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Urban Public Space Axis Rector of Green Infrastructure in the Current City of Ecuador

Experience Ambato**Marina Perez-Perez¹***¹Architecture, Arts and design Faculty, Technological University Indoamerica, Ecuador*

Abstract

The current city calls for the reconsideration of a close relationship between gray infrastructure and public spaces, understanding the infrastructure as a set of items, equipment, or services required for the functioning of a country, a City. Ambato, Ecuador, is a current intermediate city, has less than 1% of the urban surface with use of public green spaces, which represents a figure below the 9m²/ hab., recommended by OMS. The aim of this paper was to identify urban public spaces that switches of green infrastructure in the city today, applying a methodology of qualitative studies. With an exploratory descriptive level analysis, in three stages, stage of theoretical foundation product of a review of the existing literature, which is the theoretical support of the relationship gray infrastructure public spaces equal to green infrastructure. Subsequent to this case study, discussed with criteria aimed at green infrastructure and in the public spaces of the study area. Finally, after processing and analysis of the results, we provide conclusions for urban public space as a definition of the green infrastructure of the current city of Latin America; in the latter, the focus is to support this article.

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1. Introduction

The current city, fragmented by structures constituted in networks and nodes, has caused urban public spaces to empty, forgetting that these spaces are considered an opportunity to strengthen social relations and that budgets are also allocated to improve the vitality of these spaces. In this sense, the new trends in the configuration of the urban environment, point towards a literacy of space, based on the sensitive perception and imagination of citizen (Trachana, 2013), where the current city is seen as a large social space, in which values the practices of its active citizens by and for it (Lefebvre, 1978). As a result we obtain a model of public space produced by modernity, far from reality, with this model the state offers an ideal setting for the integrating and mediating function of its inhabitants, with the idea of a public space as a guarantee of democracy and space of freedom, with the opportunity to be an individual.

The definition of the city presents different relationship solutions by mixture of uses, continuous, intermittent or occasional: hybridization, when it hosts different activities, public spaces, equipment, etc.; or acupuncture, by repetition of the same activities in sequence along an infrastructure system (Mayorga & Fontana, 2012), the street. The streets have been "something rather than a public service, rather than a series of linear physical spaces that

enable scrolling they are places of encounter and exchange, social or commercial; the medium where people meet, main reason being of cities” (Jacobs, 2013).

The exorbitant consumption governance, low services to the ecosystem and new behaviors, product of globalization, give as a result urban sustainability indices that define green infrastructure. The scope of the green infrastructure occurs in various scales.

Based on a three-dimensional model of sustainable development, indicators for the study of the green infrastructure provide the three basic axes, with particular approaches. In the case of social sustainability, the role-played by the participatory processes of the inhabitants of the city becomes relevant. The diversity of classes are manifested in the social middle class and high tends to locate its field of action in its residential spaces and public spaces under private control socially paragraphs, by adopting an indifferent attitude with regard to the public space classic, except in what is related to your travel needs. Attitude that has consequences, which imply that the city is taken as a reality outside, inevitable or normal, and their actions are limited to the area where your House, contributing to its territory the nature of public space is located. On the other hand the popular classes, intensely used traditional public space, through its economic practices, mobility, consumption, recreation, imposing its aesthetics, on par with the absence of urban culture that allows assuming public as own and communal, the absence of a culture that guidelines for the care and respect of the public space. Low empowerment of public space in the Latin-American city resulting in practices forms of use, and appropriation of public space indifferent to the common good.

1.1. The infrastructure in the current city.

It is recognized that the decreasing quality of public space is due to causes, such as the impact of changing the function of the meeting space in the communication era. The combination of work, care and personal life leads to whether today’s society needs the vitality of cities, adding the appearance of shopping centers, leisure, etc. They attract a large number of people, generating a set of spaces for collective use. Which causes territorial segmentation with problems such as the appearance of borders or the zoning of uses with the consequent loss of diversity and quality of life.

