Perception of the urban parks' ecosystem services in Tuxtla Gutiérrez, Chiapas, Mexico

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Mariana Gómez Rangel[1]
gomezrangelmariana@gmail.com

María Luisa Ballinas Aquino[2]
mballinas@colmex.mx

1 Centro de Investigación y Promoción Cultural para la Integración Comunitaria, A.C. México

2 cimsur-unam, México

— Abstract—

Urban parks provide ecosystem services to people who live near these spaces and those who frequent them to carry out a specific activity. The services offered by urban parks are of vital importance for the development of society since they make it possible to reduce the stress of the population, improve air quality and climate control, as well as carry out recreational activities. This work aims to contrast the perception of users about the ecosystem services of two parks that are in the same eastern area of the city. We used the participant observation technique, were we obtained a comparative description of the characteristics of gray and green infrastructures of the parks of Tuxtla Gutiérrez, Chiapas, Mexico (Parque del Oriente and Parque Fundamat). Likewise, surveys were carried out to know the perception that users have about the previously mentioned parks with respect to some ecosystem services. Results show that the size, variety of activities, and the state of the infrastructure offered by Parque del Oriente influence the fact that there are users from distant neighborhoods, unlike what happens with Parque Fundamat, where users live close to that location. It should be noted that the people going to both parks recognize the cultural and regulatory ecosystem services.

Keywords:

Environment; urban environment; quality of life.

The world's population has increased fivefold since the last century (United Nations Human Settlements Programme, 2011). Currently, 55% of the population lives in cities and this percentage is estimated to increase by 13% by the year 2050 (Debnath *et al.*, 2014; United Nations, 2018). This population increase brings, on the one hand, the acceleration of the use of natural resources, while, on the other, the greater requirement for green areas that provide Ecosystem Services (ES) to the population (Balvanera and Cotler, 2007; Vásquez, 2016; Seto *et al.*, 2017). In the urban context, the concept of Ecosystem Services (ES) is relevant because it allows the assessment of the relationship between ecosystems and the well-being of the population, as well as the integration of green areas and natural resources for decision-making in the urban policies (Balvanera & Cotler, 2007; Frutos & Esteban, 2009; Camacho & Ruiz, 2012; Laterra *et al.*, 2017).

The term ES is defined by the international group of Millennium Ecosystem Assessment (Balvanera and Cotler, 2007), as: "The benefits that the population obtains from ecosystems" (MEA, 2003). Although ES emerge as a seemingly concrete and simple concept, some authors point out more specific aspects that address their complexity. In this sense, De Groot *et al.* (2002) link ES with the ability of natural processes and components to provide goods and services that meet human needs, directly or indirectly; while the U.S. Environmental Protection Agency or in the United States (2004) defines ES as those environmental functions or processes that, directly or indirectly, contribute to human well-being or have a potential to do so in the future. On the other hand, Camacho and Ruiz (2012) and Guevara *et al.* (2003) explain that ES can be divided into a) goods and b) services, the former are tangible and refer to physical objects such as food, wood, plants, water, and soil; while services are considered intangible since they are processes that cannot be touched physically, where the benefit to the population is obtained indirectly, as in carbon capture, climate regulation, landscape, or erosion control.

A classification of the ES that ecosystems offer to society is given by the MEA in 2005, which divides these benefits into four different types of services (Table 1):

Table 1

Table of classification of ecosystem services according to the MEA (2005)

Types of ecosystem services	Operation
SUPPORT	
Soil formation and conservation	Aid for non-desertification of the place
Nutrient cycle	It enriches the soil with organic matter and the regeneration of the plants' mineral nutrients.
REGULATION	
Water regulation	Vegetation cover can decrease surface runoff and aid in absorption to feed the groundwater, i.e., the cover serves as a moderator in flash floods and other problems such as erosion.
Climate regulation	The vegetation cover helps in carbon sequestration (CO_2 atmospheric) and prevents irradiation and heat islands.
Pollination and seed dispersal	It helps in the processes of floral gametes dispersion with the help of pollinators, animals, wind, and water.
SUPPLY	
Food	It provides food and the development of a plant, animal, or microbiological species that can be consumed directly or indirectly by humans
Non-eatable products	Fiber (cotton), wood, biochemical (medicinal plants, cosmetics, etc.), and firewood.
From water	The vegetation cover needs the availability of water, but in turn serves as its provider, generating and maintaining the available water quality.
CULTURAL	
Identity and diversity	La identificación de las personas hacia los ecosistemas crea un vínculo entre ellos.
Landscape, Values, and Heritage	Most ecosystems represent a landscape value to the community that is often protected by UNESCO as cultural heritage sites.
Spiritual	Many communities link the presence of trees to certain ancient beliefs and belonging to that place.
Aesthetics	They provide an ornamental element to the place.
Recreation and tourism	The ecosystems represent characteristics that make other people who are not precisely from that community want to visit them.
Generation of knowledge	They serve as places where scientific and traditional knowledge can be produced.

Source: MEA, 2005

ES serves as a connection between the population and the ecosystem, the latter being represented in this study through urban parks, which are outlined, open, publicly accessible areas, where their use is predominantly recreational, and ecosystems with vegetation and trees that dominate the landscape constitute the main green spaces within an urban settlement

(Chiesura, 2004; Gómez-Baggethun & Barton, 2004; taken from Vargas & Roldán, 2018). Culturally these places allow the interaction of the person with himself, with others, and with the natural environment, which favors the construction of identity (Ballinas, 2014) and the coexistence of users of different social strata (Martínez-Valdez *et al.*, 2020). There are some authors (Reyes-Paecke & Figueroa, 2010; Leandro-Rojas, 2014; Cuevas, 2015; Merayo *et al.*, 2016; Stainbrook, 1973 cited by Martínez-Soto *et al.*, 2016; Martínez-Soto *et al.* 2020) who mention that parks help improve the mental state of the community because people express the health benefits of doing physical activities in contact with nature. The reduction of some mental conditions is reflected in the work of Song *et al.* (2014), which was carried out in Japan, where a group of young men found a low in anxiety and stress in 14.3% of the population studied when young people had access to a frequent walk through a park with trees (cited by Merayo *et al.*, 2016).

ES studies in urban areas include those that refer to hedonic prices (Loret de Mola, 2018) and environmental indicators (Morales- Cerdas *et al.*, 2018), as well as studies that emphasize the zoning of ES (Guauque, 2019). The implementation of urban policies and citizen participation in the improvement of green areas have been studied concerning the increase in ES (Cervantes & Martínez, 2021), while planning is analyzed and linked to the distribution of urban areas that allow access to ES (Ojeda, 2020).

Within the various types of urban green spaces, the park has a special appreciation for its architectural, aesthetic, and historical characteristics; as well as for the construction of a better image and habitability of the city (Castro *et al.*, 2003; Montañez, 2017; Martínez-Valdez *et al.*, 2020).

In the urban park, vegetation is a fundamental characteristic since it constitutes a quality factor for the lives of people in cities (Rapoport *et al*, 1983; cited by Meza & Moncada, 2010). However, the attraction to these spaces is related to the present vegetation, the quality of maintenance, social security, free access (Duygu, 2015), and the distance from the users' place of residence to the park. In this context, Katz (2011) states that the optimal distance to make use of urban parks is approximately 5 minutes from the users' place of residence (Katz, 2011); however, the UN considers a distance traveled up to 30 minutes (Sepúlveda, 2017).

