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# Understanding the sociocultural valuation of ecosystem services in urban parks: a Colombian study case

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**Abstract**
The significance of urban ecosystem services on the perception of parks among the public is profound. Parks are valued for their functional benefits, the experiences they provide, and their relationship with green spaces. To better understand the sociocultural values associated with five urban parks in Tunja (Boyacá, Colombia), in this case study, we interviewed three types of stakeholders: decision-makers, social leaders, and park users. We employed semi-structured interviews to identify the perception and orientation values of different stakeholders. According to the results, stakeholders recognize 18 ecosystem services as the most important, with cultural ecosystem services having the highest perception value. We found that socio-cultural values are influenced more by the characteristics of the parks than their size, and socio-demographic aspects of stakeholders such as age, level of education, and gender had no significant effect. We conclude that people value urban parks for the benefits associated with trees and the emotional connections they develop with them over time, assigning intangible value to city parks. However, we also identified discrepancies in values between governmental and non-governmental stakeholders that may adversely affect decision-making and policy formulation. This information can be valuable to urban planners who seek to assess and integrate measures that promote green spaces in cities to achieve sustainability.

**Keywords** Human well-being · Orientation values · Perception values · Stakeholders · Urban ecosystems

## Introduction

The literature considers three ecosystem services (ES) valuation domains (Martín-López et al. 2012). Specifically, the biophysics, which provides knowledge about the identification and state of ecosystem components to supply ES (de Groot et al. 2010); the economic one, which analyzes the monetary value (Salzman et al. 2018); and the sociocultural one, which provides knowledge of the relative importance of ES for people (Arias-Arévalo et al. 2017). The integration and analysis of the different valuation dimensions are necessary for decision-making, for which the integration of disciplines such as ecology, economics, and social sciences has been required. The valuations not only imply adding the different parts but also imply capturing the interactions between them. The absence of information in any of the valuations does not allow a complete vision to be achieved regarding the ES. On the contrary, the priority of anyone could end up making invisible socio-cultural dynamics that change or redirect the delivery of ES, so decision-making could be focusing on improving an ecosystem service at the expense of others that can also be beneficial to the population (Gómez-Baggethun and Barton 2013).

The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) recognizes the importance of comprehensive assessment focused on constructing joint

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knowledge to analyze and manage the man-nature relationship (Díaz et al. 2015). A comprehensive assessment involves a multidisciplinary group, significant time, and resources. Although the integral valuation is a more holistic approach, the scope of the present work is of a sociocultural valuation. The socio-cultural valuation of ES is defined as: "*the importance that people, as individuals or as a group, give to ES*" (Scholte et al. 2015). Socio-cultural valuation encompasses a broad vision as it is connected to the entire spectrum of ecosystem services (Scholte et al. 2015). Socio-cultural valuation differs from the concept of cultural ecosystem services since the latter refers to ecosystems' aesthetic, spiritual, or scientific aspects.

Although the term socio-cultural valuation is not yet used universally, with its use, the role of context and culture in determining the value given to the environment or other domains, such as the community, is recognized (Bullock et al. 2018). Kenter (2016 refers to cultural values, such as shared values that reflect the importance of culture, interpretation in management, and the valuation of ES. Fish et al. (2016), for their part, define socio-cultural values as the collective principles, life goals, norms, and expectations that influence how ecosystems acquire meaning and importance for people. This study uses socio-cultural valuation regardless of the type of ecosystem service analyzed. Thus, socio-cultural values encompass the material, moral, spiritual, aesthetic, affective, symbolic, or medicinal importance values of the ecosystem for people (Arias-Arévalo et al. 2017). Values are fundamental in selecting or evaluating behaviors, people, and events. They are ordered in a system of priorities (de Groot and Steg 2008) based on vital and determinant factors for evaluating ecosystems, which the authors call orientation value. Thus, value from the psychological perspective is a belief on which the human being acts by preference.

When the benefits provided by urban ecosystems are identified, and the values of these benefits are understood, progress can be made towards achieving sustainable cities (TEEB 2011). In cities, sociocultural values arise from the importance people assign to green areas and the ecosystem services they offer, identified from the experiences people obtain with nature (Haase et al. 2014). They are essential for the success of management strategies for green areas and for the improvement in the design of instruments and policies for the management of urban socio-ecological systems, which contributes to the development of appropriate governance initiatives (Gómez-Baggethun and Barton 2013; Haines-Young and Potschin 2010; Ko and Son 2018), as well as for the management of urban green areas and land planning in cities (Dobbs et al. 2018; Pereira 2016; Posada et al., 2016). In the same way, these valuations are elements that make it possible to visualize and create environmental awareness from the same stakeholders that make use of green areas in such a way that they become a tool to promote governance initiatives, participatory processes, and generation of social and environmental justice (Pereira 2016).

In Colombia, urban green infrastructure is called the main ecological structure, which comprises nearby protected area systems, ecological corridors, particular management areas, and urban parks (Decree Law 1077, 2015). The latter are classified according to their size as metropolitan (> 10 ha), zonal (1 ≤ 10 ha, with specialized equipment, such as sports centers, swimming pools, courts, and skating rinks, among others), neighborhood (1 ≤ 10 ha without specialized equipment, such as sports centers, swimming pools, courts, and skating rinks, among others), and pocket (≤ 1 ha) (Decree Law 1077, 2015). According to this Law, municipalities and districts can create entities responsible for public space administration, development, maintenance, and financial support according to their legal organization. That is why most of the urban parks in Colombia are managed by municipal environmental secretariats, although there are other responsible entities. It is a top-down management strategy that leaves aside local particularities due to the different power relationships between the actors (Felipe-Lucia et al. 2015). Similarly, national territorial planning policies do not incorporate ES or their valuation, and the National Policy on Biodiversity and Ecosystem Services Management does not explicitly refer to urban ES. Some aspects have allowed the incorporation of valuation in decision-making to be limited, for example, the lack of reliability in the valuation methods, the insufficient technical resources for its incorporation, and the lag between the delivery of the results of the study concerning decision-making deadlines (Pascual et al. 2023).

As in most Colombian cities, in Tunja (140.9 km north of Bogotá, Colombia), sustainable urban planning has had a setback because green areas have not played a relevant role within the urban planning context (Ruiz et al. 2015). As an example that could be extrapolated to other Colombian cities, even other cities in the region, we perform a socio-cultural valuation of the urban ES of Tunja to know: (1) how important ecosystem services are for people based on understanding how they perceive them, (2) what main motivations influence people's environmental attitudes, and behaviors about these services; and (3) to identify the ecosystem services that occur together in the parks based on this sociocultural valuation. Our case study aims to bring urban planning policymakers valuable information to design new public policies focused on people's ecosystem services demand to achieve sustainable cities.

