Urban Forestry & Urban Greening 13 (2014) 534–542

Contents lists available at ScienceDirect

Urban Forestry & Urban Greening

journal homepage: www.elsevier.com/locate/ufug

Relation between visitors' behaviour and characteristics of green spaces in the city of Granada, south-eastern Spain

Cristiano Adinolfi[a,b], Gina Patricia Suárez-Cáceres[b], Paloma Cariñanos[b,*]

[a] Department of Environmental Sciences, Faculty of Science and Technology, University of Naples "Parthenope", 80143 Naples, Italy
[b] Department of Botany, Faculty of Pharmacy, Campus de Cartuja, University of Granada, 18071 Granada, Spain

ARTICLE INFO

Keywords:
Environmental services
Green spaces
Mediterranean urban green zones
Urban Parks
Visitors' behaviour

ABSTRACT

This paper examines the relation between visitor behaviour and certain features of a number of major green spaces in the city of Granada, south-eastern Spain, focussing on key urban, ecological and landscape-related issues. Information on user profiles and numbers, the various uses made of these areas, their design, plant species richness and local urban and sociological background, was collected by means of *in situ* observation in a total of ten urban green spaces with surface areas of over 5000 m^2. Findings indicated that these spaces were used largely for purposes directly related to well-being: recreational and sporting activities, socialising, or simply relaxing. Interestingly, the most common activities in each space were governed by features intrinsic to the space itself: accessibility, design, maintenance and plant richness and distribution, all of which affected the health-related attributes and aesthetic value of the space. The study also highlighted a number of serious deficiencies in certain green spaces, which will need to be addressed in future action plans and replanning projects as an essential step in ensuring that they meet the real needs and expectations of the target population. The information provided by this research may prove particularly valuable for improving the systemic functions of green spaces in Mediterranean cities sharing similar bioclimatic and sociological features, and for ensuring that they fulfil the role assigned to green spaces in sustainable cities.

Introduction

Urban green spaces – a term which includes parks, gardens, open corridors and wooded walking areas – constitute a key element of modern urban design (Bennett and Mulongoy, 2006; Lafortezza et al., 2013), providing a focus of interaction between human, the environment and biodiversity (Li et al., 2005). These spaces have become the object of growing interest, since they are currently perceived not only as decorative or aesthetic elements, but also as venues designed to fulfil specific ecological, social, economic and systemic services for which they were expressly created, as well as others inherent in their development (Dobbs et al., 2011). Among the many functions assumed by green spaces, particular attention is being paid at present to those positively benefitting users by providing a daily focus for shared leisure activities and socialising (Chiesura, 2004; Tyrväinen et al., 2005; Lafortezza et al., 2009), sporting activities or simply relaxation, thus meeting the urban residents' need for short-range natural venues (De Groot, 2006; De Groot et al., 2006; Tzoulas et al., 2007; Matsouka and Kaplan, 2008).

A city's green spaces define its landscape, and also serve as an indicator of the environmental quality of the urban ecosystem and the quality of life of its inhabitants (Millennium Ecosystem Assessment, 2005). A number of studies have shown that the presence of parks and gardens or, in general, of green environments near homes and hospitals, contributes to improving the health of sick patients (Pretty, 2004; Velande et al., 2007; Ward Thompson, 2011), and helps to reduce the stress that increasingly affects city-dwellers (Jackson, 2003). Green spaces have other environmental and ecological advantages, in that they directly influence local climate conditions, cushioning the effect of urban heat islands (Bowler et al., 2010), and thus limiting the use of air conditioning (Simpson, 1998). Trees and plants play a major role in atmospheric CO_2 sequestration (Hendrey et al., 1999; Calfapietra et al., 2009) and can also act as noise screens (Van Renterghem and Botteldooren, 2002); both these services have a direct positive effect on the well-being and quality of life of local residents (Nowak and Dwyer, 2007; Roy et al., 2012). At the same time, they ensure the availability of habitats for a range of flora and fauna, thus enriching biodiversity; in most cases,

* Corresponding author. Tel.: +34 958241977; fax: +34 958248632.
E-mail addresses: cristiano.adinolfi@gmail.com (C. Adinolfi), gina.suarez.ca@gmail.com (G.P. Suárez-Cáceres), palomacg@ugr.es (P. Cariñanos).

http://dx.doi.org/10.1016/j.ufug.2014.03.007
1618-8667/

Fig. 1. Map showing the location of Granada.

green spaces offer the only contact with nature in an urban setting (Savard et al., 2000; Barbosa et al., 2007; Sanesi et al., 2009). Green spaces are increasingly playing a pivotal role in urban planning, in some cases providing a true green infrastructure in heavily built-up areas (Antrop, 2004; Lafortezza et al., 2013).

Such spaces also provide economic services, directly influencing the value of housing and of the city's cultural heritage (Bengoechea Morancho, 2003; Laverne and Winson-Geiderman, 2003); they enable the creation of new job opportunities in maintenance, and help to reduce investment in air pollution control (Jim and Chen, 2010). However, in order to improve the quality of these spaces and enhance their role in the urban context, it is essential to determine to what extent citizens identify and value the ecosystem services that they provide. Research has shown that the amount and quality of urban green spaces affect the citizens' pattern of activities and even the form and frequency of everyday recreational pursuits (Van Herzele and Wiedemann, 2003); a number of papers report that the use of these spaces is determined by its specific characteristics (Peschardt et al., 2012). This paper examines the relationship between visitor behaviour and certain features of the major green spaces in the city of Granada, south-eastern Spain, focussing on urban, sociological and environmental features of the spaces themselves and their immediate surroundings. Factors analysed include the number of visitors at different times of day and in different seasons, the activities in which the visitors engage, the infrastructure and services available, and the richness and distribution of existing flora. The findings may be of value when implementing improvements to existing spaces and planning design strategies for new ones, not only in Granada but in any Mediterranean city sharing similar bioclimatic and sociological features.