Another important feature in the study of parks is the presence of green and gray infrastructure (Castro *et al.*, 2003). Green infrastructure is the presence and interconnection of trees that preserve ecosystem functions and provides benefits to the population, while gray infrastructure is represented by civil works that are built within parks (Benedict and McMahon, 2002; Tzoulas *et al.*, 2007; Eisenman, 2013; cited by Vasquez, 2016). For Vásquez (2016) the green infrastructure arises as an alternative to the grey one since the latter is created only to satisfy a specific need; instead, the

green infrastructure allows to solve naturally several problems at the same time, for example, flood containment, water scarcity, thermal changes and lack of green space for the population. Zuñiga-Terán *et al.* (2020) indicate that these two types of infrastructure can work in a complementary way, coexisting in urban parks, spaces where ES is perceived. However, urban green areas can be perceived as a policy object, through the agreement of conservation and maintenance plans (Rivas-Torres, 2001; Fischesser, 2009; cited by Velasco *et al.*, 2013).

For the present research, an assessment is proposed that includes both user perceptions and technical aspects. The methodology of this study is based on the perception that people have with respect to ES at a cultural level, without this implying the exclusion of other ecosystem services perceived by the community as relevant. This is ultimately linked to the data obtained in the participant observation.

MATERIALS AND METHODS

The municipality of Tuxtla Gutiérrez is in the Socioeconomic Region 1 of the State of Chiapas, Mexico. The city is bordered on the north by the municipalities of San Fernando and Usumacinta; on the south by Suchiapa; on the west by Ocozocoautla de Espinoza and Berriozábal; and on the east by Chiapa de Corzo (INEGI, 2010; cited by SEDESOL, 2013). Tuxtla Gutiérrez has 159 spaces for recreation and sport within the city's 480 neighborhoods, within these are 107 parks (Pérez, 2014) of which only two will be studied for the present work.
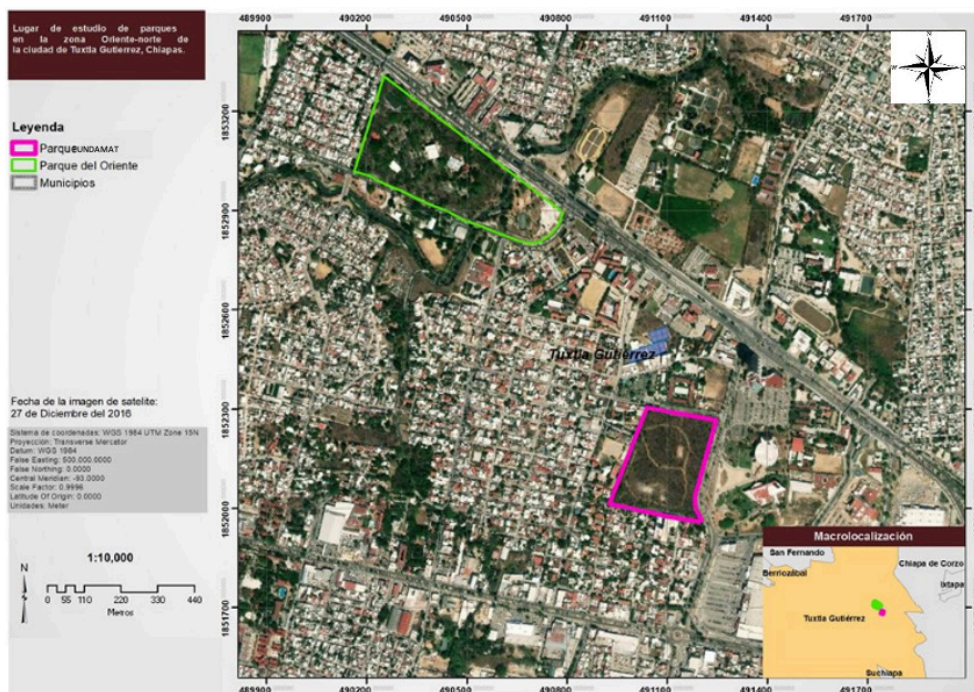
Figure 1. Location of Parque del Oriente and Parque Fundamat in the city of Tuxtla Gutiérrez, Chiapas.
Source: Perla Paniagua for this project, 2020

Table 2

Geographic location of the two evaluated parks

PLACE	COORDINATES	HEIGHT (msnm)	EXTENSION (m²)
PARQUE DEL ORIENTE	93° 5' 25.4" W 16° 45' 37.47" N	505	107.19
PARQUE FUNDAMAT	93° 5' 0.63" W 16° 45' 7.23" N	517	72.44

Source: Own elaboration with INEGI data, 2020

The two parks that make up this study are located in the northeast of the city of Tuxtla Gutiérrez, Chiapas at a distance of approximately 1.5 km (see Table 2). Parque Fundamat has a smaller extension, approximately 33% less than Parque del Oriente. The latter adjoins the northern area of the city, which serves as a fast-track link between the east and west, and is also opposite a public secondary school, as well as nearby houses. While Parque Fundamat is located inside the El Retiro neighborhood, around it, there are houses and within a radius of approximately 500 m, there is a high school, an administrative unit, and a shopping mall (see Figure 1).

Participant observation

For the participant observation, it is allowed to describe the gray infrastructure of both parks and the activities carried out by users in those spaces. We observe the influence of people, infrastructure for sports, rest and recreation areas, and the presence of containers, public lighting, and parking. For the green infrastructure, we observe the differences in the woodland, the characteristics of the density, and the care of each space. Finally, we observe the use of space in urban parks, that is, the interaction of visitors with the green and grey infrastructure.

We also used participant observation to describe the infrastructure of the two areas (Díaz, 2010), in which we made a preliminary observation and record. In the end, data from this observation are organized and analyzed, according to the aspects considered in this study.

Survey

The surveys were based on cultural ES classified by MEA (2005). Random sampling was performed by quotas, a procedure that is part of the non-probability samples (Ochoa, 2015). For this case users over 18 years are chosen, since some questions are dating back to past years.

96 surveys are carried out in total, which is divided between the two parks (48 for each park), applying six daily surveys in eight days, the application schedule is staggered to cover different groups of people who come to the park, either in the morning, noon, afternoon or evening. The aspects considered for sampling are gender (men and women) and age (18-35, 36-50, and 51 years and older).

The topics covered in the survey are the neighborhood of origin, frequency of attendance, knowledge of administration, use and knowledge of infrastructure, assistance to other parks, knowledge of biodiversity, park changes over time, and future prospecting.

Figure 2. Conducting surveys. Source: Own elaboration

RESULTS

The results of the participant observation are exemplified by the characteristics of the infrastructure, as well as the conditions in which these spaces are (Table 3).

Table 3

Comparison table of the grey and green infrastructure observation

CHARACTERISTICS	PARQUE DEL ORIENTE	PARQUE "FUNDAMAT"
GREY INFRASTRUCTURE		
Courts	One basketball court that is in good condition.	A small football field.
Gym	Open to the public at the established schedules.	Not applicable.
Running and walking tracks	In good condition, one for each activity.	It has only one track for both activities.
Pool	In good condition, semi-Olympic.	It does not have one.
Exercise machines	They are located in two areas of the park.	It does not have one.
Bathrooms	Two bathrooms that are supervised by one person.	Closed and in poor condition.
Trash cans	There are eight containers in poor condition.	There are six containers with no space to deposit garbage.
Parking	It has one inside and two outside.	It has one on the outside.
Benches	There are fifteen benches	There are eight benches
Palapas	There are two that are used for dance classes	It does not have one.
Administrative unit	You can ask for information and enroll in different activities	Not applicable.
GREEN INFRASTRUCTURE		
Forestry status	The trees' appearance is better visualized	There are dry trees and uncut branches.
Density	In comparison with Parque Fundamat, it has a lower tree population density.	In comparison with Parque del Oriente, there is a greater tree density per unit of area.
Signaling	There are signs at the entrance doors encouraging people to take care of the green areas.	It does not have signs.

