the analysis of public spaces. University lecturer Consulting, mainly on issues of partial plans.
Expert 6	- Professional in architecture. - Master's in management and urban development. - Specialist in land development and management	Public officials depend on a municipal administration related to land-use planning and management. Professional experience focused on the formulation and management of urban planning instruments, in particular the formulation of land-use plans and the evaluation of partial plans. Extensive knowledge in the development and coordination of planning, design, and construction projects at different scales. Extensive experience in the development of participatory plans and designs and skills in group management, administrative management, and management of standardization processes.

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