Methods

Study area

This study was carried out in the city of Granada (37°10′ N, 3°35′ W), in south-eastern Spain (Fig. 1). The city covers a surface area of 88.02 km^2 and is located in a large Intrabaetic Basin formed by the Genil river and the foothills of one of Europe's highest mountain ranges, Sierra Nevada. The metropolitan area, which has nearly 240,000 registered inhabitants (Andalusian Autonomous Government, 2012) is divided into 33 neighbourhoods and 8 administrative districts. The climate is typically Mediterranean, with a degree of continentality; generally cool with freezing winters and hot summers. Rainfall tends to be sparse, occurring predominantly in winter (yearly average temperature: 15 °C; total annual rainfall: 375 mm, according to data for the period 1971–2000 provided by the Spanish Meteorology Agency, AEMET). This climate regime favours considerable floral diversity, both natural and ornamental, in private and public parks and gardens as well as along roadsides. The city currently boasts around 700,000 m^2 of public green spaces, yielding a ratio of 2.91 m^2 of green space per inhabitant, *i.e.* considerably less than the minimum of 9 m^2 per inhabitant recommended by the EU and the World Health Organization (WHO) (Kuchelmeister, 1998; Gómez et al., 2004). The largest wooded area is the peri-urban forest surrounding the Alhambra world heritage complex; the rest of the total green space is made up of 363 varying-sized parks and gardens (Gomez-Lopera, 2005; Andalusian Autonomous Government, 2010). The present study focussed on 10 of the 60 green spaces whose surface area exceeds 5000 m^2, selected as being representative of the various urban locations and encompassing a range of socioeconomic settings, designs, infrastructure and landscape features.

In order to determine the socioeconomic background and attitudes of local users, the area of influence of each park was established as a radius of 300 m, this being considered by the International Council for Local Environmental Initiatives (ICLEI) as the optimal distance in order for a visit to the park to form part of the daily routine of local residents (Hague and Siegel, 2002; Milton, 2002; Barbosa et al., 2007; Wendel et al., 2012). The location of primary schools in the area surrounding the green space was also recorded, as an indicator of the possible influx of children after school. The locations and main features of the green spaces are shown in Fig. 1 and Table 1, respectively. Technical, historical, and sociological data (for example, information on the socio-economic status of the neighbourhoods where the parks are located), were obtained from files and technical papers held by the responsible authorities: the Granada City Council Parks and Gardens Service and various District Civic Centres.

Estimating visitor numbers and their use of green spaces

The method used to record data concerning visitor numbers and activities was based on the System for Observing Play and

Table 1
Main characteristics of the 10 parks of the city of Granada considered in this study.

Green area (district)	Coordinates	Surface	Population (aoi)[a]	No of schools (aoi)
Zaidin (Zaidin-Vergeles)	37°09′19.91″ N 3°35′44.53″ O	7.178 m^2	47.731	12
Quinta Alegre (Genil)	37°09′50.01″ N 3°35′13.29″ O	10.745 m^2	15.441	3
Paseo del Violon (Center)	37°09′55.45″ N 3°35′59.94″ O	14.751 m^2	22.819	8
Cruz de Lagos (Zaidin)	37°09′38.71″ N 3°36′12.24″ O	13.157 m^2	47.731	10
Joaquina Eguaras (North)	37°12′28.02″ N 3°36′44.34″ O	7.110 m^2	9.883	3
Almunia de Ainadamar (Chana)	37°11′41.17″ N 3°37′31.93″ O	30.000 m^2	6.395	4
Paseo del Salon (Center)	37°10′10.05″ N 3°35′40.33″ O	8.085 m^2	16.963	8
Paseo de la Bomba (Center)	37°10′06.81″ N 3°35′26.43″ O	8.085 m^2 [b]	16.963	7
Fuentenueva (Beiro)	37°11′02.58″ N 3°36′20.79″ O	15.638 m^2	8.700	10
Garcia Lorca (Ronda)	37°10′16.42″ N 3°36′33.91″ O	71.500 m^2	24.564	6

[a] aoi, área of influence, 300 m^2 around the park.
[b] The surface of the Paseo del Salón and Paseo de la Bomba have been considered together due to one is next to the other and they have the same area of influence. They will be considered as only one green space in the text.

Recreation in Communities (SOPARC), as described by Mckenzie (2002). This system was designed to provide direct information on community park use, including the characteristics and the uses made of parks. The method is based on momentary time sampling techniques in which systematic scans of individual and contextual factors within predetermined areas in parks are made. For this study, systematic non-participatory observations were carried out by one of the co-authors, and consisted of weekly *in situ* visits to each park over three different periods during the spring of 2012, at three different times of day: 10.00 h for visits between 26 March and 2 April; 14.00 h for visits between 9 and 21 April; and 16.00 h for visits between 23 April and 4 May. Visits were made at different times during weekdays in order to chart changes in visitor numbers in the course of the day. Observation of the same event over a certain time, enabled representative and comparable samples to be obtained (Golicnik and Thompson, 2010; Hino et al., 2010; Parra et al., 2010; Besenyi et al., 2013). Each visit comprised a 20-min visual scan, during which the number of users present, entering or passing through the park was logged, together with the activities in which they engaged. The protocol involved a systematic walk through each park (Golicnik and Thompson, 2010). Activities were grouped into three main categories: (a) relaxation and leisure, including activities such as reading, group conversations or simply sitting and enjoying the space and its aesthetic charm; (b) sports, such as jogging, running or cycling; and (c) walking on the paths or crossing the park, alone or in groups, with or without pets. For each period, visits to neighbouring spaces were scheduled together, in order to obtain comparative data for the same day at each park: Zaidin and Quinta Alegre Parks, for example, were always visited on Mondays at the time set for each period.

These visits were also used to collect information on other park features, including their level of accessibility, different types of areas, existence of surveillance, and landscaping features, also based on the SOPARC tool (Mckenzie, 2002). This method enabled other information such as the age-range of users to be estimated, albeit with less precision, and even enabled direct communication with park users to ascertain their degree of satisfaction with existing park infrastructure and facilities (*e.g.* the existence and accessibility of kiosks), as well as security aspects of the same.