The assessment of public space, accounts for the habitability that presents, as urban quality of life, habitable and comfortable conditions. Linked to a degree of satisfaction of services and perception of habitable space: parks, green infrastructures. In this multidimensional framework, the public space from its habitability constitutes one of the satisfies of the quality of urban life. The importance of public space is such that a city is valued depending on the experiences that individuals have in relation to their peers(Paramo, Burbano, Jimenez-Dominguez & Barrios, 2018).

In the current context, cities are protagonists of the provision of services, the construction and location of buildings, in facing inequalities and in managing the environment as a contribution to human health (Montoya, 2016). In this sense it is necessary to collect spontaneous and emerging processes that build the social space, proposing alternatives to the current urban model, with green infrastructures.

The public spaces of the current city are unique compared to the quality of the spaces of the traditional city. Working on the regeneration of these spaces requires proposals that come from technical, economic, environmental and social perspectives. The current city claims to reflect on its internal growth, reflection on the possibility of becoming a consolidated city as an urban model based on sustainability, understanding public space as a resource that must be taken care of, maintained, and revalued environmentally, effectively, healthily and habitable

Infrastructures are decisive in that configuration of the current city, which increases the demand for comfort and mobility. Infrastructure brand that relationship influencing the definition of urban spaces, issuing guidelines in the form of the city and defining the potential or shortcomings (Ramos, 2015), which affects the surrounding public spaces.

The infrastructure found a historical time, through sections that can be read on several levels. This is why infrastructure is considered as the main core, which acts as the current city coalescer. This infrastructure analysis is

given based on the sum of these differential cross-sections at different spatial and temporal scales (Munar, 2015). That you join tangent scenarios' infrastructure with a formal relationship, defined by the infrastructure.

Green infrastructure is a wide range of specific practices and a series of definitions. The U.S. environmental protection agency defines the green infrastructure as a durable, cost-effective approach to the management of the impacts of the humid climate, which provides many benefits to the community.

In general, green infrastructure is economic, improving security and the quality of life of the community, incorporates both the natural environment and engineering systems to conserve the values and functions of ecosystems and provide a wide range of benefits for the inhabitants of the city.

Green infrastructure can be designed to meet the needs of the rural life in the city. It includes parks and urban forests, which provide a habitat for the quality of life. In general, smart cities are using the green infrastructure from the streets and green roofs, to bring the benefits of nature to the built environment. It can be a central element of the regional intelligent planning, ensuring the city to have a habitable environment for future generations.

The green infrastructure has become a tool for the resilient city to enhance its ecosystems, contribute to the conservation of biodiversity, benefit to the populations and habitat in the sectors of agriculture, forestry, water, In addition to the mitigation of climate change and adaptation in order to strengthen consistency with the needs of the current city.

Green infrastructure can be defined as “an interconnected network of green spaces that conserve the functions and values of natural ecosystems and provide benefits associated with the population” (Benedict & McMahon, 2002). An idea that emerged in 1900, notwithstanding the concept of green infrastructure reappears in the decade of 2010, with the design and planning of urban and peri-urban environments (Eisenman, 2013). Gradually the green infrastructure has been included in the definition of urban environments, expanding its presence. Hence, in the beginning, the term green infrastructure that was focused on the conservation and maintenance of natural ecosystems, through a network of interconnected spaces, did not include this type of green infrastructure (Hellmund & Smith, 2006). In the current city, the incorporation of the concept of green infrastructure in the planning process is a challenge. Understanding urban green public spaces as infrastructure, is to consider the importance in the preservation of natural resources for future generations, of fragmented and disorganized urban growth (Valdes & Foulkes, 2016). At the local level, green infrastructure helps maintain landscape integrity and social welfare. The relationship of gray infrastructures with public spaces allows the green infrastructures of the current city to be perfectly enhanced, as well as to define it from a scientific-technical methodology of urban growth analysis, social welfare and environmental protection, emphasizing spaces public spaces for recreation, leisure and relationship with nature.