Source: Own elaboration

As seen (in Table 3) both parks have things in common, such as courts or fields (although for different activities); they also have running or walking tracks, garbage cans, and some benches to sit on. Parque del Oriente has more gray infrastructure, such as a gym area, a pool, exercise equipment, and a palapa where some activities are performed such as Latin or Arab dances; unlike Parque Fundamat which contains less diversity of grey infrastructure, which is in deteriorating conditions.

Attendance Frequency

The results of the survey regarding the frequency of attendance to parks are represented in how many times users come to these during a month, the

response is divided into three categories: 0 to 4 times, 5 to 10 times, and 11 to more times in the month. We can see (Figure 3 and Figure 4) the answers divided between men and women.
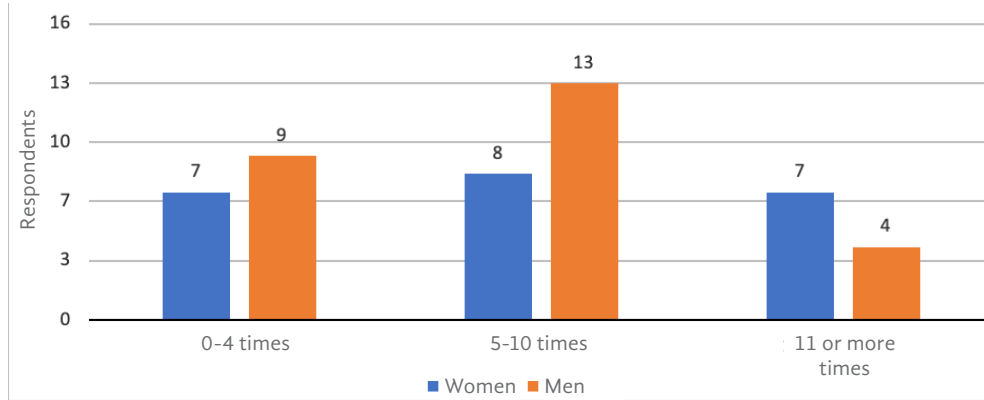

Figure 3. Frequency of attendance at Parque del Oriente for one month. Source: Own elaboration
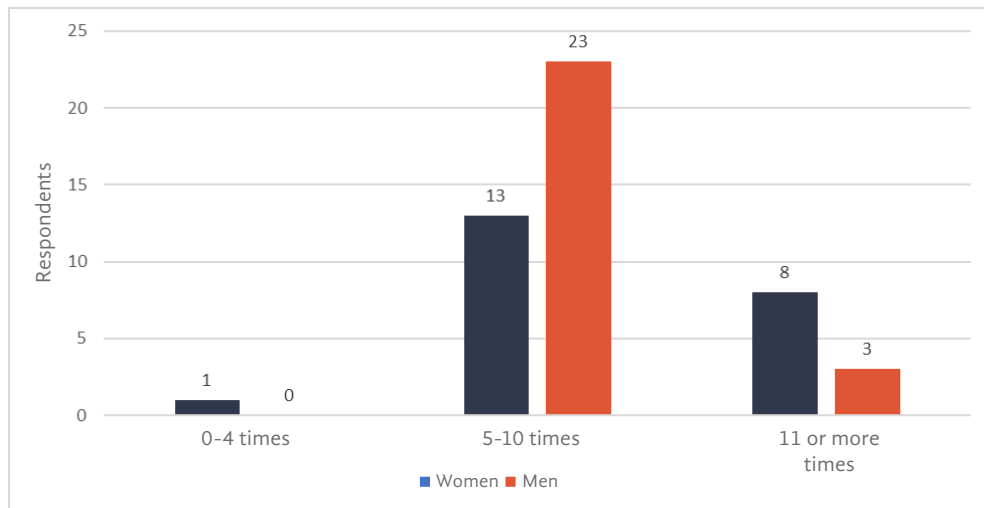

Figure 4. Frequency of attendance at Parque Fundamat for one month. Source: Own elaboration

As can be seen, both in Parque del Oriente (Figure 3) and in Parque Fundamat (Figure 4), there is a higher frequency of attendance in the range of 5 to 10 times a month. In Parque del Oriente, the only frequency range in which women's participation is higher than men's is the range of 11 to more times per month. In the case of Parque Fundamat, there is a greater presence of men than women in the range of 5 to 10 times per month. The frequency range of attendance at the park from 0 to 4 times a month is higher in Parque del Oriente (16) than in Parque Fundamat (1); while the frequency range of attendance at the park from 5 to 10 times a month is higher in Parque

Fundamat (36) than in Parque del Oriente. In the last range of 11 to more times per month, the same number of people is observed for both parks (11).

Age

The ages of the respondents, as well as the frequency of visits, are divided into three categories as mentioned in the methodology, these being: 18 to 39, 40 to 59, and 60 years and older. It should be noted that the lower limit is 18 years. The answers are represented in percentages for each park (Figure 5 and Figure 6).
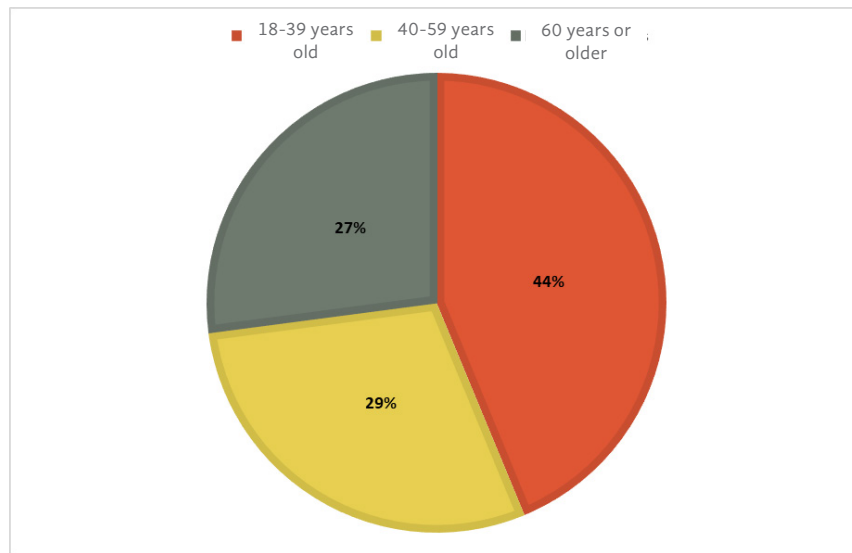

Figure 5. Respondents' ages in Parque del Oriente. Source: Own elaboration

Figure 6. Respondents' ages in Parque Fundamat. Source: Own elaboration

The age group with the highest percentage of visits to both parks was the youngest, that is, those under 40 years of age, with 44% for Parque del Oriente and 40% for Parque Fundamat. The second group with the highest attendance is the 40 to 59 years old, with 29% for Parque del Oriente and 37% for Parque Fundamat. Finally, there is the group of attendees over the age of 60, with an attendance of 27% and 23% respectively. It is noted that Parque Fundamat has 8% more visits than Parque del Oriente in the age range of 40 to 59 years.