Flora: species richness and distribution

Information on plant species composition was processed in various ways. During *in situ* visits, plant species were identified and the number of individuals per species was counted; these data were used to calculate species richness. The total number of trees recorded, and tree density per ha was calculated. Additionally, species distribution was analysed with a view to estimating the contribution of plants to the well-being of local residents, in terms both of aesthetic and scenic value, and of the comfort and relaxation provided in shaded areas, children's play areas, rides, etc. (Nagendra and Gopal, 2010).

Statistical analysis

To test for possible correlations between visitor numbers and times of day, and also between visitor activities and times of day, a one-way analysis of variance (ANOVA) was performed, assuming as a null hypothesis that visitor numbers and activities were independent of time of day. In addition, a non-parametric Spearman test was performed to identify potential correlations between the variables studied: type of park, number of visitors, visitor activities, number of trees, canopy, and species richness. The SPSS v.20 software package was used for all statistical analyses.

Results

Data on visitor numbers for each green space, by period and time of day, are shown in Figs. 2–4.

In general, the García Lorca Park and Boulevard Joaquina Eguaras were those receiving most visitors in the three periods over the study interval; the Paseo del Salon and the Paseo de la Bomba were especially popular in visits during on 9 and 21 April at 14.00 h. The Quinta Alegre Garden was the least visited space at all periods and at all times of day. Interestingly, the period in visitor numbers were largest was from 23 April to May 4, in which most visits were made at 16.00 h.

The activities engaged in by visitors over the same periods and times of day are shown in Tables 2–4. Activities were grouped into three major categories: relaxing, sports and walking. Observations showed that walking was the activity most frequently recorded in

Table 2
Activities conducted in the Green spaces during the first period (26th March-6th April, at 10.00 h).

	Zaidin	Quinta Alegre	Paseo del Violon	Paseo de la Bomba	Paseo del Salon	Garcia Lorca	Fuente-nueva	Almunia de Ainadamar	Cruz de Lagos	Joaquina Eguaras
LEISURE/RELAX	X	X				X	X		X	
SPORT						X		X		X
WALKING			X	X	X	X		X		X

Table 3
Activities conducted in the Green spaces during the second period (9th April–21st April, at 14.00 h).

	Zaidin	Quinta Alegre	Paseo del Violon	Paseo de la Bomba	Paseo del Salon	Garcia Lorca	Fuente -nueva	Almunia de Ainadamar	Cruz de Lagos	Joaquina Eguaras
LEISURE/RELAX		X	X	X		X	X			
SPORT						X		X	X	X
WALKING	X		X	X	X		X	X		X

Table 4
Activities conducted in the Green spaces during the third period (23rd April–9th May, at 16.00 h).

	Zaidin	Quinta Alegre	Paseo del Violon	Paseo de la Bomba	Paseo del Salon	Garcia Lorca	Fuente -nueva	Almunia de Ainadamar	Cruz de Lagos	Joaquina Eguaras
LEISURE/RELAX	X	X	X	X	X	X	X	X	X	X
SPORT						X				
WALKING	X		X			X				X

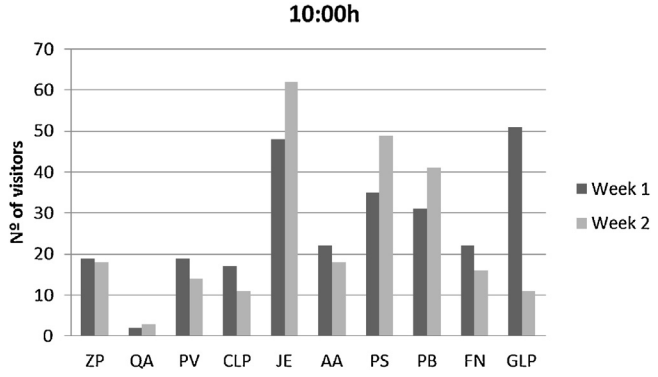

Fig. 2. Number of visitors in the different green areas during the period comprising between the 26th March and 6th April, at 10.00 h. ZP: Zaidin Park; QA: Quinta Alegre; PV: Paseo del Violon; CLP: Cruz de Lagos Park; JE: Joaquina Eguaras; AA: Almunia de Ainadamar; PS: Paseo del Salon; PB: Paseo de la Bomba; FN: Fuentenueva; GLP: Garcia Lorca Park.

most parks during the 10.00 h and 14.00 h visits, while during the final period, at 16.00 h, relaxing was the most frequent activity, especially in the shade of trees. Boulevard-type green spaces were those with a larger number of users walking. Sporting activities were the least common pursuits, and were recorded in all the three periods and times of day only in the Garcia Lorca Park.

Flora: species richness and distribution

Data on plant species richness and distribution in the green spaces studied are provided in Table 5. Tree species richness ranged from only 26 different taxa in Cruz de Lagos to 134 in the Paseo del Salon and the Paseo de la Bomba. Species growing in all the green spaces studied, albeit in varying numbers, included *Platanus* × *hispanica, Cupressus* spp., *Tilia* spp., *Olea europaea*, *Morus nigra*, *Melia azederach*, *Acer negundo* and *Punica granatum*. The number of trees growing in each green space also varied considerably, ranging from a minimum of 161 (Cruz de Lagos) to a maximum of 1349 in the Paseo del Salon/Paseo de la Bomba. Tree density per ha was calculated with a view to estimating the available shaded surface area. Density ranged from 1600 trees/ha in the Paseos to

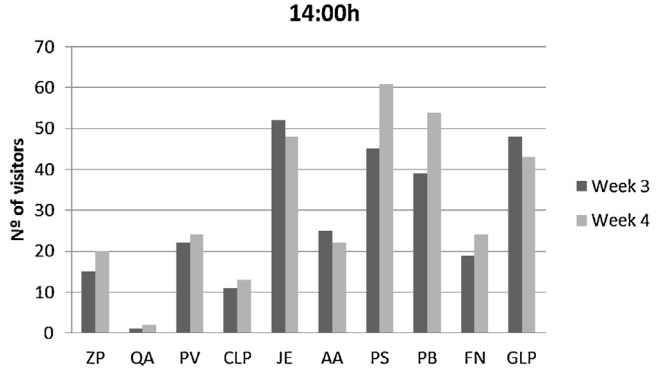

Fig. 3. Number of visitors in the different green areas during the period comprising between the 9th April and 21st April, at 14.00 h. ZP: Zaidin Park; QA: Quinta Alegre; PV: Paseo del Violon; CLP: Cruz de Lagos Park; JE: Joaquina Eguaras; AA: Almunia de Ainadamar; PS: Paseo del Salon; PB: Paseo de la Bomba; FN: Fuentenueva; GLP: Garcia Lorca Park.