## Methods

### Study area

Tunja is located within the Andean Forest landscape, which encompasses various life zones, including Humid Montane Forest (bh-M), Humid Lower Montane Forest (bh-MB), Very Humid Montane Forest (bhm-M), and Dry Lower Montane Forest (bs-MB) (Municipal Agreement 0016 2014). The city is at 05°32'7" north latitude and 11°22'04" west longitude (Fig. 1); the city is immersed in elevations ranging from 2,700 to 3,150 m above sea level at its highest point. The average temperature ranges from 12 to 18 °C (Ruiz et al. 2015). The city is the capital of the department of Boyacá, in Colombia, and has an area of 121.4 $km^2$, including an urban perimeter of 15.7 $km^2$ (Ruiz et al. 2015). It has 181,710 inhabitants, and the demographic projections of this city are estimated at an increase of 20,948 inhabitants by 2035 (DANE 2018). Tunja currently has 88 registered parks with extensions ranging from 420 $m^2$ to 2.7 ha (Ruiz et al. 2015), which is equivalent to an offer of 1.34 $m^2$ / inhabitants, meeting only 20% of the minimum acceptable indicator proposed by the United Nations of 10$m^2$/inhabitants, the desirable being 15$m^2$/inhabitants (Soto 2016).

### Research design: selected urban parks and data analysis

To carry out the sociocultural assessment of ecosystem services provided by urban parks, we selected freely accessible public parks located within the urban perimeter of Tunja City, of zonal scale (5,000–10,000 $m^2$) and urban scale ($\geq$10,000 $m^2$), according to the classification of the Land Management Plan of the city of Tunja 2016–2019, to have parks of different sizes represented. The zonal-scale parks have access through arterial mesh roads, are dedicated to recreation, sports, and leisure, and have a capacity of between 600 and 3,000 users. Urban-scale parks have access through the elements of the regional or arterial road subsystems, are dedicated to recreation, sports, and leisure, have squares, and have a capacity for 100,000 users. We selected the Pinzón and Santander parks as zonal scale parks and the Recreacional del Norte, La República, and Centenario as urban scale parks (Fig. 1; Table 1).

### Ecosystem services

To select the list of urban ecosystem services, we carried out a bibliographic review in Scopus, Science Journals (ProQuest), and Google Scholar, considering the following keywords: "urban ecosystems service" AND "cities," "sociocultural value" AND "urban ecosystems," "urban green areas," "urban ecosystems forest," "urban park" AND "urban green space." With this review, we consolidated a list of the 30 most studied ecosystem services in urban areas; however, we only considered the 18 most frequently mentioned by the interviewees, corresponding to one support service, eight regulation services, and nine cultural services (Table 2).

### Stakeholders

In order to know the values of different groups of people that are directly related to urban parks in the city of Tunja, we considered three stakeholders categories: (i) **decision-makers** are those people who are responsible for the management of green areas and decision-making in the city (governmental stakeholders); this category refers to the representatives of the Boyacá Regional Autonomous Corporation (CORPOBOYACÁ), the representatives of the Government of Boyacá and representatives of the Mayor's Office of Tunja, (ii) **social leaders**, are those people who belong to the academic sector or who have some type of leadership (non-governmental stakeholders), such as belonging to an association for the care of the environment and (iii) **park users**, are people who have a direct relationship with the park (non-governmental stakeholders), for example, people with some economic activity within the parks (street vendors, informal merchants), with some activity in the surroundings of the parks (establishments, formal merchants) and inhabitants of the city who transit and make use of the parks. We used the "snowball" technique to access decision-makers and social leaders. This technique allows us to obtain information on specific populations or groups of people with common characteristics as key informants (Goodman 1961). We used random sampling with three selection criteria to select the park users: we considered that they visited parks studied at least four times per month, were adults, and had lived in the city for at least five years.

### Sociocultural valuation

Finally, we developed a semi-structured interview as a qualitative research method of mixed construction to determine the perception and orientation values of the different stakeholders on urban ecosystem services. Perception values are defined as the value of importance that people assign to parks and the services they perceive (Haase et al. 2014). Orientation values are those beliefs that influence behavior and direct behavior toward caring for the environment (Scholte et al. 2015). The questionnaire was divided into three components. The first component focused on sociodemographic variables, including how often they visit the park and how much time they spend there. The second

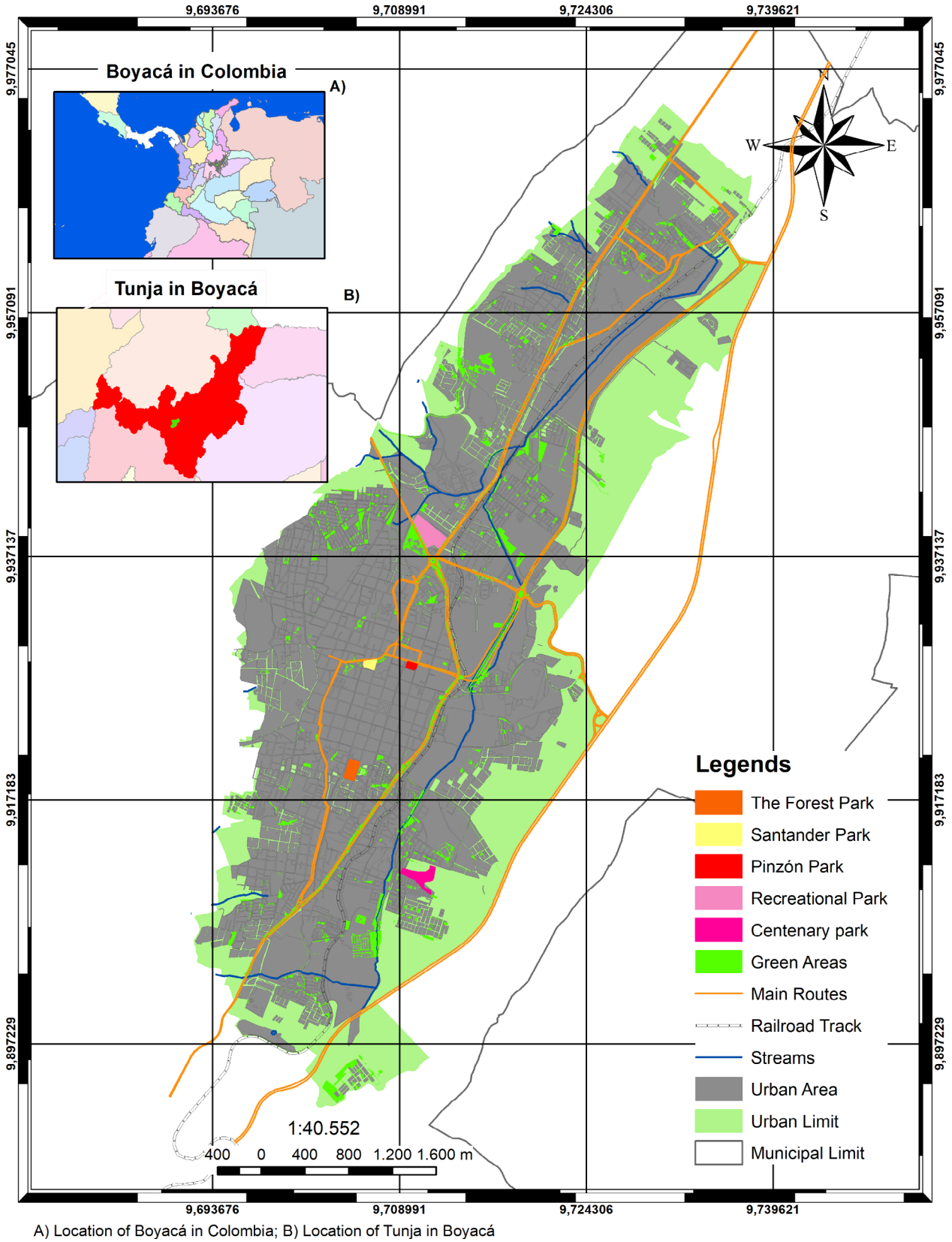


**Fig. 1** Location of urban parks in Tunja (Boyacá, Colombia). Source: adapted from data from the Tunja Municipal Development Secretary