Origin

In the survey, in the population data, we wanted to know the users' origin, thus obtaining a map with the neighborhood from which the people who attend Parque del Oriente (Figure 7) and Parque Fundamat (Figure 8) come.
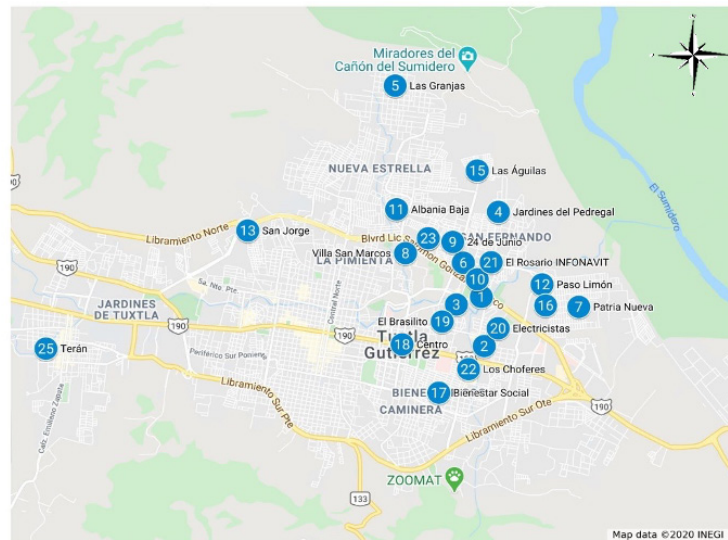

Figure 7. Map of the neighborhoods where the users surveyed in the Parque del Oriente reside.
Source: Own elaboration

The previous map (Figure 7) shows the spatial distribution of the neighborhoods of the visitors to Parque del Oriente. There were six neighborhoods found within a radius of less than 1 km for 37% of the respondents, while 63% of the visitors come from 18 neighborhoods located within a radius greater than 1 km from the park. It should be noted that, among the latter group of neighborhoods, one of them is located approximately 10 km from the park.
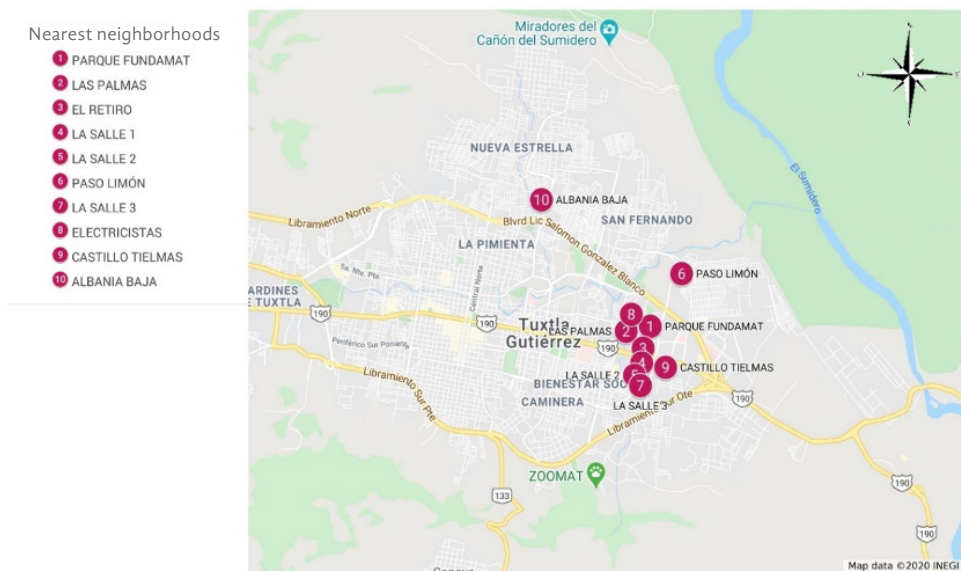
PARQUE FUNDAMAT

Figure 8. Map of the neighborhoods where the users surveyed in Parque Fundamat reside.
Source: Own elaboration

In Parque Fundamant (Figure 8) there are seven neighborhoods in a range of less than 1 km from where 88% of the respondents come, while 12% of visitors from two neighborhoods are within a radius of more than 1 km, within the latter group, one of them is located at a distance from the park of approximately 4 km. Parque del Oriente has vistors that come from more than double the number of neighborhoods than Parque Fundamat, and it is also visited by users from more distant neighborhoods.

Visiting other parks

As seen in Figure 9, almost half of the users of Parque del Oriente visit another park apart from this one; while in Parque Fundamant there is less diversification of visits to other parks (see Figure 10).
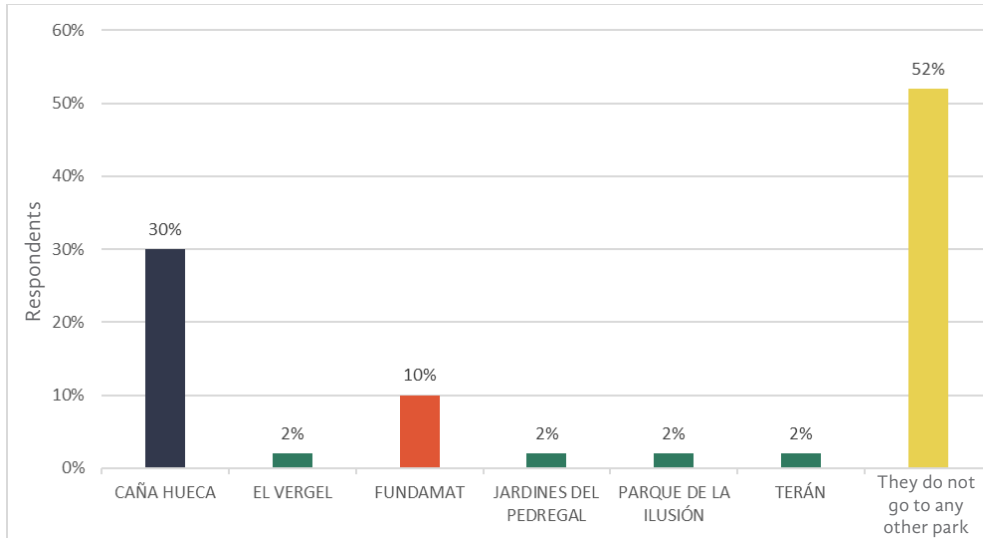
Figure 9. Other parks visited by users of Parque del Oriente. Source: Own elaboration
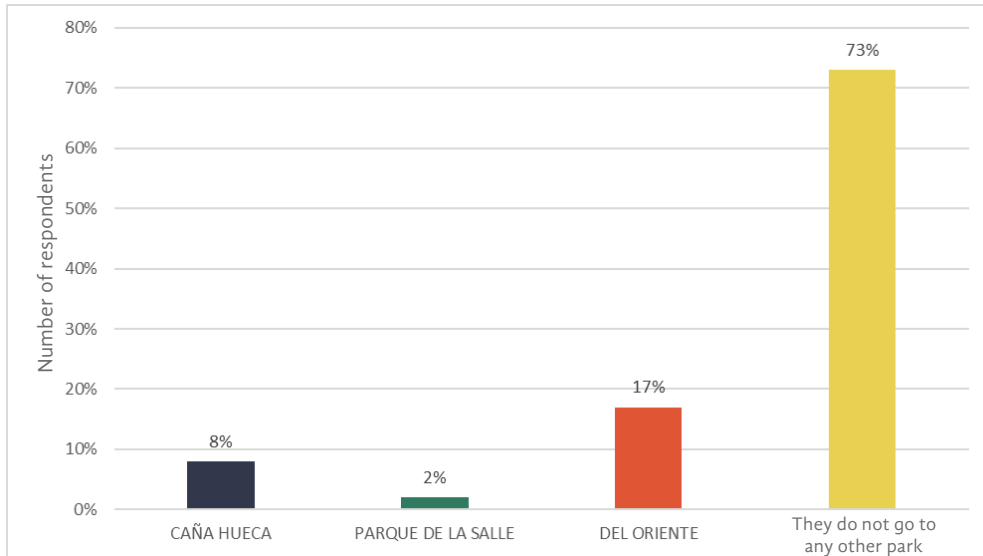

Figure 10. Other parks visited by users of Parque Fundamat. Source: Own elaboration

In Parque del Oriente, 48% of the total users also attend another park, while in Fundamat, 27% of respondents usually visit a second park to perform their daily activities.