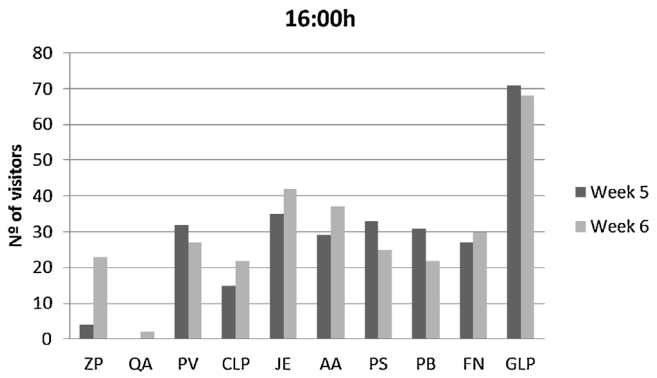

Fig. 4. Number of visitors in the different green areas during the period comprising between the 23rd April and 9th May, at 16.00 h. ZP: Zaidin Park; QA: Quinta Alegre; PV: Paseo del Violon; CLP: Cruz de Lagos Park; JE: Joaquina Eguaras; AA: Almunia de Ainadamar; PS: Paseo del Salon; PB: Paseo de la Bomba; FN: Fuentenueva; GLP: Garcia Lorca Park.

Table 5
Characteristics of the vegetation: no of trees, no species and density (trees/ha) and Canopy (percentage of the park's surface covered by trees) in the different green zones considered in this study. Characteristics of the parks: Accessibility (No E = number of entrances Bt = Boulevard/type), Surveillance (S = with surveillance, w/s = without surveillance), Landscaping features (A = arbours; WA = walking avenues; t = terraces; o = orchards; pg = playground; w = walks; rg = roses garden; ga = grass areas; we = water elements; b = Heritage buildings; seats = st).

PARK	Zaidin	Quinta Alegre	Paseo del Violón	Paseo de la Bomba y del Salón	Garcia Lorca	Fuentenueva	Almunia de Aynadamar	Cruz de Lagos	Joaquina Eguaras
Specific richness (no of species)	41	57	26	134	65	57	52	38	32
No of trees	232	436	314	1349	771	603	715	161	486
Density (trees/ha)	300 t/ha	400 t/ha	500 t/ha	1600 t/ha	100 t/ha	380 t/ha	230 t/ha	120 t/ha	650 t/ha
Canopy (% of total surface covered by trees)	±49%	±13%	±29%	±62%	±43%	±70%	±30%	±15%	±32%
Characteristics	8 E., A., WA., pg., w/s	1 E., 2t., o., rg., b., S.	Bt., A., WA., w/s	Bt., A, w., pg., we., S.	4 E., WA., pg.,rg., ga., we., b., S.	5 E., w., ga., w/s.	12 E., A, WA., pg., we., w/s.	5 E., w., st., w/s.	Bt., A., WA., pg., st., w/s.

Table 6
Analysis of variance (ANOVA) between the number of users and timetable and type of activities and timetable.

	Sum of squares	d.f.	Mean square	*F*	Significance
Visitors					
Between groups	118.317	2	59.158	0.091	0.914
Within groups	17,610.150	27	652.228		
Total	17,728.467	29			
Activities					
Between groups	2.400	2	1.200	1.453	0.252
Within groups	22.300	27	0.826		
Total	24.700	29			

only 100 trees/ha in the Garcia Lorca Park. Noteworthy functional and aesthetic features and infrastructural elements included the 12 entrances to the Almunia Park, the variety of environments in the Garcia Lorca Park (arboretum, tree-lined avenues, lake, grassy areas), two terraces at different heights in the Quinta Alegre Gardens, and the ancient trees (over 100 years old) in the Paseo del Salon/Paseo de la Bomba.

Statistical results

Analysis of variance (ANOVA) revealed that visitor numbers differed significantly (0.914) as a function of the period of spring, while activities differed significantly (0.252) as a function of time of day (Table 6).

Spearman's correlation test revealed a significant correlation between visitor numbers and type of park, number of trees, canopy, and activities engaged in; no correlation was observed between visitor numbers and plant species richness (Table 7).

Discussion

The ten parks studied here account for 25% of the total surface area of green spaces in the city of Granada. These spaces were selected not only because of their size (over 5000 m^2) but also because they are located in the eight districts into which the metropolitan area of the city is sub-divided, and can be considered representative of environments with varying socioeconomic and environmental characteristics (Hino et al., 2010). Some of the parks and gardens are historical (Paseo del Salon, Paseo de la Bomba, Quinta Alegre), some were built in the mid-twentieth century (Fuentenueva, Almunia de Aynadamar), and others are more modern (Garcia Lorca Park, Boulevard Joaquina Eguaras and Parque Cruz de Lagos). Differences in local socioeconomic and cultural environments clearly prompt different perceptions, practices and attitudes towards green spaces (Aurtenetxe, 1989; Beer, 1994; Erkip, 1997; Priego González de Canales, 2008; Hino et al., 2010). Here, the area of influence covered a maximum radius of 300 m or 15 minutes'

Table 7
Spearman's rank correlation coefficient between visitors, activities and several parameters.