**Table 1** Description of the urban parks in Tunja (Boyacá, Colombia) where the sociocultural assessment of ecosystem services was conducted. Source: Data from the Municipal Development Plan (2016–2019)

| No. | Park Name | Area ($m^2$) | Area (Ha) | POT Scale |
|---|---|---|---|---|
| 1 | Santander | 9.690 | 0,969 | Zonal |
| 2 | Pinzón | 5.075 | 0,5 | Zonal |
| 3 | Bosque la República | 17.000 | 1,7 | Urban |
| 4 | Multiparque Centenario | 27.000 | 2,7 | Urban |
| 5 | Recreacional del Norte | 43.000 | 4,3 | Urban |

component was about the perception and orientation values towards the selected ecosystem services. The third component consisted of three open-ended questions, asking them if they identified any other benefits of the park and if they wanted to explain the response regarding its importance. Before implementing the questionnaire, we conducted a pilot test to adjust the questions and interview structure.

To know the perception values of the stakeholders on the ecosystem services of urban parks (Table 3), we used four categories of values: essential (4), very important (3), necessary (2), and important but not necessary (1). Similarly, according to Scholte et al. (2015), the orientation values were evaluated as those guidelines that direct a behavior for the care of the environment. For these orientation values, we use three categories (Obeng and Aguilar 2018): (1) egoistic value, which refers to each person's interest in himself; (2) the altruistic value, which refers to the interest towards other people; (3) the biospheric value that refers to the interest towards other species. However, we included a combination of these three categories as option 4 because the interviewees simultaneously chose more than one of the three categories of orientation value when we applied the interview.

We applied the questionnaire to 83 participants; 55% of the interviewees were park users, 35% were decision-makers, and 10% were social leaders. We performed the interviews in each selected park for a month, every day of the week, including weekends and holidays. We conducted the interviews between 7 and 10 am and 4 and 6 pm since these are the times with the highest influx of park users in the selected parks.

**Table 2** List of ecosystem services used for multiple correspondence analysis (MCA)

| Variable type | Category | Ecosystem service (variable in ACM) | Value Code |
|---|---|---|---|
| Ecosystem Services | Support | Habitat for other species of animals and vegetation | Hav |
| | Regulation | Wind speed reduction | Wsr |
| | | Climate regulation | Clr |
| | | Noise levels reduction | Nlr |
| | | Humidity regulation | Hur |
| | | Disease Control | Dic |
| | | Shade production | Shp |
| | | Air purification | Aip |
| | | Polluting gases absorption | Poa |
| | | Oxygen production | Oxp |
| | | Carbon sequestration and storage | Css |
| | | Rainwater retention | Rwr |
| | | Urban temperature regulation | Utr |
| | | Ultraviolet rays reduction | Urr |
| | Cultural | Observation of plants and animals | Opa |
| | | Stress reduction | Str |
| | | People interaction/social cohesion | Pei |
| | | Entertainment and leisure | Enl |
| | | Scenic beauty | Scb |
| | | Sense of belonging | Seb |
| | | Feelings of well-being | Fwb |
| | | Contact with the nature | Cna |
| | | Environmental education | Eed |
| | | Spiritual experiences | Spe |
| | | Sports and recreation | Spr |
| | | Mental and physical relaxation | Mpr |
| | | Feeling of tranquility | Fet |
| | | Fresh air | Fra |
| | | Health improvement | Hei |

**Table 3** Sociocultural value used for multiple correspondence analysis (MCA)

| Value type | Value | Category | Value (points) |
|---|---|---|---|
| Sociocultural Value | Perception value (PV) | Essential | 4 |
| | | Very important | 3 |
| | | Necessary | 2 |
| | | Important but not necessary | 1 |
| | Orientation Value (OV) | Egoistic | 1 |
| | | Altruist | 2 |
| | | Biospheric | 3 |
| | | Egoistic -biospheric | 4 |
| | | Egoistic -altruist | 5 |
| | | Altruist-biospheric | 6 |
| | | All of them | 7 |

**Table 4** Sociodemographic characteristics used for multiple correspondence analysis (MCA)

| Variable type | Variable | Category | Code |
|---|---|---|---|
| Socio-demographic | Gender | Female | Gen |
| | | Male | |
| | Age | 21–30 | Age |
| | | 31–40 | |
| | | 41–50 | |
| | | 51–60 | |
| | | > 61 | |
| | Education | High school student | Edu |
| | | University specialization (pos-graduate level prior to Mater's in Colombia) | |
| | | High school graduate | |
| | | Associate degree | |
| | | Bachellor | |
| | Park use per week | 2 to 5 times | PUw |
| | | More than 5 times | |
| Stakeholders (Sst) | | Decision makers | Dem |
| | | Social leaders | Sol |
| | | Park users | Pau |

## Sociodemographic characteristics

In addition, we considered sociodemographic characteristics that could influence perception and orientation values, such as gender, age, living environment, political orientation, and membership in environmental organizations (Table 4), because the literature has shown that ecosystem services perception and prioritization change with sociodemographic factors such as age, level of education, and gender (Martín-López et al. 2012), and that ES priority bundles have been consistently associated with stakeholder groups (Peter et al., 2022). Additionally, since ecosystem services are not provided individually (Raudsepp-Hearne et al. 2010), we identified groups of ecosystem services (packages) relevant to society, considering the perception values.

## Data analysis

We carried out a multiple correspondence analysis (MCA) because it is an analysis that allows us to summarize and visualize data that contain categorical variables. In this case, we use it to analyze the data set from the interview, considering the individuals, the variables, and their categories. The objective was to identify associations between urban ecosystem services and their perception and orientation values. In addition, we determined if the sociodemographic variables and the type of social actor influenced the type of value. Two graphs represent the results. The first describes the variables that contributed the most to the first two axes, and the second describes the value categories. For the latter, confidence ellipses were drawn around the categories of the variables, relating them to the type of stakeholder to visualize groupings that could mark possible affinities or discrepancies between them. We performed the analysis using the functions of the FactoMineR package (version 1.42; Lê et al. 2008). We build reliable ellipses with the "addEllipse" function within the FactoMineR package (Husson et al. 2012). All features are available in R Studio v. 3.6.1 (R Core Team 2019).

Finally, we performed two hierarchical cluster analyses using Ward's linkage method with Euclidean distances (Ward 1963) in the PAST software version 2.17 (Hammer et al. 2001). The first one was to identify the relationship between the parks, considering the perception values of the stakeholders. The second one was to determine how the ecosystem services are grouped into "packages" using the perception value of the interviewees.

## Results

### Sociodemographic characteristics

We found that the people interviewed in the parks of the city of Tunja were adults with a mean age between 30 and 60 years (66%), followed by young adults (under 30 years), who represented 26%, and older adults (over 60 years), who represented 7% (Table 5). Similarly, most interviewees (60%) stated they are bachelors, the other 36% are high school students, and 3% are technicians. Additionally, most people (89%) visit the park between two and five times a week, while only 10% of interviewed people go to the park more than ten times a week. Finally, 49% of the people who visit the five parks are women, while 51% are men.