The second park to which users of Parque del Oriente go more often is Parque Caña Hueca (30%), while 10% of the people come to Parque Fundamat. On the other hand, the survey carried out in Parque Fundamat shows that 8% of visitors go to Parque Caña Hueca, and 17% of respondents go to Parque del Oriente.

Infrastructure

The grey or green infrastructure, which users use more when they go to parks, is different in the cases mentioned in this study since in Parque Fundamat there is greater tree density while in the Parque del Oriente there is more diversity of gray infrastructure and a larger built space.
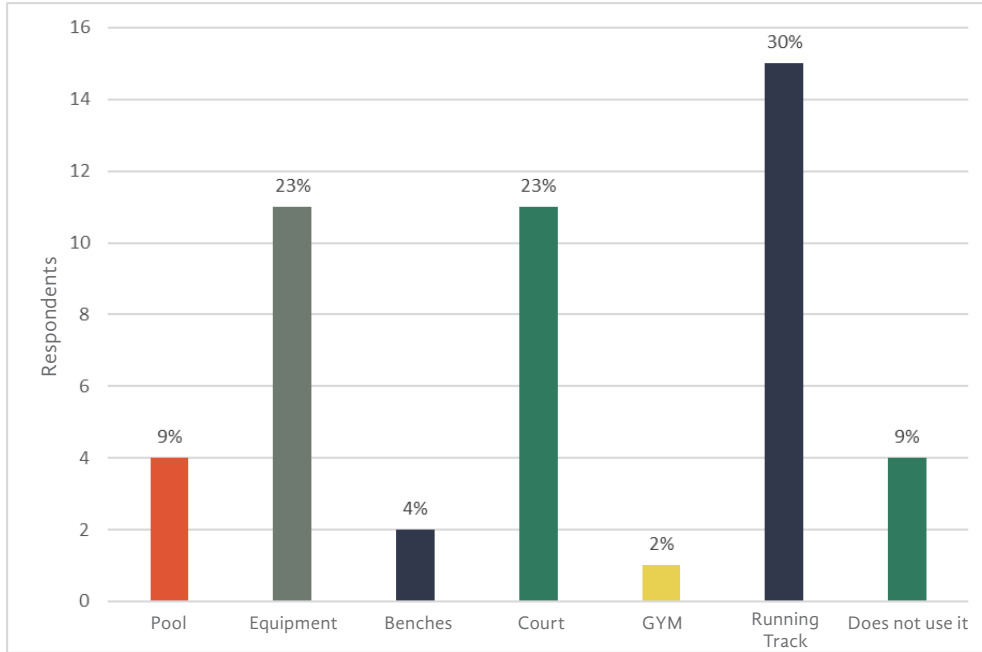

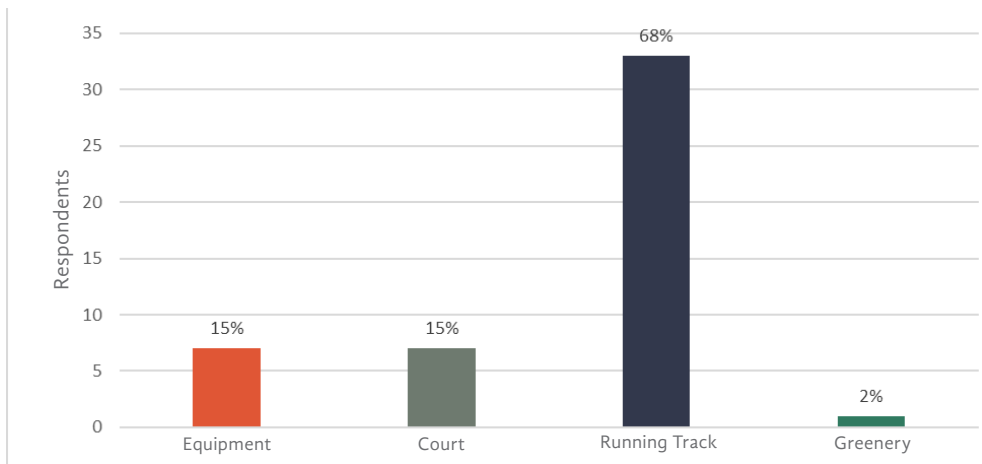*Figure 11.* The infrastructure used in Parque del Oriente. Source: Own elaboration

Figure 12. The infrastructure used in Parque Fundamat. Source: Own elaboration

The infrastructure most used in both parks was the running track, with 30% of those surveyed in Parque del Oriente and 68% of those surveyed in Parque Fundamat, slightly more than twice as many as the first park. In terms of the equipment for exercises and the use of the courts both answers had the same amount in each park (23% in Parque del Oriente and 15% in Parque Fundamat). It should be noted that the use of courts or fields in Parque Fundamat is for football, and in Parque del Oriente is for basketball.

Other answers found in Parque del Oriente are the use of the pool, benches, and the gym with 9%, 4%, and 2% of users respectively, and 9% of visitors do not use any infrastructure. For Parque Fundamat only one user commented that for him, the vegetation is the infrastructure that he uses the most, representing 2%.

Ecosystem services

One of the most important features to evaluate was the perception of the benefits that users feel they receive from the park they attend, this was an open question in which visitors mentioned only one answer. In both results, it can be observed that the benefits that most matter to users are related to the ES supplies, with 89% for Parque del Oriente (Figure 13) and 87% for Parque Fundamat (Figure 14), for cultural ES the results, were 11% and 13% respectively.
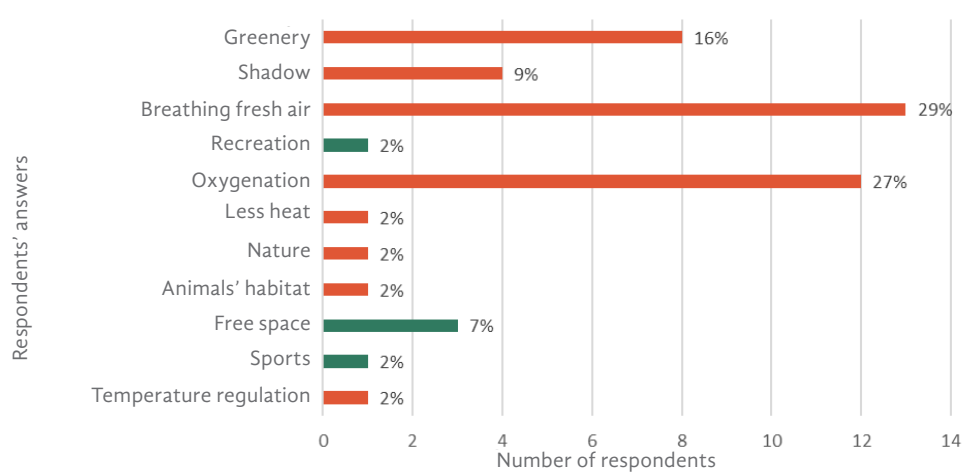