	Parks	Species richness	No of trees	Canopy	Activities
Visitors					
Corr. coeff.	0.661**	0.279	0.664**	0.455*	0.430*
Sig. (Bil.)	0.000	0.136	0.000	0.011	0.018
N	30	30	30	30	30
Activities					
Corr. coeff.	−0.011	−0.188	0.091	0.027	
Sig. (Bil.)	0.954	0.320	0.631	0.887	
N	30	30	30	30	

* Significant correlation at $p < 0.01$ (bilateral).
** Significant correlation at $p < 0.05$ (bilateral).

walk, this being viewed as the threshold distance in order for a visit to the park to form part of the daily routine of local residents (Bussey, 1996; Barbosa et al., 2007). Interestingly, the parks located in the most densely populated neighbourhoods were not those receiving the largest number of visitors, at least on the study dates and during the times of *in situ* visits. Visitor numbers may reflect the specific functions of a given green space, and its benefits for users, rather than the socioeconomic environment in which it is located. The two spaces with the highest visitor numbers differ considerably in social and economic terms: the Paseo del Salon and Paseo de la Bomba are located in the city centre, bordering the River Genil; local residents are mostly upper-middle class and middle-aged to elderly; by contrast, the Boulevard Joaquina Eguaras, in the north of the city, is located in a lower-middle class neighbourhood with a high rate of unemployment and a great deal of social housing. The social and cultural profile of local residents may influence the use made of a green space: while older people find that walking – alone, in company or with pets – improves their health and quality of life (Takano et al., 2002; Lo and Jim, 2010), visitors to the Boulevard Joaquina Eguaras tended to engage in leisure and sporting activities, mainly in the morning during working hours, in groups of like-minded people: housewives, pensioners or unemployed people, as observed during visits.

Safety is one of the factors determining the number of users in open urban spaces (Koskela and Pain, 2000; Colquhoun, 2004; Jorgensen and Anthopoulou, 2007; Kaya and Kubat, 2007; Jansson et al., 2013). Although Granada's annual crime statistics are well below those of other Spanish cities (Ministry of Internal Affairs, 2013), a recent report focusing on 150 parks and gardens in 18 Spanish cities noted a need for improved safety in a few green areas in Granada (Eroski Consumer, 2010). Although the present study was carried out in spring, the time of year associated with the greatest park visitor numbers in Mediterranean areas because of the cooling effect of green areas by comparison with the heat outside (Lafortezza et al., 2009), visitor numbers at some of the parks studied proved lower than expected. This was particularly true of the Cruz de Lagos Park, where – despite its location in one of the city's most densely populated districts – visitors numbers were always very low. This may be linked to the fact that some areas of the park are less visible and surveillance is inadequate. During the visits, groups of people consuming alcohol were observed, that might be intimidating for other users. A similar situation was found in the Boulevard Joaquina Eguaras, where some users, through brief conversations with the observer, admitted being scared to walk past the empty park at night due to the poor lighting. The quality of both parks was rated as poor in the recent report cited above (Eroski Consumer, 2010), which notes a need for improved safety and surveillance. Other causes of low park usage include the presence of stray animals that annoy athletes and scare children (Madge, 1997; Louzã, 2007); this frequently happens in the Zaidin Park, where – despite a by-law requiring dogs to be kept on a leash within the walking areas of parks (Granada City Council, 1996), a number of users were seen to unleash their dogs so they could to run freely in the park, even in the children's playground area.

The intrinsic characteristics of the parks themselves, in terms of design, accessibility, flora and infrastructure, also affect both visitor numbers and the type of activities in which they engage. Parks specifically designed for walking and sporting activities were among those with the highest number of visitors (García Lorca, Paseo del Salon, Paseo de la Bomba, Joaquina Eguaras); these spaces contain wide tree-lined avenues and infrastructure elements facilitating the simultaneous transit of pedestrians and athletes. These parks also contained a large number of visitors simply relaxing and socialising, activities favoured by park design. Interestingly, however, a negative correlation was observed between visitor numbers and number of activities, suggesting that the presence of more visitors does not entail a greater number of different activities. This may be due in part to the fact that many green spaces lack the appropriate infrastructure, for example for sporting activities. A good example is Fuentenueva Park, located on the University Campus; though most users are young people, the park is not suitable for sports. There is a lack of walking areas, the park is heavily wooded, and the surface is mainly gravel. In order to fulfil the function of a green space as a venue benefitting the well-being of users, this park would clearly need to be reconditioned (Oguz, 2000; Cornell et al., 2001; Williams and Green, 2001; Crow et al., 2006; Oku and Fukamachi, 2006; Berney, 2010); at present, despite its location and user profile, its design is not conducive to a long stay, and it is used mainly for transit.

Statistical analysis revealed a number of interesting findings with regard to the correlation between visitor numbers and times of day, and between visitor activities and times of day. Considerable variance was observed among green spaces for both visitor numbers and visitor activities as a function of time of day; it proved impossible to construct a frequency model common to all green spaces. Although visitor gender and age were not used as variables here, it was generally found that the largest visitor group in the mornings was that of elderly people, walking and relaxing in the parks. By contrast, afternoon users were mainly young; young people are better able to withstand the heat, and usually work or study in the mornings (Gómez et al., 2004; Lafortezza et al., 2009). Visitor numbers were thus reasonably balanced over the time span studied. The difference in user profiles depending on the time of day would account for the difference in the activities engaged in. In the mornings, it tended to be adults that engaged in sporting activities, mainly jogging or running, whilst in the afternoons it was generally children and teenagers, cycling being the most popular activity. Similarly, the elderly people relaxing in the parks in the morning tended to be replaced by mothers with babies in the late afternoon (Lo and Jim, 2010).