### Sociocultural valuation of ecosystem services

#### Perception values

According to the multiple correspondence analysis, our results indicate that sociodemographic aspects did not determine the perception values given to ecosystem services; conversely, they were determined by the type of stakeholder (Fig. 2). This shows the discrepancies between governmental and non-governmental stakeholders. Although the social leaders showed similar perception values to those shown by decision-makers and park users (Appendix S1), the latter two showed contrasting perception values. While decision-makers valued regulating and cultural services to a lesser extent, park users valued them to a greater extent. For example, in dimension one, decision-makers valued as necessary (value 2) the ecosystem services of reducing wind speed and shade production, while park users valued the same ecosystem services as essential (value 4). Similarly, decision-makers valued the stress reduction ecosystem service as important but not necessary (value 2), while park users valued it as very important (value 3) (Fig. 3). This could be explained by the different uses that the stakeholders give to the parks, the park users are in direct contact with these areas. In contrast, the decision-makers do the management from the government institutions.

**Table 5** Sociodemographic characteristics of the stakeholders interviewed in the parks of Tunja (Boyacá, Colombia)

| Categories | Answer | Number of answers (n) |
|---|---|---|
| Gender (Gen) | Female | 41 |
| | Male | 42 |
| Age (Age) | 21–30 | 22 |
| | 31 —40 | 25 |
| | 41–50 | 20 |
| | 51–60 | 10 |
| | > 61 | 6 |
| Education (Edu) | High school student | 4 |
| | University specialization (postgraduate level before Mater's in Colombia) | 6 |
| | High school graduate | 26 |
| | Tenchnichian | 3 |
| | Bachellor | 44 |
| Park Use per week (PUw) | 2 to 5 times | 74 |
| | More than 5 times | 9 |

#### Orientation values

On the other hand, we found that the egoistic and altruistic value categories and their mixed options determined the orientation values that the stakeholders granted to the ecosystem services of the parks in Tunja. Decision-makers gave contrasting values to those shown by social leaders and park users. Decision-makers egoistic and egoistic/biospheric valued regulating and cultural ecosystem services, while social leaders and park users granted altruistic values to cultural services (Figs. 4 and 5) (Appendix S2). These results show a discrepancy between the orientation values given by governmental and non-governmental stakeholders. Stakeholders exposed to social interaction present altruistic behaviors, valuing cultural ecosystem services such as contact with nature, environmental education, and interaction with people.

#### Relationships between parks

We identified three groups of parks considering the value of perception (Fig. 6). The first group (orange line) comprises the Centenario and Recreational urban-scale parks and the zonal-scale park, Santander. These parks are places that concentrate many visitors from the south and north of the city, respectively (see Fig. 1), whose similarity is explained by their size, which allows a provision of green areas made up of grasses, paths, and trees with proximities to gray spaces such as basketball and micro-soccer courts and children's recreation areas. These conditions can attract common interests among users reflected in their value to the

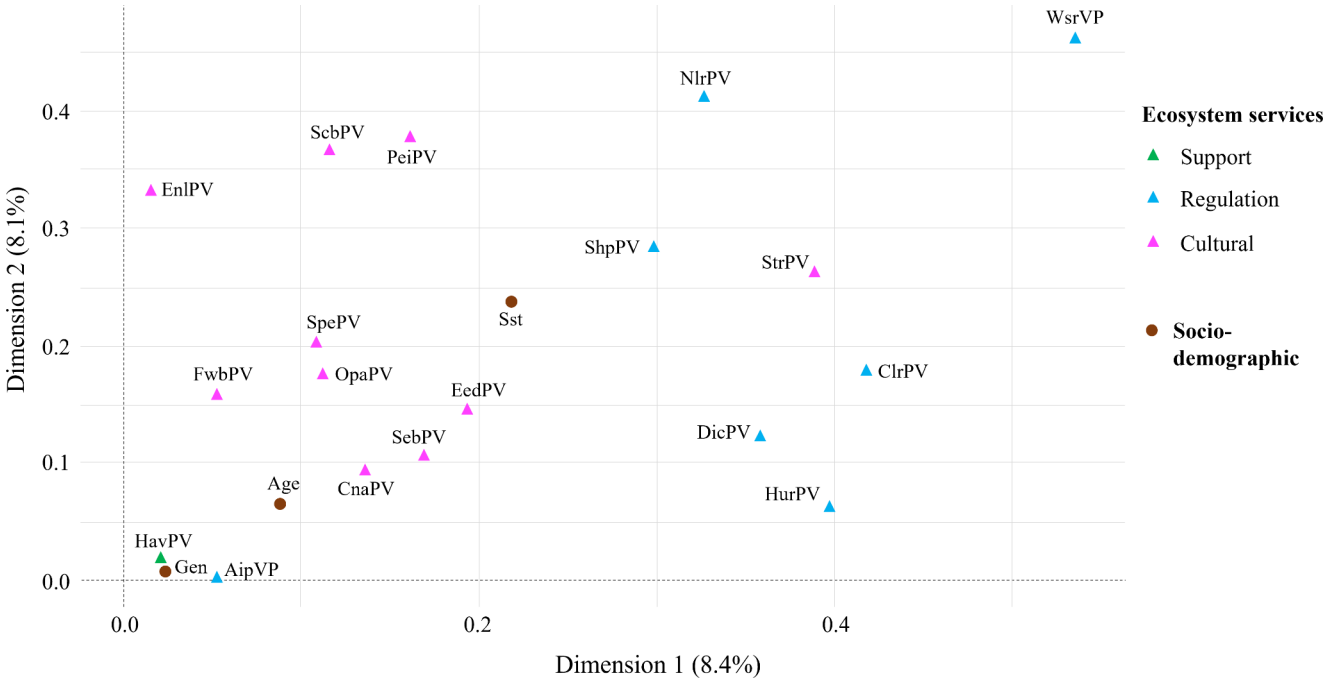


**Fig. 2** Multiple correspondence analysis for the perception value (PV) of urban ecosystem services in urban parks in Tunja (Boyacá, Colombia), considering stakeholders and sociodemographic variables. The first three dimensions represent 23% of the accumulated variance. The codes of ecosystem services can be consulted in Table 2