1.2. The integration of green infrastructure in the current city.

Despite the relationship between habitat and quality of life, public spaces have evolved unbundled in cities. The activities that were customary to perform in these spaces, have moved to private spaces and have modified behaviors in individuals, making them increasingly frequent less parks, squares, streets. These changes meant that the spaces were replaced by private spaces that sought to complement the activities with safety, comfort and hygiene (Paramo, Burbano & Fernandez-Londono, 2016).

In countries, developed or developing, cities are synonymous with an alternative to desirable existence. There are a series of factors resulting from these processes, for example, unemployment, the informal economy, among others (Castillo-Oropeza & Alejandro-Ramos. The public space of Latin American cities is currently the object of management, in order to contribute to the improvement of the quality of life of its inhabitants, given the importance that is given to sustain the social practices carried out in the public space (Paramo et. al, 2016).

The limited success of sustainable urban development is related to the limited availability of information in less developed countries, hence the need to monitor these cities and study their contribution to the right to quality of life (Nacif, 2016). The common place to the cultural and the economic, as well as the coexistence of the natural

environment with the built one, focuses on the re-interpretation of the physical environment for the user through activities and respect for the human scale. Activation of the present space at any time of the day with spontaneous character. With expression based on the relationships arising in the public space, the capacity of attraction of the place and the users and that jointly, construct through the public spaces that urban fabric capable of absorbing changes, reacting and increasing by itself its social capital.

For Latin American cities (where less than 50% of their land has basic services, water supply, sanitation, or transportation), adapt to sustainability, one of the resources are urban indicators, which allow monitoring the public spaces. Indicators are essential components in the evaluation of progress towards sustainable development (Gallopín, 2006). The relations of the city, in terms of the public space, are expressed in the streets, squares, parks, places of citizen meeting. The public space is the main space of urbanism, urban culture and citizenship (Borja & Muxi, 2003). The public space is not only considered an indicator of urban quality but also a privileged instrument of urban policy to build a city and to maintain and renovate traditional cities and to give the infrastructure a civic value. The incorporation of the concept of sustainable development in the management and urban planning is the result of research that contributes to enrich the strategies of management and green planning of the city (Flores-Xolocotzi, 2012).

The green infrastructure is a term increasingly used among professionals of natural resources, for the purposes of this paper, the green infrastructure is an interconnected network of green spaces that preserves the natural values and functions of the ecosystem and provides benefits to the population. The green infrastructure is the necessary ecological framework for the environmental component of sustainability, and this is where it joins the social and economic one. The green infrastructure is presented as a strategic approach to conservation that addresses the environmental and social impacts of uncontrolled expansion and accelerated consumption and the fragmentation of urban sprawl. In the field of the concept and value of infrastructure, principles for successful green infrastructure initiatives are presented.

1.3. The current city of the mountains of Ecuador. Ambato case study

The demand for green infrastructure in the current city of Ecuador is a guiding element for urban management. Aligned to the actions of the New Urban Agenda, which promotes a sustainable and inclusive urban economy, promoting environmental sustainability and adequate. The need to increase efforts to move towards a low carbon economy, contribute to curb climate change and aim for long-term economic growth. The NUA recognizes the importance of actions to achieve these objectives with a focus through the implementation of sustainable activities.

For the study of green infrastructure, in the current city, it has been applied in a specific case study, with a qualitative - quantitative methodology, and an exploratory - descriptive analysis, in three stages, the first is the theoretical foundation product to review existing literature to support the exposition of basic concepts and the theoretical support of the gray infrastructure-urban public spaces relationship. After that, the case study is analyzed, with criteria oriented to green infrastructure, analyzing the public spaces of the study area in Ambato, Ecuador, mappings were made for the registration of the infrastructures. Faced with the particularity that Ambato is an intermediate city with high seismic character.

The territory of Ecuador through its mountain systems, with three natural regions, costa, sierra and east. At different altitudes, the coast arrives at the level of the sea, the sierra with the highest level the Chimborazo to 6,267 msnm and the East located in the Amazon region that goes from the 3,353 m to the 300-150 msnm (IGM, 2013).