Figure 13. What ecosystem services are perceived in Parque del Oriente?. Source: Own elaboration
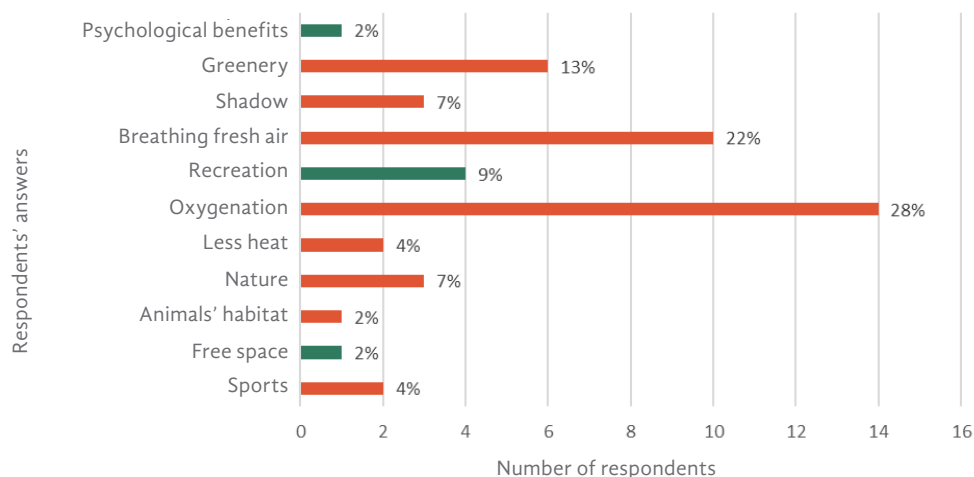
Figure 14. What ecosystem services are perceived in Parque Fundamat?. Source: Own elaboration

For the users of both parks, "Oxygenation" and "Breathing clean air" ecosystem services were the most mentioned results with 29% and 27% respectively for Parque del Oriente, and 28% and 22% for Parque Fundamat. These are related to the good air quality that people feel when they are in such places, although it should be noted that sport, relationships with animals, psychological benefits, or having recreational spaces had a low presence in the perception of users, even though it is previously stated that users do perform some sport or recreational activity in the designated infrastructures. This means that users attach more importance to the environmental benefit of air quality than to sports activities. Another data to consider is the perception of vegetation that had more relevance in Parque del Oriente.

Prospecting

Survey responses favored the Parque del Oriente, where 89% of users believe it can improve, while 9% believe the park could remain the same and 2% believe it can have a worse condition than the current one. Figure 15 shows how they believe the park can be improved.
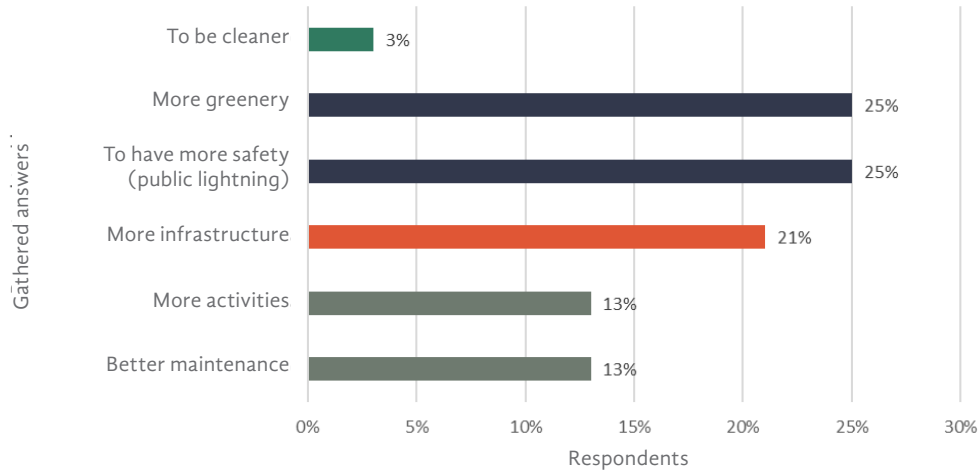
Figure 15. Prospecting for Parque del Oriente in the future. Source: Own elaboration

For Parque Fundamat, 63% mentioned that the park could be in better condition, 24% believe it could stay the same, and 13% think it could be worse than its current condition. The "better condition" response breaks down the following options shown in Figure 16.

Figure 16. Prospecting for Fundamat Park. Source: Own elaboration

23% of the users of Parque del Oriente (Figure 15) mentioned that it could be in a better state, 16% mentioned that it could have more vegetation and another 16% expect the park to have more lighting to improve the security of the park at night. This means that approximately 90% of users expect some aspects to be improved, such as infrastructure and maintenance, 2% expect the park to be in worse condition in the future, and 9% expect no change.

Contrary to the previous results, 24% of users of Parque Fundamat (Figure 16) believe that the park will remain the same in the future, while 15% of users believe that the park can have better maintenance and be

cleaner, 13% expect more vegetation, and 13% of respondents think the situation of the park could get worse.

DISCUSSION

As for the age of the users surveyed, this research agrees with the work of Flores-Xolocotzi (2012), since in the present study, it was found that the age block of 60 and over is the one with the lowest percentage of visitors to the parks, also agreeing with the work of Pérez and Fargher (2016) who found that teenagers and young adults were the ones who came to the parks the most. On the other hand, the study of Gómez (2013) differs from these authors and the present work, since, in the parks of Salamanca, Spain the visitors who come the most are elderly, This factor may be because older adults form part of 24% of the population in Spain (López, 2019), while in Mexico the elderly sector represents 12.8% of the total population (National Demographic Dynamics Survey, 2018 taken from Monroy, 2020).

The frequency of visits to the parks of this study and the work of Pérez and Fargher (2016) agrees since for both places more than 50% of visitors come to the parks in a range of 5 to 10 times a month. Another study carried out by the National Association of Parks and Recreation of Mexico (ANPR, 2018), reported that more than 50% of the respondents visit them from 8 to more than 12 times a month. In the case of this work the percentages favored Parque Fundamat with 97% compared to Parque del Oriente with 66% in the range of 5 to more visits per month, this figure differs from Reyes-Paecke and Figueroa (2010), which describe that visitors go more times to larger parks, considering that Parque del Oriente has 35 m2 more than Fundamat, so this preference in this work is not met.

As for the origin of neighborhoods, the study of Reyes-Paecke and Figueroa (2010) found that a park, having more length, attracted people from more distant neighborhoods. This aspect is like what was observed in this study since Parque del Oriente attracts visitors from more than twice as many neighborhoods as Parque Fundamat, as well as users from more distant neighborhoods. In addition to the size of the park, some other features are also related to the attraction of users such as the presence of more and better infrastructure, as obtained in the participant observation, the proximity of mobility routes, diversity of users, visibility (public lighting), and the sense of accessibility (Múñoz, 2014; Videla, 2016; Katz, 2017) help Parque del Oriente to attract people from more distant neighborhoods.

The resulting comparison of the participant observation (Figure 2) showed that the infrastructure Parque del Oriente has is predominantly gray: the courts, the walking tracks, parking, garbage dumps, and benches. It should be emphasized that the observation showed that the Parque del

Oriente's infrastructure is in better condition than that of Fundamat, so perhaps the location and larger size of the first one influence the desire to maintain a cleaner and more careful image for the citizens who travel the northern highway of the city.

Figure 17. Entrance to Parque del Oriente. Source: Own elaboration

Figure 18. Entrance to Parque Fundamat. Source: Own elaboration

As for the ES perceived by users of both parks the most perceived benefit was that of oxygenation as opposed to Flores-Xolocotzi (2012) who stresses the importance of recreation and sport, while in their work, the ANPR (2018) showed that 44% believe parks help provide conservation and environmental services (cultural ES). It is important to consider that compared to the ANPR, in this comparative work the greatest result was the perception

of provisioning and regulation ES, which gives implicit importance to the green infrastructure; although the reference to activities favored by grey infrastructure appears more often than not.

Like this study, the ANPR's work (2018) also questions the exploration of the park by users, since 25% were inclined to think that the maintenance of the park could be an area to improve in the future while for this work the results were 14% for Parque Fundamat and 8% for Parque del Oriente. As for public lighting improvement, the ANPR's result was 15%, agreeing with the results of the present work. The improvement of toilette facilities (16%) and accessibility to disabled persons (12%) were considered in the responses provided by the ANPR, which were not subjects mentioned by the people in this study, who focused on issues such as cleanliness and increased vegetation.