Good accessibility for park visitors (for example, access ramps, wide entrances, sufficient number of entrances, even ground and, in short, any removal of architectural barriers), is also a key consideration. A larger number of entrances facilitates access from different sides, and thus from different parts of the neighbourhood. Most of the green spaces studied here have a sufficient number of entrances offering access from different sides, while boulevard-type gardens and walks facilitate transit. The exception with regard to ease of access is the Quinta Alegre Garden, which was also the green space receiving fewest visitors. Access to the garden is through a single entrance and then *via* a stairway, which leads in turn to two terraces located at different heights. This barrier effect is one of the main causes of complaint among visitors, especially the elderly and disabled, as well was communicated to the observer during visits; the relevant authorities have often been asked to provide disabled access (Granada City Council, 2013). A further constraint is that animals are not allowed in the historical parks. Major roadworks in the vicinity (such as the building of the Granada underground line close to the Cruz de Lagos Park) can hinder access to green spaces. Proximity to busy roads poses a greater risk of children, and indeed adults, being run over (Crompton, 2001; Van Herzele et al., 2005; Boone et al., 2009; Reyes Päcke and Figueroa Aldunce, 2010).

Appropriate facilities in a green space can enhance the provision of other ecosystem services (Wendel et al., 2012). In two of the parks studied (Zaidin and Almunia de Aynadamar), there were kiosks selling food and drinks. But while the Zaidin Park kiosk was always open but rarely used (at least during the visits made for this study), visitors to the Almunia de Aynadamar Park, when they were asked, complained that the kiosk was rarely open and, when it was, the service was of poor quality. Both parks need to reconsider whether facilities of this sort are appropriate for the purpose of improving

social and health benefits (services) associated with urban and peri-urban green spaces (Sanesi and Chiarello, 2006; Dobbs et al., 2011; Gore et al., 2013).

The number of primary schools located in the vicinity of each park was also recorded, in order to establish the likelihood of more children using the park in the afternoons, after school hours. A number of studies highlight the positive benefits, for children, of time spent in areas with vegetation (Taylor et al., 2001, 2002), arguing that frequent use of green areas should be a fundamental part of their social and cultural development (Elsley, 2006; Konijnendijk et al., 2013). There was a distinct increase in visitor numbers at the Garcia Lorca Park after school hours, probably due to the presence of 6 schools in the vicinity, and to the Park's own large playgrounds. Visitor numbers also increased after school hours at other parks close to several schools (Table 1 and Fig. 4).

The nature of a park's vegetation has both health-related and aesthetic implications (Smardom, 1988; Grove et al., 2006). Also, the degree of naturalness of an urban green space can have an effect on perceived restorative potential by users of the same (Carrus et al., 2013). Statistical analysis revealed a significant correlation between visitor numbers and number of trees in the park (Table 7). Of the green spaces studied, the Paseo del Salon and Paseo de la Bomba were notable for tree density and tree species richness, with up to 134 different species. This enhances their value as areas for walking, by combining physical well-being with aesthetic appeal (Gobster et al., 2007; Catell et al., 2008). The most prominent species in terms of size are the huge horse chestnuts (*Aesculus hippocastanum*), cedars (*Cedrus deodara*, *Cedrus atlantica*), and magnolias (*Magnolia grandiflora*), *Robinia hispida*, *Platanus* × *hispanica*, *Tilia* × *vulgaris*; species with spectacular blossoms include *Prunus laurocerassus, Lagerstroemia indica* and *Malus* × *purpurea*, while pleasant scents are provided by abundant *Citrus* species; all this serves to further enhance the appeal and aesthetic quality of these green spaces (Chen et al., 2009). Some of these species were introduced as ornamentals in upper-class residential areas (Kendal et al., 2012), while others – such as the cypress – are perceived as emblematic of the city's history, and have acquired additional symbolic value (Casares-Porcel, 2010). On the contrary, the low number of trees and species richness of the Cruz de Lagos Park can influence a low perception of restorative potential and degree of naturalness by users, being on the spaces with a lower number of visits (Carrus et al., 2013).

Another key factor is the species richness and biotype variety of the plant species growing in parks, together with their distribution (Nagendra and Gopal, 2010). Though no significant correlation was recorded here between visitor numbers and tree species richness in parks (Table 7), diversity was at least found to influence the visual scenic beauty of the green space (Chen et al., 2009). The Garcia Lorca and Almunia de Aynadamar Parks, for example, boast a similar number of trees, but species richness is considerably greater in the Garcia Lorca Park. Moreover, part of its ground cover is lawn, thus enabling other recreational activities such as sports, or simply resting on the grass (More, 1985). Trees grow in clusters in this park, which also favours greater shade availability, prompting a drop in air temperature (Streiling and Matzarakis, 2003; Georgi and Zafiriadis, 2006; Bowler et al., 2010). This may be one indicator of the extent to which vegetation in green spaces contributes to the well-being of visitors. Vegetation favours the formation of microclimates inside parks, rendering them more comfortable than the external environment. As Fig. 5 shows, temperatures gradually rose throughout the study period, exceeding 30 °C at noon during May. The increase in temperature coincided with an increase in visitor numbers in some parks over the same period, and with greater prevalence of relaxation-related activities in others. Although temperatures were not measured in the present study, a number of studies have highlighted a drop in air temperatures, and an increase

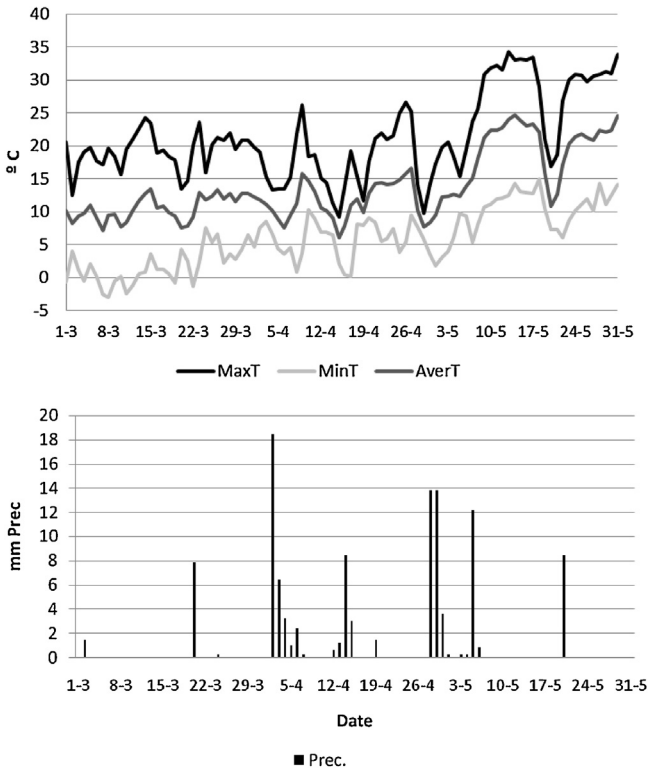

Fig. 5. Daily mean temperatures and daily total precipitation from the first of March to the end of May 2012 in the city of Granada.