Figure 1. Location of Ambato

Ambato (Fig. 1), 155.80 km., of Quito, the Ecuador capital, has an area of 1016,454 km², which equals 29.94% of the province of Tungurahua. Located in the region sierra at 2.575,00 meters above sea level, is part of the climate Equatorial mesothermal dry (Pourrut, 1983). Between latitude 1° 14' 32.11", longitude 78° 37' 45.23". The temperature fluctuates from 13.3 to 14.7 °C variation given by the irregularity of the terrain, reaching the extremes of 7 to 24°C, relative humidity between 70-80%. According to the records of the past 10 years, next above, measurements of T and RH have been kept without relevant variations. It is traversed by the Ambato River which has a length of 26.6 km. The annual water deficit in the area amounts to approximately 1913.35 mm. Its geography is differentiated by the Western mountains, more than half of the surface, dividing it into two almost equal parts and a high plains area constituted by the Andean alley. Its orography is rugged with a series of hills, hills, streams and ravines, which considerably limit the existence of broad valleys.

Ambato, capital of the province of Tungurahua, was founded in 1535, 251 years Ambato was the victim of three significant earthquakes (1698, 1797 and 1949), the latter caused left an Ambato in architectural ruins, giving rise to a new city. The current city of Ambato, in addition to being a resilient city is an intermediate City (BID, 2015). with 154,369 inhabitants, with immediate rural surroundings with economic relations of interaction at the regional level (Salazar, Irarrazaval & Fonck, 2017). Its main economic activity is trade in regional output. With a periurban incipient growth Ambato is an emerging city.



Figure 2. Study Area, Ambato, Ecuador.

Is defined an area of study that includes the current downtown and its immediate urban expansion, with an area of 343.4 hectares (Figure 2), in which the green public spaces are 26.5 hectares (Figure 3), representing 0.78% of the surface to such a study.

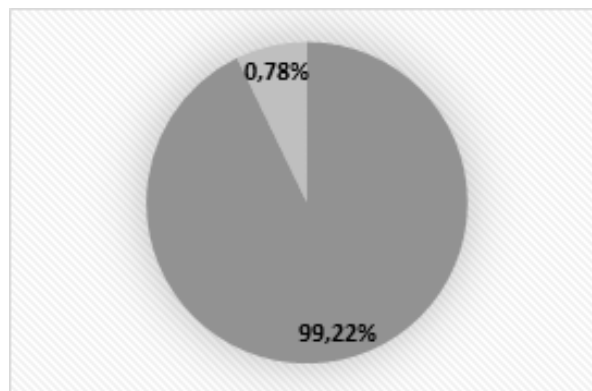


Figure 3. Study area and area of urban green public spaces.

1.3.1. Road infrastructure

The road system considered one of the pillars of growth, connecting territories and facilitating commercial and cultural exchange, as well as collaborating in the quality of life of the inhabitants. The emphasis on the role of the roads, in mobility, to achieve urban integration and social appropriation, goes in the degree of the infrastructures involved. In which the infrastructure allows articulation of circulation, facilitating the speculative practices of the real estate market, where the formal and abstract design of the city, determined by the disposition of the infrastructure, were related to each other and to the value of used to exchange value of the land (Galan, 2017).



Figure 4. Road infrastructure in the study area.

The technical and socio-environmental aspects of the road infrastructure claim to follow sustainability indicators, applying the “eco-development” (Ordonez Diaz & Meneses Silva, 2015). aimed at the balance between economy and ecology and its inclusion in development models that favor dominated populations, displaced and the Third World.

In an attempt to improve the living conditions of the current city, a group of Latin American countries has identified investment in infrastructure represents a decisive tool to advance towards economic and social development. A good road system is crucial for developing countries to exploit the potential of the economic sector: good roads and good roads are essential, efficient electricity network guarantees to industry and commerce (Venanzi, 2014). Figure 4 shows the road infrastructure that benefits urban public green spaces in the study area.