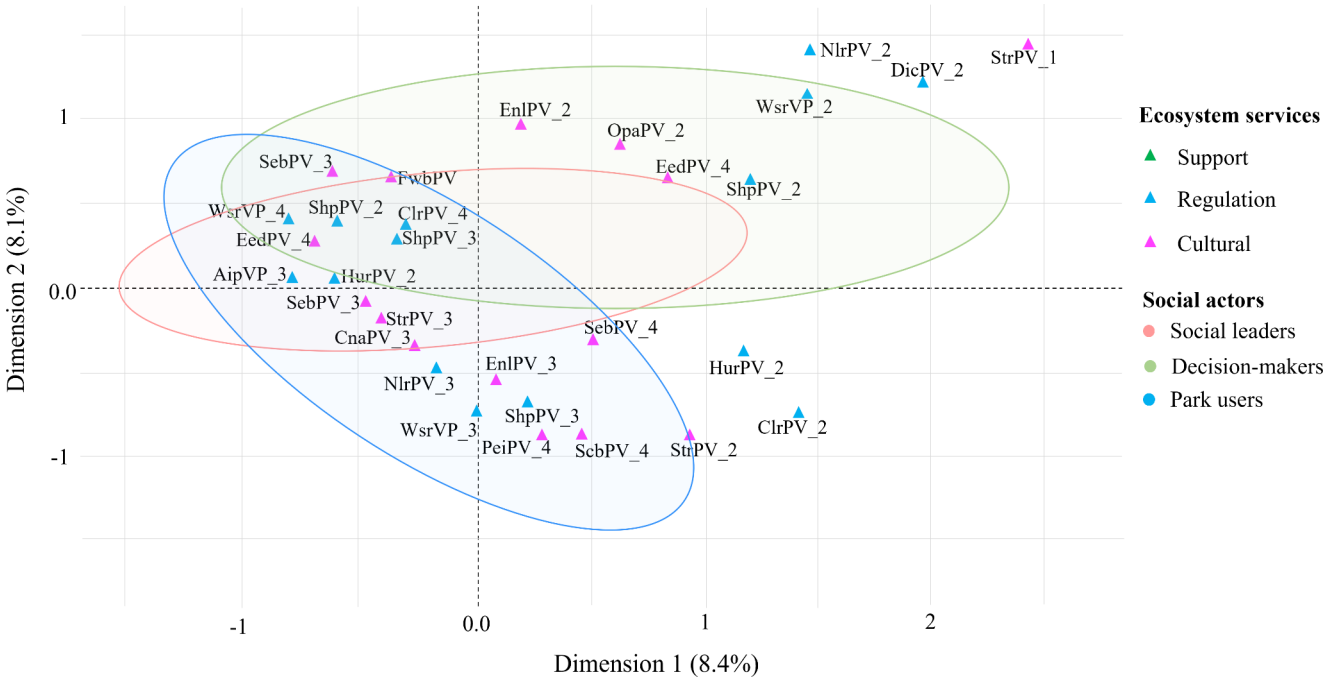


**Fig. 3** Multiple correspondence analysis for the perception values (PV) that different stakeholders grant to urban ecosystem services of parks in Tunja (Boyacá, Colombia). The first three dimensions represent 23% of the accumulated variance. The number next to the ecosystem service code indicates the category of importance, important but not necessary (1), necessary (2), very important (3), or essential (4). The codes of ecosystem services can be consulted in Table 2

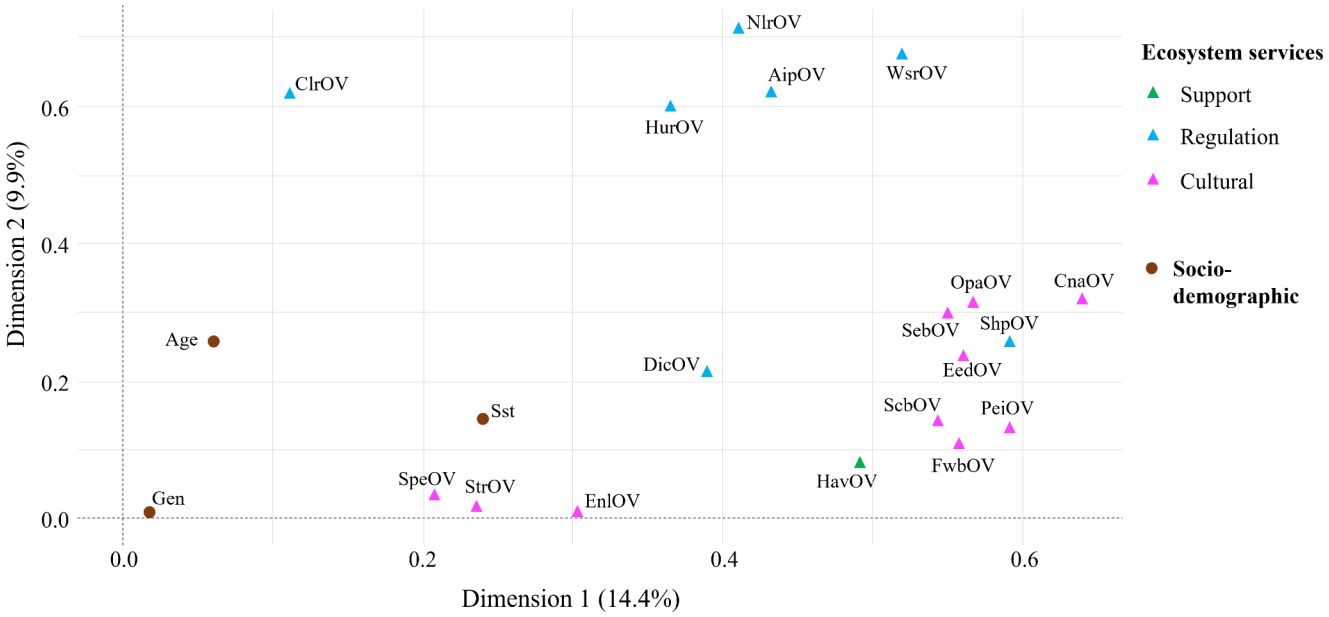


**Fig. 4** Multiple correspondence analysis of the orientation value (OV) of urban ecosystem services, stakeholders, and sociodemographic variables associated with urban parks in Tunja (Boyacá, Colombia). The first three dimensions represented 31% of the accumulated variance. The codes of ecosystem services can be consulted in Table 2