CONCLUSION

Although both parks are located on the east side - north of Tuxtla Gutiérrez, Chiapas and are characterized by being spaces of public and free access, the infrastructure that each one has means that different activities will be carried out, attracting different types of users. Sports and recreational activities are better valued in the present work and in that of Pérez (2014), this shows that the attraction of people to urban parks is directed to the use of gray infrastructure. On the other hand, it is noted that this infrastructure may be linked to the more evident presence of administrative and maintenance personnel, as is the case in Parque del Oriente.

Although for this work the number of users arriving at each park was not counted, in the participant observation and the application of surveys it was observed that more people came to Parque del Oriente, since it was easier to find more visitors to survey in a shorter period than in Parque Fundamat where the questionnaire time was longer due to the waiting of people to survey.

As for the extension, the larger a park is, the greater diversification of activities and care from public actors can be found in them, thus attracting people even from distant neighborhoods. Although the green infrastructure of Parque del Oriente is in better condition due to greater intervention, the trees in Parque Fundamat are in a more "natural" condition giving it a different appearance that can attract other types of users.

The relevance of this comparative study is based on the objective of investigating the perception that park users have about cultural and recreational ES as attraction factors to visit a park within the city. However, the result shows that visitors to both urban parks are more attracted by regulatory ES,

which is related to the presence of green infrastructure, even though their activities are carried out in gray infrastructure.

The data obtained can reinforce the idea of other authors who emphasize the importance of services provided by urban parks (Flores-Xolocotzi, 2012; Costanza *et al.*, 1997) opening lines of research that resume the social importance of urban parks' impact (Egea and Salamanca, 2020). Some researchers (Merayo *et al.*, 2016; Reyes-Paecke & Figueroa, 2010; Leandro-Rojas, 2014; Cuevas, 2015; Merayo *et al.*, 2016; Stainbrook, 1973 cited by Martínez-Soto *et al.*, 2016; Martínez- Soto *et al.* 2020) claim that, unlike the population living in rural areas, the urban community that has contact with nature, presents more social and health pathologies. In this sense, it would be relevant to investigate the relationship between urban parks and health, from the perspective of Ecosystem Services in the case studies. Finally, the urban parks analyzed from the perspective of Ecosystem Services are presented as spaces of opportunity to promote the cities' quality of life.

REFERENCES

Asociación Nacional de Parques y Recreación. (2018). *Viviendo los parques.* Recuperado de anpr.org.mx/wp-content/uploads/2018/08/VIVIENDO-LOS-PARQUES-Usos-y-Costumbres-de-los-Mexicanos-2018.pdf

Ballinas, M. (2014). Áreas verdes en el diseño de viviendas sustentables: una mirada desde la calidad de vida urbana. En González, R(Ed.), *Estudios ambientales y riesgos naturales* (pp. 53-90). Jaguar.

Balvanera, P. y Cotler, H. (2007). Acercamientos al estudio de los servicios ecosistémicos. *Gaceta Ecológica*, 84-85 (2),8-15. https://www.redalyc.org/articulo.oa?id=53908502

Barranquilla, Colombia. *Lecturas de Economía, 88* (1)183-205. https://dx.doi.org/10.17533/udea.le.n88a06

Benedict, M. y McMahon, E. (2002). Green infrastructure: smart conservation for the 21st century. *Renewable Resources Journal, 20*(3), 12-17.

Camacho, V. y Ruiz, A. (2012). Marco conceptual y clasificación de los servicios ecosistémicos. *Revista Bio ciencias, 1*(4), 3-15.

Castro, P., Escoriza, T., Oltra, J, Otero, M. y Sanahuja, E. (2003), ¿Qué es una ciudad? Aportaciones para su definición desde la prehistoria. *Scripta Nova. Revista electrónica de geografía y ciencias sociales, 7*(146) http://www.ub.edu/geocrit/sn/sn-146(010).htm

Cervantes A. y Martínez, M. (2021). *Relación de las áreas verdes urbanas con las mejores ciudades del mundo. Una revisión histórica. Teoría y educación ambiental. Reflexiones en tiempo de pandemia* (96-112). Universidad Autónoma de Chapingo.

Costanza, R., d'Arge, R., de Groot, R., Farberk, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R., Paruelo, J., Raskin, R., Suttonkk. P. y van den Belt, M. (1997). The value of the world's ecosystem services and natural capital. *Ecological Economics, 25* (1), 3-15. https://doi.org/10.1016/S0921-8009(98)00020-2

Cuevas, S. (2015). Análisis comparativo de los beneficios sociales, psicológicos y de seguridad de las zonas verdes en Malmö (Suecia) y Querétaro (México). *La pantalla insomne.* http://www.revistalatinacs.org/15SLCS/libro-colectivo-2015-2-edicion.html

De Groot, R., M. A. Wilson y R. M. J. Bowmans. 2002. A typology for the classification, description, and valuation of ecosystem functions, goods and services. *Ecological Economics* 41: 393-408.

Debnath, A. K.; Chin, H. C.; Haque, M. M. and Yuen, B. 2014. A methodological framework for benchmarking smart transport cities. *Cities.* 37(2):47-56

Díaz, L. (2010). *La observación.* http://www.psicologia.unam.mx/documentos/pdf/publicaciones/La_observacion_Lidia_Diaz_Sanjuan_Texto_Apoyo_Didactico_Metodo_Clinico_3_Sem.pdf

Directorate-General Enviroment. (2014). Pasando de la infraestructura gris a la verde. https://ec.europa.eu/environment/efe/themes/moving-grey-green-infrastructure_es

Duygu, R. (2015). Environment and Ecology at the Beginning of 21st Century, Publisher: St. Kliment Ohridski University Press, Editors. En Efe,R., Bızzarrı,C., Cürebal, I. y Nyusupova, G (eds.), *Recreation and Urban Park Management.* pp.302-312. St. Kliment Ohridski University Press

Egea, C. y Salamanca, E. (2020). Sociabilidades en las plazas de Buenos Aires. Usos, usuarios y diseño urbano. *Estudios Demográficos y Urbanos. 35* (2), 517-556. http://dx.doi.org/10.24201/edu.v35i2.1880

Flores- Xolocotzi, R. (2012). Análisis de los gustos recreativos en el Parque Ambiental Bicentenario de Metepec, Estado de México. *Pasos. 10* (3), 315-329. https://doi.org/10.25145/j.pasos.2012.10.038

Frutos, P., y Esteban, S. (2009). Estimación de los beneficios generados por los parques y jardines urbanos a través del método de valoración contingente. *Urban Public Economics Review*, (10), 13-51.

Galindo-Bianconi, A. y Victoria-Uribe,R. (2012). La vegetación como parte de la sustentabilidad urbana: beneficios, problemáticas y soluciones para el Valle de Toluca. *Quivera, 14* (1): 98-108. https://www.redalyc.org/articulo.oa?id=401/40123894006

Gómez, A. (2013). *El verde urbano de las ciudades de Salamanca, Valladolid y Zamora: Delimitación, ubicación y percepción* (tesis doctoral). Universidad de Salamanca, España.

Guauque, D. (2019). *Zonificación de importancia de servicios ecosistémicos aportados por áreas verdes de la ciudad de Bogotá.* (Tesis para especialización). Universidad Militar Nueva Granada, Colombia.

Guevara, A., Pérez-Duarte, M., Varela J., Porrúa M., Manson, R., Muñoz-Piña, C., Montiel, E., Zamora, C. (2003). *Introducción a los servicios ambientales.* SEMARNAT.