in relative humidity and shade effect inside parks, compared to external conditions (Spronken-Smith and Oke, 1998; McPherson and Simpson, 2003; Gómez et al., 2004; Baris et al., 2009; Lafortezza et al., 2009; Pataky et al., 2011). Our study confirmed the significant relationship existing between the percentage of shadiness in the parks, measured as a percentage of vegetation cover projected vertically on the total area of the park (canopy), and the presence of visitors. The parks with the highest visitor numbers in the final study period were those providing the largest amount of shade, ornamental lakes or other water features, and children's playgrounds (García Lorca, Fuentenueva, Zaidín, and Cruz de Lagos). By contrast, the boulevard-type gardens were not conducive to a long stay during the hours of maximum sunlight (Givoni, 1991; Georgi and Zafiriadis, 2006).

However, park vegetation may also have a negative effect on health; all the parks studied contained plant species whose pollen is regarded as a major allergen affecting local allergy-sufferers, including *Oleaceae* (*Olea* spp., *Ligustrum* spp., *Fraxinus* spp.), *Cupressaceae* (*Cupressus* spp., *Thuja* spp., *Chamaecyparis* sp., *Platycladus* sp.), *Platanus* × *hispanica, Populus* spp. and *Salix* spp. A number of other factors appear to contribute to the allergenicity of urban green spaces (Cariñanos and Casares-Porcel, 2011). The period in which this study took place, April-May, coincided with the flowering of species associated with the highest allergy incidence in the Mediterranean area (D'Amato et al., 2010); green spaces containing numerous allergenic species or a high density of such species were thus avoided by pollen-allergy sufferers, who account for almost 30% of the city's population (Díaz de la Guardia et al., 2003).

Conclusion

The findings of this study of the major green spaces in the city of Granada, using indicators such as visitor numbers, visitor activities, vegetation and the characteristics of the surrounding area,

confirmed that the main function of these spaces is to enhance the well-being of local residents, providing them with a venue for relaxing, socialising and engaging in sporting activities, and thus for improving their quality of life. The extent to which this function is fulfilled depends both on factors intrinsic to each space – design, accessibility, biodiversity and infrastructure – which facilitate the provision of a range of ecosystem services, and on external factors linked to the area in which they are located. However, the study also highlighted deficiencies in some of the parks studied, including safety issues, difficulty of access, and lack of facilities that would ensure that different activities could be performed simultaneously. These findings may be of use when implementing measures to improve or refurbish existing urban green spaces, and when designing and planning new spaces, in order to ensure that they meet the real needs and expectations of the population. They may also be of interest for other medium-sized Mediterranean cities sharing similar bioclimatic and sociological features.

Acknowledgements

The authors thank to the following Organisations for their support: University of Granada Own Program Project PP2012-PI05, and Department of Innovation, Science and Enterprise, Junta de Andalucia, through Project P10-RNM-5958.

References

Andalusian Autonomous Government, 2010. Environmental report of Andalusia (IMA) 2010. Consejería de Medio Ambiente y Ordenación del Territorio. Junta de Andalucia (in Spanish).

Andalusian Autonomous Government, 2012. System of multiterritorial information of Andalusia (SIMA). Instituto de Estadistica y Cartografia de Andalucia. Consejeria de Economia, Innovacion, Ciencia y Empleo. Junta de Andalucia (in Spanish).

Antrop, M., 2004. Landscape change and the urbanization process in Europe. Landscape and Urban Planning 67, 9–26.

Aurtenetxe, J.J.L., 1989. Estructura urbana y diferenciación residencial. El caso de Bilbao (Urban structure and residential differentiation. The case of Bilbao). Centro de Investigaciones Sociológicas, Madrid (in Spanish).

Barbosa, O., Tratalos, J.A., Armsworth, P.R., Davies, R.G., Fuller, R.A., Johnson, P., Gaston, K.J., 2007. Who benefits from access to green space? A case study from Sheffield, UK. Landscape and Urban Planning 83, 187–195.

Baris, M.E., Satris, S., Yargon, M.E., 2009. The contribution of trees and green spaces to the urban climate: the case of Ankara. African Journal of Agricultural Research 4, 791–800.

Beer, A.R., 1994. Urban greenspace and sustainability. Developing a more effective urban environmental planning methodology by identifying local level actions towards greater environmental sustainability. In: Van der Vegt, H., Ter Heide, H., Tjallingii, S., Van Alphen, D. (Eds.), Sustainable Urban Development: Research and Experiments. Proceedings of a PRO/ECE-Workshop held in Dordrecht, November 1993. Delft University Press, Dordrecht, The Netherlands, pp. 69–88.

Bengoechea Morancho, A., 2003. A hedonic valuation of urban green areas. Landscape and Urban Planning 66 (1), 35–41.

Bennett, G., Mulongoy, K.J., 2006. Review of experience with ecological networks, corridors and buffer zones. In: Secretariat of the Convention on Biological Diversity (CBD), Montreal. Technical Series No. 23.

Berney, R., 2010. Learning from Bogotá: how municipal experts transformed public space. Journal of Urban Design 15 (4), 539–558.

Besenyi, G.M., Kaczynski, A.T., Wilhelm Stanis, S.A., Vaughan, K.B., 2013. Demographic variations in observed energy expenditure across park activity area. Preventive Medicine 56, 79–81.

Boone, C.G., Buckley, G.L., Grove, J.M., Sister, C., 2009. Parks and people: an environmental justice inquiry in Baltimore, Maryland. Annals of the Association of American Geographers 99 (4), 767–787.