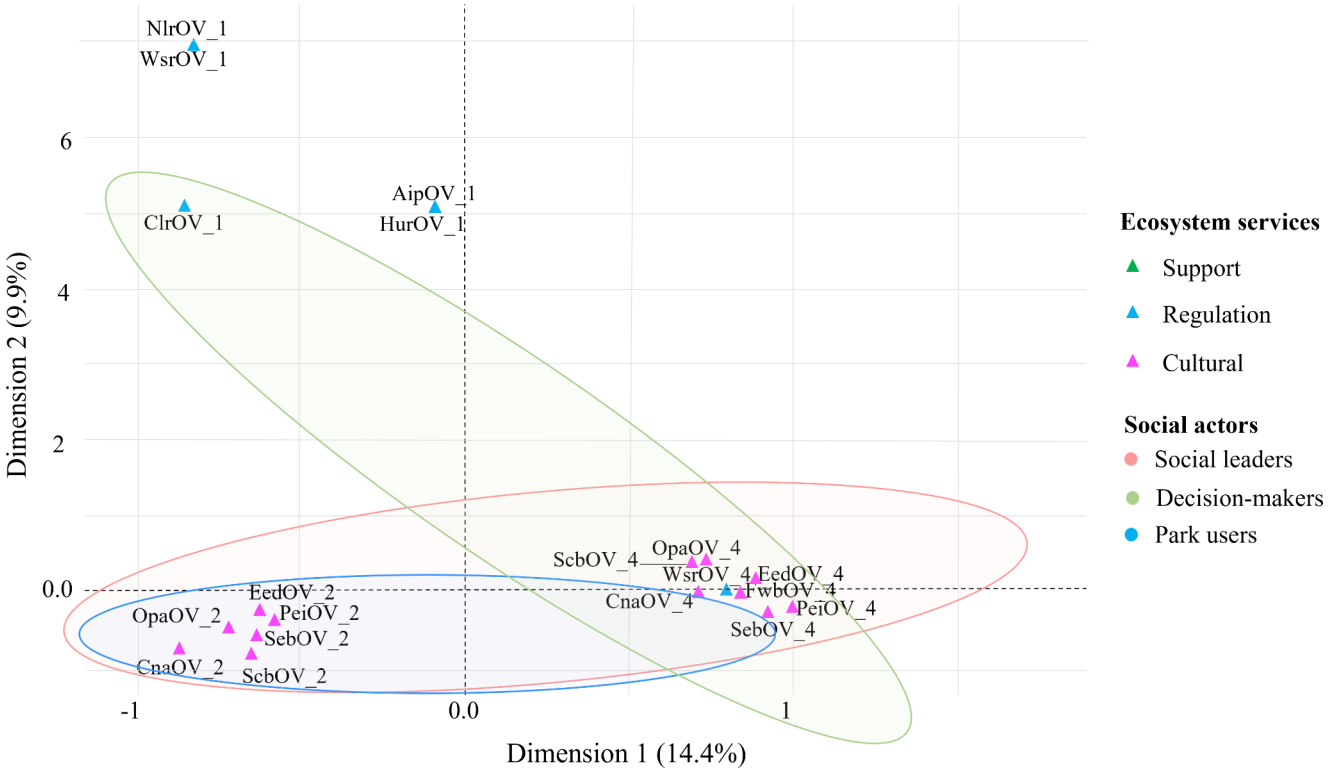


**Fig. 5** Contribution of the categories of the variables in the first two dimensions of the multiple correspondence analysis of the orientation value (OV) of urban ecosystem services in the city of Tunja (Boyacá, Colombia). The ecosystem service codes and numbers indicating the guidance value option can be found in Table 2

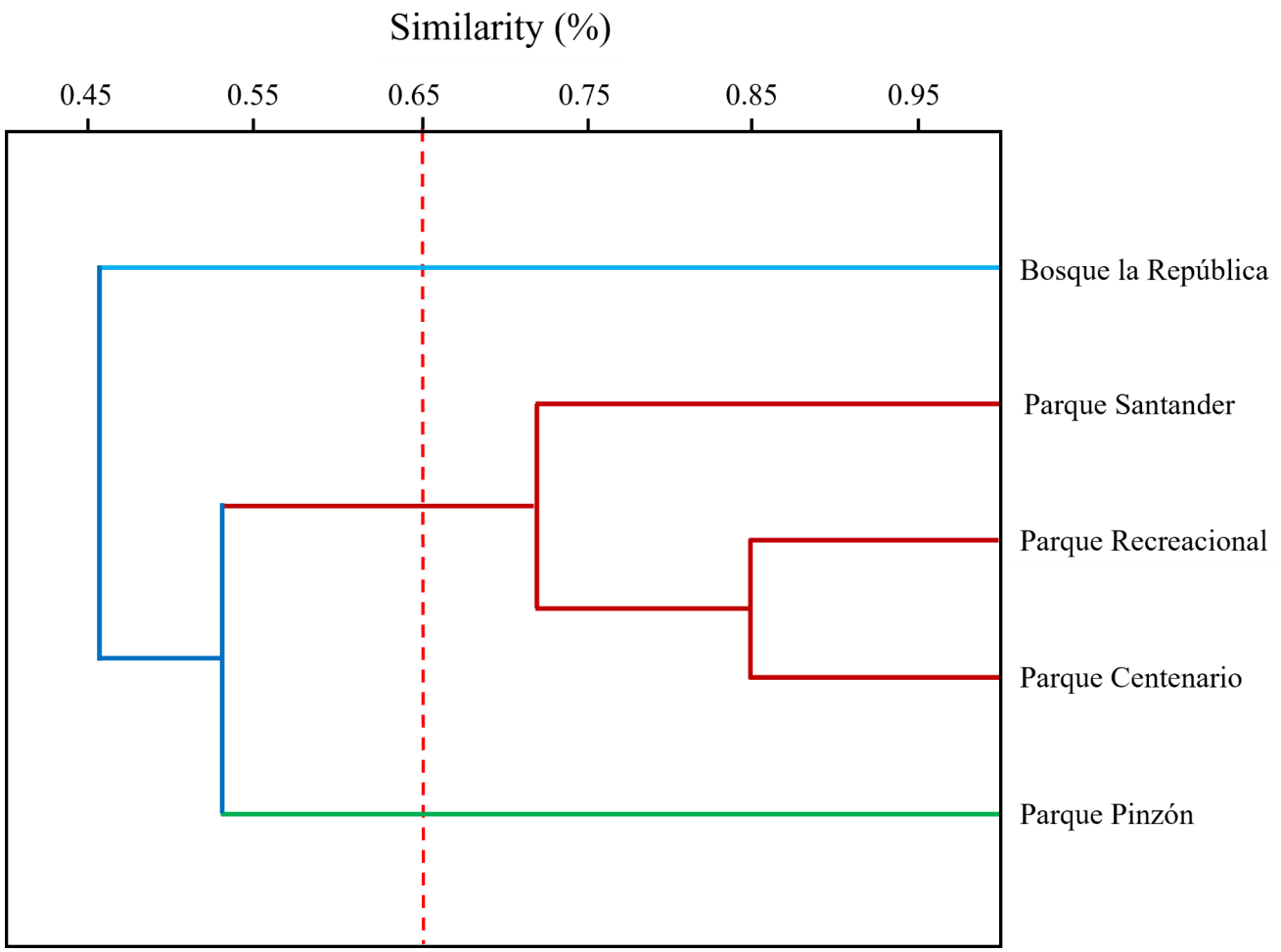


**Fig. 6** Hierarchical analysis of clusters according to the nearest neighbor method for the perception values of ecosystem services in urban parks in Tunja (Boyacá, Colombia)

evaluated ecosystem services. The second group (green line) and the third group (blue line) include only one park each, the Pinzón zonal-scale park and the Bosque la República urban-scale park, respectively. Pinzón Park is the smallest and offers limited gray areas, while the Bosque la República Park is the oldest in the city, built in 1916. These two conditions were enough for its users to have different values than the first group.