Instituto Ciudadano de Planeación Municipal (IMPLAM) (2015). Valoración de los parques urbanos la ruta hacia una Tuxtla sustentable. https://tuxtla.gob.mx/iciplam/descargas/VALORACION-DE-LOS-PARQUES-URBANOS-2015.pdf

Katz, P. (2017). *What makes a good urban park.* https://www.cnu.org/publicsquare/2017/03/01/what-makes-good-public-park

Laterra, P., Martín-López, B., Mastrangelo, M. y Garibaldi, L. (2017). Servicios Ecosistémicos en Latinoamérica. De la investigación a la acción. *Ecologia Austral, 27*(1), 094-098. 10.25260/EA.17.27.1.1.611

Leandro-Rojas, M. (2014). Potencial del espacio público como facilitador de bienestar y salud mental. *Revista Costarricense de Psicología, 33*(1),31-45. https://www.redalyc.org/pdf/4767/476747237002.pdf

López, L. (2019). *Bilbao prueba dos parques pioneros en Europa con juegos de memoria para los mayores.* https://ortotecsa.com/wp-content/uploads/2019/08/Bilbao.pdf

Loret de Mola, U. (2018). *Sobre el Uso de Índices de Precios Hedónicos para Comprender la Provisión de Servicios Ecosistémicos de las Áreas Verdes Urbanas en Cinco Megaciudades de América Latina.* (Tesis de licenciatura). Universidad Científica del Sur, Perú.

Loures, L.,Santos, R., y Panagopoulos, Thomas. (2007). Urban Parks and Sustainable City Planning-The Case of Portimão, Portugal. *WSEAS Transactions on Environment and Development, 10* (3), 171-180. https://www.researchgate.net/publication/228860531_Urban_Parks_and_Sustainable_City_Planning-The_Case_of_Portimao_Portugal

Martínez-Soto, J., López-Lena, María, y de la Roca Chiapas, J. (2016). Efectos psicoambientales de las áreas verdes en la salud mental. *Interamerican Journal of Psychology, 50*(2), 204-2014. https://www.redalyc.org/articulo.oa?id=28447010004

Martínez-Valdés, V., Silva Rivera, E, y González, E. (2020). Parques urbanos: un enfoque para su estudio como espacio público. *Intersticios sociales, 19* (1), 67-86. http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S2007-49642020000100067

Merayo, J., Serrano, N. y Marqués, P. (2016). Influencia de los espacios verdes urbanos en la salud mental. *Metas Enfermería, 19* (9), 20-26. https://www.enfermeria21.com/revistas/metas/articulo/80987/influencia-de-los-espacios-verdes-urbanos-en-la-salud-mental/

Meza, M. y Moncada, J. (2010). Las áreas verdes de la ciudad de México. Un reto actual. *Scrip Nova, 14* (1), https://revistes.ub.edu/index.php/ScriptaNova/article/view/1707

Millennium Ecosystem Assessment. (2003). *Ecosystems and Human Well-Being: A Framework for Assessment. Washington, DC: Island Press*, 2003. 49-70

Millennium Ecosystem Assessment. (2005). Ecosystems and Human Well-being: Biodiversity Synthesis. Washington, DC: *World Resources Institute*, 82

Monroy, J. (2020, 26 de marzo). En México, 15.4 millones de personas de 60 años o más. *El economista.* https://www.eleconomista.com.mx/politica/En-Mexico-15.4-millones-de-personas-de-60-anos-o-mas-20200326-0008.html

Montañez, D. (2017). *Hacia un modelo de parque urbano sostenible.* https://m50.com.mx/2017/07/13/hacia-un-modelo-de-parque-urbano-sostenible-por-david-montanez-rufino/

Morales-Cerdas, V., Piedra, L., Romero, M. y Bermúdez, T. (2018). Indicadores ambientales de áreas verdes urbanas para la gestión en dos ciudades de Costa Rica. *Rev. Biol. Trop. 66* (4): 1421-1435.

Múñoz, M. (2014). *Accesibilidad a las áreas verdes urbanas como espacios públicos. El caso de Ciudad Juárez, Chihuahua* (tesis de maestría). El Colegio de la Frontera Norte, México.

Ochoa, C. (2015). *Muestreo no probabilístico: muestreo por cuotas.* https://www.netquest.com/blog/es/blog/es/muestreo-por-cuotas

Ojeda, L. (2020). Equidad en el acceso a las áreas verdes urbanas en México: revisión de literatura. *Sociedad y ambiente.* https://revistas.ecosur.mx/sociedadyambiente/index.php/sya/article/view/2341

Organización de las Naciones Unidas (2018). *Las ciudades seguirán creciendo, sobre todo en los países en desarrollo.* https://www.un.org/development/desa/es/news/population/2018-world-urbanization-prospects.html.

Pérez S., y Fargher, L. F. (2016). Uso de los parques recreativos en Mérida, Yucatán. *Estudios demográficos y urbanos, 31*(3), 775-810. http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0186-

Pérez, A. (2014). *Estudio socioambiental de los parques y áreas verdes de la ciudad de Tuxtla Gutiérrez, Chiapas.* (Tesis de licenciatura). Universidad de Ciencias y Artes de Chiapas, México.

Reyes- Paecke, S. y Figueroa, I. (2010). Distribución, superficie y accesibilidad de las áreas verdes en Santiago de Chile. *EURE, 36*(109), 89-110. https://dx.doi.org/10.4067/S0250-71612010000300004

SEDESOL. (2013). *Unidad de Microregiones, cédulas de información municipal.* http://www.microrregiones.gob.mx/zap/datGenerales.aspx?entra=nacion&ent=07&mun=101

Sepúlveda, A. (2017). *Parques urbanos.* https://parquesalegres.org/biblioteca/blog/parques-urbanos/#:~:text=CARACTER%C3%8DSTICAS,verdes%20a%20trav%C3%A9s%20de%20andadores.

U.S. Environmental Protection Agency. (2004). *Ecological benefits assessment strategic plan.* Washington. DC: SAB Review Draft.

United Nations Human Settlements Programme (2011). *Cities and climate change: Global report on human settlements.* http://www.unhabitat.org/downloads/docs/GRHS2011_Full.pdf

Vásquez, A. (2016). Infraestructura verde, servicios ecosistémicos y sus aportes para enfrentar el cambio climático en ciudades: el caso del corredor ribereño del río Mapocho en Santiago de Chile. *Revista de geografía Norte Grande*, (63), 63-86. http://dx.doi.org/10.4067/S0718-34022016000100005

Vásquez, A. (2016). Infraestructura verde, servicios ecosistémicos y sus aportes para enfrentar el cambio climático en ciudades: el caso del

corredor ribereño del río Mapocho en Santiago de Chile. *Revista de Geografía Norte Grande,* vol. (63). 63-86

Velasco, E., Cortés, González, A., Moreno, F. y Benavides, H. (2013). Diagnóstico y caracterización del arbolado del bosque de San Juan de Aragón. *Revista mexicana de ciencias forestales, 4*(19), 102-111. http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S2007-11322013000500009

Vélez, L. (2009). Del parque urbano al parque sostenible. Bases conceptuales y analíticas para la evaluación de la sustentabilidad de parques urbanos. *Revista de Geografía Norte Grande*, (43), 31-49. http://dx.doi.org/10.4067/S0718-34022009000200002

Videla, J. (2016). *Parques urbanos y sustentabilidad.* http://www.arquitecturaenacero.org/proyectos/sustentable/parques-urbanos-y-sustentabilidad

Zuniga-Teran, A., Staddon, C., de Vito, L., Gerlak, A., Ward, S., Schoeman, Y., Hart, A. & Booth, G. (2020) Challenges of mainstreaming green infrastructure in built environment professions, *Journal of Environmental Planning and Management, 63*(4), 710-732. https://doi.org/10.1080/09640568.2019.1605890 .