The traditional infrastructures, the gray infrastructures respond to a limited number due to their complex integration in the territory. Being replaced or coexisting with diverse green infrastructures of different dimensions, structured forming networks of natural, semi-natural or artificial elements, capable of offering multiple environmental, social and economic functions (Magdaleno, 2017). Among the measures for the implementation of green infrastructures are those that are decisive, considering that the gray infrastructures are conventional transport, service, social or commercial structures. They can also be storage (reservoirs and rafts) and conduction (pipes or channels) for wastewater, rainwater or supply.



Figure 5. Electricity network in the study area.



NOMENCLATURA

-  LIMITE_ESTUDIO_2
-  RIO_AMBATO
-  VERDE_ESTUDIO
-  1_SOLO_TUBERIA_GIS
-  2_SOLO_POZOS_GIS
-  3_SOLO_FLECHAS_GIS

1:15.000

Figure 6. Sanitary energy network in the study area.



Figure 7. Drinking water net work in the study area.

Table 1. Gray infrastructure in the public spaces of Ambato (figures 5, 6 & 7)

INFRASTRUC TURE	ELECTRIC NETWORK					SANITARY NETWORK		WATER NETWORK
	Low voltage		Medium voltage	Interior lighting	Network posts	Piping download	Well	
	Aerial	Underground	Aerial					
Public spaces								
1. Dos Culturas	Si	Si	Si	Si	Si	Si	Si	Si
2. Los Sauces	Si	No	Si	Si	Si	Si	Si	Si
3. Luis A. Martínez	Si	No	Si	Si	Si	Si	Si	Si
4. Los Quindes	Si	No	Si	Si	Si	Si	Si	Si
5. La Vicentina	Si	Si	Si	Si	Si	Si	Si	Si
6. La Madre	Si	Si	Si	Si	Si	Si	Si	Si
7. Juan Benigno Vela	Si	Si	Si	Si	Si	Si	Si	Si
8. Juan Montalvo	Si	Si	Si	Si	Si	Si	Si	Si
9. Cevallos	Si	Si	Si	Si	Si	Si	Si	Si
10. Doce de Noviembre	Si	Si	Si	Si	Si	Si	Si	Si
11. Plaza Sucre	Si	Si	Si	Si	Si	Si	Si	Si
12. Neptali Sancho	Si	Si	Si	Si	Si	Si	Si	Si

Table 1 shows the types of gray infrastructure that each urban public space in the study area has, namely the data on service infrastructures: electricity networks, sanitation networks and drinking water networks (figures 5, 6 & 7).

They are known as "gray" because of the lack of connection they exert on "green" ecosystems, in the largest of cases they are single-purpose, monofunctional facilities, to respond to a specific need of society. High cost, high energy needs, significant impact on the environment, limited integration in the territory.

2. Green infrastructure and quality of life

The green infrastructure the case study arises in two ways:

1. From a conceptual framework to define the enhancement of public spaces,
2. Specific knowledge in the area of study of Ambato,

With an approach to the issue of climate change by means of the concept of green infrastructure, adaptation and mitigation of climate change, that is close to the way that public spaces urban green as one more strategies for dealing with climate change in cities, with green infrastructure, are considered highly efficient.

At the level of design, twelve public spaces of the current city of Ambato conducive to both group and individual activities. Even with the similarities that may have, there are differences determined from variable location, dimensions and activities, which respond to a geographical location (Figure 8, 9 & 10).