### Packages of ecosystem services

Similarly, we identified three grouped service packages considering the perception value (Fig. 7). A total of 18 ecosystem services were the most relevant according to people's perceptions. The first package (red box) mainly groups regulation services related to park trees and their direct benefits to users. Services such as the reduction of noise levels (Nlr), shade production (Shp), wind speed reduction (Wsr), climate regulation (Clr), humidity regulation (Hur), and disease control (Dic) are the most perceived by stakeholders. The cultural services included in this first package include observation of plants and animals (Opa) and stress reduction (Str). The second package (green box) groups only cultural services related to the different types of social interaction and people's appreciation of trees in parks. Services such as interaction with people (Pei), entertainment and leisure (Enl), contact with nature (Cna), scenic beauty (Scb), feelings of well-being (Fwb), spiritual experiences (Spe), and environmental education (Eed) are the most perceived by the stakeholders. Finally, the third package (orange box) groups the three types of ecosystem services as follows: the habitat support service for other species (Hav), the city air purification regulation service (Aip), and the sense of belonging cultural service. (Seb). These results show that for the city of Tunja's stakeholders, the parks' trees are highly valued due to the benefits associated with these trees. In the same way, it is important to point out that cultural

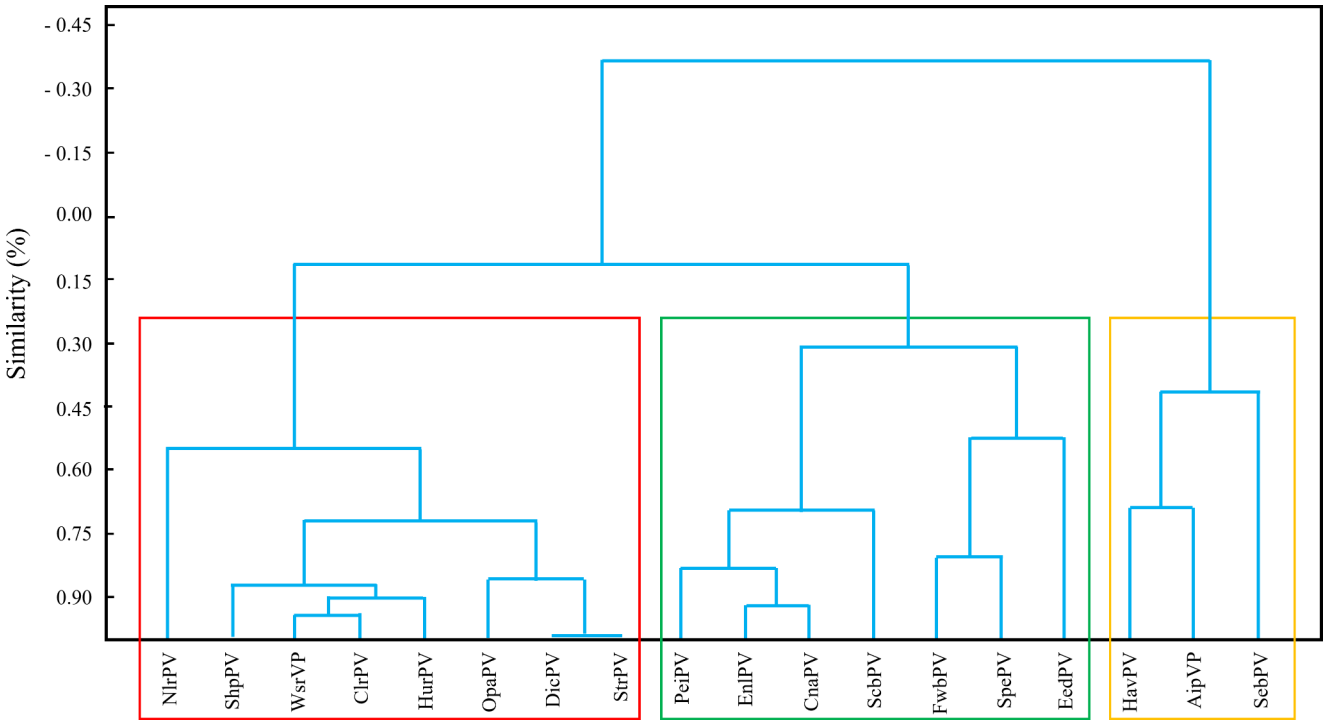


**Fig. 7** Packages of ecosystem services based on perception values (PV) in urban parks in Tunja (Boyacá, Colombia), using hierarchical cluster analysis according to the nearest neighbor method. The codes of ecosystem services can be consulted in Table 2

services are the only ones present in the three packages; this demonstrates their predominant value within the valuation.

## Discussion

Our study aimed to analyze the sociocultural value of urban ecosystem services, exploring the perception and orientation values of different stakeholders and how the different types of green areas and packages of ecosystem services are related from a perceptual value perspective. In this sense, the cultural ecosystem services were the ones that had the highest perception value by park users since parks are considered essential elements for interaction with people (scenic beauty, entertainment, fun, sense of belonging, and feelings of well-being). When people are in contact with green areas within cities, these spaces generally become relevant for activities that promote cultural aspects such as social relationships and aesthetic and recreational values (Ko and Son 2018).

Regulating ecosystem services such as reduced wind speed, reduced noise levels, and regulation of the city's climate was the most valued by park users compared to decision-makers and social leaders. This may be because Tunja City can reach temperatures up to 26 °C (Ruiz et al. 2015). The literature indicates that the presence of trees in parks can intercept solar radiation and balance the temperature under its canopy both in cold and hot hours (Corzo 2007) and that the presence of vegetation in a variety of shapes and sizes helps to mitigate the impact of urban heat islands that occur in some areas of the city, as well as to minimize local climate change (Roeland et al. 2019). This reflects, on the one hand, the importance of urban parks in providing spaces for human well-being and the recognition of the multifunctionality of these green spaces by those interviewed when assessing regulation services (Bertram and Rehdanz 2015); on the other, the importance of the type of interaction that each type of actor has with the park is evident to grant a perception value to the services provided by them. Our results are also consistent with those reported for other cities worldwide, where perception values differed between users depending on the interaction they carried out in urban parks. The evidence indicates that the more time and activities they spend out people in parks, the greater their perceptions will have higher values (Baltazar et al. 2022; Gai et al. 2022; Zhang et al. 2022).

In the same way, cultural services were more relevant when analyzing the orientation value, and, within these, the egoistic and altruistic values with traits of biospheric motivations were the ones that appeared the most. The three types of stakeholders expressed similar orientation values for urban parks' ecosystem services. Egoistic and altruistic orientation values (with biospheric traits or mixed values) demonstrated that stakeholders perceive ecosystem services

as important for themselves and others, demonstrating individual and group social identity. Our findings also reveal cultural services such as contact with nature, interaction with people, environmental education, and a feeling of well-being, which generate importance for individual well-being but also extend to collective well-being (Gómez-Baggethun and Barton 2013; Scholte et al. 2015). Services such as noise reduction and wind speed reduction are seen as well-being indicators with egoistic orientation values, possibly because they directly impact people's health (Gómez-Baggethun and Barton 2013). These anthropocentric values support the participants' tendency to manage the instrumental use of the ecosystems presented in the city parks (Scholte et al. 2015).

What has been described above coincides with (Brieger 2019), who states that identifying an individual as a social unit strengthens solidarity and empathy in a group. These altruistic values are fundamental because the individual not only perceives himself but is also capable of perceiving himself as part of a social group and thus extending the importance of ecosystem services to other people and other social groups with whom he is related, which makes this type of values essential to apply pro-environmental behavior (Kusmanoff et al. 2016), the latter defined as the set of acts that benefit the natural environment (Lange and Dewitte 2019), in addition to indirectly benefiting other species (biospheric trait). For example, payment programs for ecosystem services are favored when egoistic and altruistic values are recognized a priori (Obeng and Aguilar 2018).