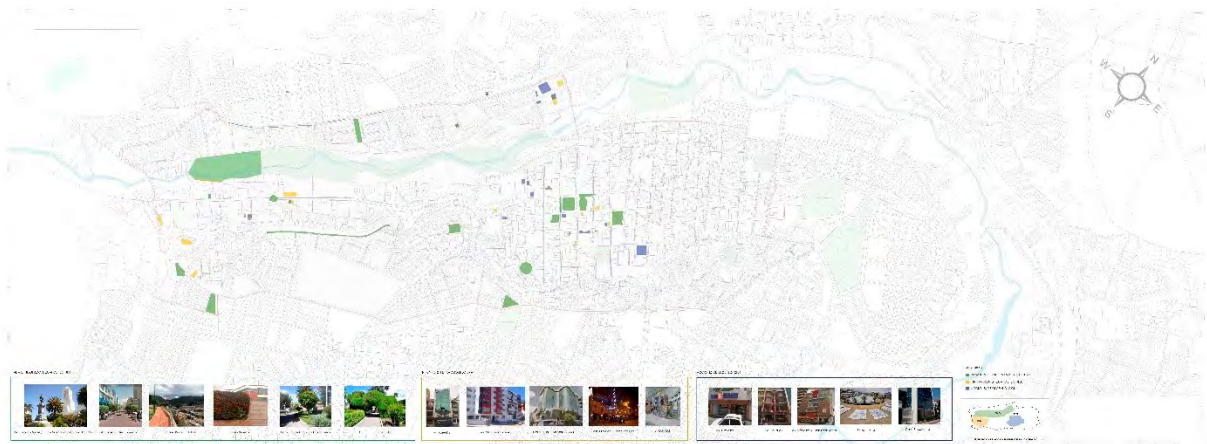


Figure 8. Geographical location of urban green public spaces.



Figure 9. The open public spaces and closed public spaces.



Figure 10. The green public spaces and the equipment.

2.1. Comfort, use and enjoyment of the public space.

In a previous study directed to stay in public spaces, outdoor activities in the Andean region of the Ecuador, yield results that dwell time is correlated with the equipment, conditions that allow users to use the space in group activities (Basantes Nunez & Garcia Higuera, 2018). Coupled with this are the environmental characteristics of the site, where the altitude, temperature and relative humidity determine the enjoyment of public space.

The studies carried out, so far, are defined by the sustainability variables; existing infrastructures in relation to urban public spaces represent a favorable for the case study data.

In an approximation of the international actions that are carried out on the links between urbanization and its infrastructures, with a view to mitigating the negative effects of uncontrolled urbanization (Bazant, 2010), guidelines for the conservation of biodiversity in the cities, in order to strengthen the sustainability of natural resources in an urban context.

2.2. Urban green public spaces the green infrastructure of the current city.

Urban public spaces, in the area of studies of Ambato, have little of the classic playgrounds. The playground loss product of urban life, space of the modern city, which arises as a response to keep children away from the street. Becoming a playful, formative, normative and educational space, a place to test the civic rules of behavior (Stutzin, 2015). Ambato urban green public spaces are far from having the value of the playground as a place full of potential for social integration not only of children but also for adults who care for them. While they agree on the way in which to understand public space, they also respond to different ways of conceiving the game and its social function. Their level of appropriation is different, the space where users are related to the city and the rest of society, staying in spaces of relations with close peers.

If public spaces in which leisure is sought through the cleared space, made as a donation for the leisure, leisure as the capacity to enjoy the world that builds understanding (Caraves, 2010). Ambato spaces shape leisure, from the Act of the ride, whether by user location, is neighbor or not, by distance or proximity, are spaces to be leisurely.

In the public spaces of Ambato, the relationship between public space and infrastructure defines ecosystem services offered by the green infrastructure, such as those that are some of the recognized ones to face climate change in the current city. In addition, they are classified according to whether they act as mitigation or adaptation mechanisms to climate change. There the importance of improving ecosystem services, as a form of a green infrastructure system, so that the city adapts to climate change (Vasquez, 2016).

The first aspect recognized in the case study, is the proper location of public spaces, records show that the equip-

ment found in the study area, in the vicinity of the public space, allow this diversity of activities, in the most of the cases, protected from noise.

Relevant elements that characterize green infrastructures (Magdaleno, 2017).