Our study allowed us to show differences in the sociocultural value of ecosystem services that the different stakeholders grant to the urban parks of Tunja City. According to Scholte et al. (2015), the perceived discrepancy between stakeholders can be explained by the knowledge, interaction, and experience that the different stakeholders have about a particular space, which determines that people assign values to these spaces for their functions but also for emotional ties that can be generated as a product of social relationships or specific experiences. This largely explains why park users valued cultural and regulatory ecosystem services to a greater extent while decision-makers valued these services to a lesser extent. Decision-makers value the space parks provide, for example, for environmental education. Urban parks become a stage for these actors to carry out management actions to raise awareness. In contrast, for park users, it represents a daily space where they carry out various cultural activities. Similar results were reported by Gai et al. (2022), who point out that this difference between the type of stakeholders generates multiple demands for ecosystem services in urban parks, which provides information for those responsible for formulating policies and managing these parks.

On the other hand, while there were differences in the sociocultural valuation of ecosystem services between the stakeholders, we do not record sociodemographic patterns about this sociocultural valuation. Our results are consistent with what was reported by Gai et al. (2022) in Beijing (China) and Ko and Son (2018) in Gwacheon (Republic of Korea), who point out that populated and built-up areas confer homogeneity to the perceptions of their inhabitants. Despite being a small city, Tunja concentrates its urban population (173,991 inhabitants) in a small urban perimeter (15.7 km$^2$), making it a city with a high population density (DANE 2018), which could explain the behavior of valuation similar to that of large cities. Following our results and those of Gai et al. (2022) and Ko and Son (2018), sociodemographic characteristics seem to have no relevance in urban contexts; however, in rural or protected area contexts, most studies on the sociocultural valuation of ecosystem services find that specific sociodemographic characteristics of the interviewees explain sociocultural values. For example, Maestre-Andrés et al. (2016) found differences when they valued ecosystem services in protected areas, derived from the place of residence, the level of education, and the age of the people interviewed. Similarly, Martín-López et al. (2012) found that perception is a consequence of lifestyle, age, level of education, and gender and varies depending on the socioeconomic and sociocultural context.

Additionally, according to Haase et al. (2014) and (Pereira 2016), the size of the park and its accessibility determine, to a certain extent, the ecosystem services it generates and which services are perceived to a greater or lesser degree. However, our results of analysis of the cluster show that the stakeholders valued the Centenario, Recreacional, and Santander parks similarly. The preceding coincides more with the characteristics of the parks than with their size. These places have large areas for children's games, such as swings, slides, and sports equipment, and recreational areas, like courts and open spaces with greater visibility. They are places of active recreation, covering more than 50% of vegetation with native tree species of medium and tall sizes distributed around and inside the parks. These parks receive many people due to their endowment, location (Fig. 1), and characteristics. They were parks where regulation and support services were highly valued, so they are considered the primary source of ecosystem services.

In addition to the socio-ecological complexity inherent in generating ecosystem services, urban parks interact with each other (Queiroz et al. 2015; Raudsepp-Hearne et al. 2010). Our findings indicate that some services are generated or distributed in packages according to the perceived value. We identified two service packages: one group primarily regulation services and the other cultural services. Our results are consistent with those reported by Queiroz

et al. (2015) and Martín-López et al. (2012), who indicate that the distribution of cultural and regulatory services cluster similarly in Stockholm and Spain's urban landscapes. According to Cheng et al. (2022), very few ecosystem service packages have been explored in urban contexts. Their analysis is relevant in decision-making because it allows identifying packages that could enhance the management of urban green areas in certain areas within the city. In Tunja, the regulation services package is strongly linked to services offered by the trees in the parks, which could give rise to actions to protect and expand the trees in other parks within the city. Cultural services are related to activities to appreciate these trees and social interaction; this could promote appropriate planning, design, and management programs aimed at society in general.

Population growth, high sociocultural heterogeneity, and the development of cities have involved the disappearance and fragmentation of ecosystems, bringing with it a decrease in the provision of ecosystem services (Gómez-Baggethun and Barton 2013; Vásquez and Vasquez 2016). Human well-being is related to the number of green spaces that city dwellers have (Escobedo et al. 2015; Haase et al. 2014); however, there are disparities in the conformation of green spaces per inhabitant in some Latin American cities. For example, Buenos Aires (Argentina) has 1.92 $m^2$/inhab, Lima (Peru) 2 $m^2$/inhab, São Paulo (Brazil) 3 $m^2$/inhab, and Santiago de Chile 4.2 $m^2$/inhab (Gómez and Velázquez 2018; Martínez-Soto et al. 2016; Sabogal Dunin Borkowski et al. 2019; Walker et al. 2006), all of them are below the acceptable minimum of 10 $m^2$/inhab by the World Health Organization. In contrast, cities such as Belo Horizonte and Curitiba (Brazil) have 18.3 $m^2$/inhab and 51.5 $m^2$/inhab, respectively (Economist Intelligence Unit 2012). Although some cities have carried out initiatives to promote the care, management, and conservation of urban green areas, such initiatives are scarce and insufficient to maintain the quality, quantity, function, and services that green areas in cities can generate, such as in this case, urban parks (Pereira 2016). In other cases, such initiatives are inconsistent with what the people who use these spaces value. Generating this knowledge informs about the characteristics that urban parks must have to satisfy the needs of those who visit them (Bertram and Rehdanz 2015) and consequently guarantee that the management measures are successful.

Incorporating evaluations in decision-making continues to be a challenge that IPBES has contributed to making visible. For example, (Pascual et al. 2023) found that many studies on valuation (62%) do not include the participation of stakeholders, urban environments are little studied (only 6%), and in the literature produced in the last three decades, only 5% document the incorporation evaluations in decision making. The most significant difficulties are found at the methodological level and the production of results under the times required to generate policies. In our case, it was impossible to incorporate the results into any policy formulation stage because it constituted an academic exercise. However, our research provides essential methodological information for cities. It offers basic guidelines that can be used by government entities so that these results can be incorporated and adapted to different stages of future policy formulation. This points precisely to incorporating social and ecological values within comprehensive management schemes, which have been sought for a decade (Chan et al. 2012).

## Conclusion

Our study confirms that in urban contexts, sociodemographic characteristics lose relevance, while the type of stakeholder is a determining factor when evaluating urban parks' ecosystem services. Within the stakeholders, the type of interaction, the experiences the actors carry out within the urban parks, and the frequency of visits determine the relevance level within the sociocultural valuation. In addition, the discrepancy in values between governmental and non-governmental stakeholders could have undesired influences on decision-making, considering that many public policies are formulated through top-down strategies, which would set aside people's interests. This information is helpful for urban planners who are challenged to evaluate and integrate measures that promote green areas in cities to achieve sustainable cities. In the case of Tunja City, the different stakeholders value urban parks as spaces that provide various cultural services because of their importance as regulators of ecosystem processes, which shows a recognition of the multi-functionality of these spaces in cities. This denotes the need to incorporate all types of ecosystem services, not only cultural ones, in sociocultural valuation studies, which, in turn, allow government entities and decision-makers to redesign or design urban green areas that enhance this multi-functionality, such as the offer of packages of ecosystem services and designs that lead to the planning of sustainable cities.

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## Declarations

**Competing interests** The authors declare no competing interests.

**Ethics approval** No individual identifiers or economic information was obtained from the participants. Appropriate introductory material was provided about the study objectives, the university involvement, that it was voluntary and no personal identifiers were being asked, and how they could obtain information if desired. The protocol was approved by the Institutional Review Board of the University of Applied and Environmental Sciences (Agreement No. 460, June 24, 2020).

**Conflict of interest** The authors declare that they have no conflict of interest.



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