- The elements that share a green infrastructure network must have a critical dimension and adequate connectivity potential with the rest of the network.
- National and European networks of protected natural spaces can be the basis of green infrastructure, due to their capacity to capture high biodiversity and ecosystems in good condition, due to the volume and importance of the ecosystem services they support. However, the green infrastructure must be based on all the major types of land use.
- Green infrastructures can include both natural and artificial elements, such as core and buffer zones, restored habitats and multifunctional areas.
- The socioeconomic potential of green infrastructure is expressed through its capacity to optimize the management of natural capital, reduce natural risks or contribute to the European 2020 strategy.

The result of a qualitative analysis, due to the need to understand the public spaces of the current city and in the specific case of the public spaces of Ambato, Ecuador, a series of mappings was made. Faced with the particularity of intermediate city with high seismic character. The systematization of the data has allowed qualitative data to be obtained in the Ambato sustainability function. The importance of public spaces also lies in the use they give and the ability to form their identity, also because of the gray infrastructure from which they benefit. The public spaces are places of potential with possibilities of green infrastructure that allows the space to adapt to the developed activity, to the characteristics of the environment and to the population density benefited.

3. Conclusions

According to the conceptual and methodological foundations for the implementation (Magdaleno, 2017), and considering some critical aspects that are currently being discussed in the study area, it is possible to propose some initiatives for the development of green infrastructures, which could be benefit for users.

The management and planning of urban green areas gradually incorporated an ecological vision, which has led, in recent years, to a three-dimensional perspective of sustainable development that requires an integral consideration of social, economic and environmental aspects.

Ecology and economics provide indicators of ecological footprint, green surface, biodiversity, carbon capture, oxygen supply, etc. Indicators of importance to assess the environmental importance of urban green areas; they are even the sustenance of one of the indicators of quality of life most used in urban planning: the 9 m² recommended by OMS. Considering a classic economic vision of sustainability, environmental economics provides economic values of environmental services of green areas without a market price; values that are useful in the benefits-costs for decision-making in the use of land in urban areas. From a social perspective, sustainability includes citizen participation, gender equity and social inclusion, hence the utility of knowing citizens' perception of urban green areas.

Today offer the public space as a space for coexistence and equality is a difficult task. Urban public spaces of Ambato are solutions that exemplify the importance of the relationship between public spaces urban green infrastructure at different scales, where the infrastructure provides successful or less successful conditions to the urban public space, guaranteeing a weight in the urban sprawl to a greater or lesser extent. Promoting the idea of public space as playful and collective space where innovative dynamics are developed, between the need and the creativity of its users and people who act jointly (Lefebvre, 1978).

The case study green public spaces represent 0.78% of the total area. Action that can be seen as an approach to the consolidation of the green infrastructure at the level of the current city of Ambato, integrating spatially different

existing and projected green infrastructure. Aside from the aesthetic and recreational qualities of public spaces of Ambato, the quality of life and sustainable development, the recognition of the multiple contributions of a green space means that a plan or project for its development have a greater political and social support.

The improvement of the green infrastructure in terms of design, implementation and a relationship cost-benefit to the local economy, the current Latin American city, first requires the definition of a policy of green infrastructure that fosters the planning of natural areas for the conservation of biodiversity and ecosystem services, important for human wellbeing. In addition to the preferences of residents in the first instance, and how they relate with the green spaces urban.

If it is impossible to imagine the existence of a city without drinking water and sewerage network, collectors of rainwater without infrastructure for the treatment of domestic waste water or infrastructure for education or health care. Similarly, the difficulty in the development of the current city without planning, calls for the implementation of green infrastructure, with vital functions for the city. Ambato, as intermediate city, with their gray infrastructure networks, the relationship with its surrounding territory is what gives character differentiating with respect to other types of urban settlements of the Ecuador. In this way, green infrastructure networks defined urban growth with unique features, facing local governments of intermediate city, largely as a special feature.

The improvement of the green infrastructure in terms of design, implementation and a relationship cost-benefit to the local economy, the current Latin American city, first requires the definition of a policy of green infrastructure that fosters the planning of natural areas for the conservation of habitat, important for human wellbeing. In addition to the preferences of residents in the first instance, and how they relate with the green spaces urban.

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