Bowler, D.E., Buyung-Ali, L., Knight, T.M., Pullin, A.S., 2010. Urban greening to cool towns and cities: a systematic review of the empirical evidence. Landscape and Urban Planning 97, 147–155.

Bussey, S.C., (Unpublished Ph.D. Thesis) 1996. Public Uses. Preferences and Perceptions of Urban Woodlands in Redditch. University of Central England in Birmingham, UK.

Calfapietra, C., Fares, S., Loreto, F., 2009. Volatile organic compounds from Italian vegetation and their interaction with ozone. Environmental Pollution 157, 1478–1486.

Cariñanos, P., Casares-Porcel, M., 2011. Urban green zones and related pollen allergy: a review. Some guidelines for designing spaces with low allergy impact. Landscape and Urban Planning 101, 205–214.

Carrus, G., Lafortezza, R., Colangelo, G., Dentamaro, I., Scopelliti, M., Sanesi, G., 2013. Relations between naturalness and perceived restorativeness of different urban green spaces. Psyecology, Bilingual Journal of Environmental Psychology 4, 227–244.

Casares-Porcel, M., 2010. Origen y causas de transformación del paisaje en los barrios históricos de la ciudad de Granada (Origin and causes of landscape transformation in the historic districts of the city of Granada). In: VIII Encuentro Internacional de Revitalización de Centros Históricos, El paisaje urbano en las ciudades históricas Centro cultural de España en México, México., pp. 117–130 (in Spanish).

Catell, V., Dines, N., Gester, W., Curtis, S., 2008. Mingling, observing and lingering: everyday public spaces and their implications for well-being and social relations. Health and Place 14, 544–561.

Chen, B., Adino, O.A., Bao, Z., 2009. Assessment of aesthetic quality and multiple functions of urban green spaces for the users' perspective: the case of Hangzhou flower garden, China. Landscape and Urban Planning 93, 76–82.

Chiesura, A., 2004. The role of urban parks for the sustainable city. Landscape and Urban Planning 68, 129–138.

Colquhoun, I., 2004. Design Out of Crime: Creating Safe and Sustainable Communities. Architectural Press, Oxford, UK.

Cornell, E.H., Hadley, D.C., Sterling, T.M., Chan, M.A., Boechler, P., 2001. Adventure as stimulus for cognitive development. Journal of Environmental Psychology 21 (3), 219–231.

Crompton, J.L., 2001. The impact of parks on property values: a review of the empirical evidence. Journal of Leisure Research 33 (1), 1–31.

Crow, T., Brown, T., De Young, R., 2006. The Riverside and Berwyn experience: contrasts in landscape structure, perceptions of the urban landscape and their effects on people. Landscape and Urban Planning 75, 282–299.

D'Amato, G., Cecchi, L., D'Amato, M., Liccardi, G., 2010. Urban air pollution and climate change as environmental risk factors of respiratory allergy: an update. Journal of Investigational Allergology and Clinical Immunology 20, 95–102.

De Groot, R.S., 2006. Function-analysis and valuation as a tool to assess land use conflicts in planning for sustainable, multi-functional landscapes. Landscape and Urban Planning 75, 175–186.

De Groot, R.S., Stuip, M., Finlayson, M., Davidson, N., 2006. Valuing wetlands: guidance for evaluating the benefits derived from wetland ecosystem services. In: Ramsar Technical Report No. 3 CBD Technical Series No. 27. Gland, Switzerland., pp. 1–44.

Díaz de la Guardia, C., Alba, F., Nieto, D., Sabariego, S., 2003. Diez años de control aerobiológico en la atmósfera de la ciudad de Granada: Calendario Polínico (1992–2001) (Ten years of aerobiological control in the atmosphere of the city of Granada: Pollen Calendar (1992–2001)). Polen 13, 251–260 (in Spanish, with English summary).

Dobbs, C., Escobedo, F.J., Zipperer, W.C., 2011. A framework for developing urban forest ecosystem services and goods indicators. Landscape and Urban Planning 99, 196–206.

Elsley, S., 2006. Children's experience of public space. Children & Society 18, 155–164.

Erkip, F.B., 1997. The distribution of urban public services: the case of parks and recreational services in Ankara. Cities 14 (6), 353–361.

Eroski Consumer, 2010. Urban Green Zones in Spain. La revista del socio consumidor 146, 6–10, Retrieved from: http://revista.consumer.es/web/es/2010001/pdf/tema-de-portada.pdf (10.01.14) (in Spanish).

Georgi, N.J., Zafiriadis, K., 2006. The impact of park trees on microclimate in urban areas. Urban Ecosystems 9, 195–209.

Givoni, B., 1991. Impact of planted areas on urban environmental quality: a review. Atmospheric Environment. Part B: Urban Atmosphere 25, 289–299.

Gobster, P.H., Nassauer, J.H., Daniel, T.C., Fry, G., 2007. The shared landscape: what does aesthetic have to do with ecology? Landscape Ecology 22, 959–972.

Golicnik, B., Thompson, C.W., 2010. Emerging relationships between design and use of urban park spaces. Landscape and Urban Planning 94, 38–53.

Gómez, F., Gil, L., Jabaloyes, J., 2004. Experimental investigation of the thermal comfort in the city: relationship with the green areas, interaction with the urban microclimate. Building and Environment 39, 1077–1086.

Gomez-Lopera, F., 2005. Las zonas verdes como factor de calidad de vida en las ciudades (The green areas as a factor of quality of life in cities). Ciudad y Territorio. Estudios Territoriales XXXVII 14, 417–436 (in Spanish).

Gore, T., Ozdemiroglu, E., Eadson, W., Gianferrara, E., Phang, Z., 2013. Green Infrastructure's contribution to economic growth: a review. In: Final Report. Department for Environment, Food & Rural Affairs and Natural England, UK.

Granada City Council, 1996. Municipal By-law on Use and Protection of Landscaped Areas (in Spanish).

Granada City Council, 2013. Municipal Accessibility Plan of the City of Granada (in Spanish).

Grove, J.M., Troy, A.R., O'Neil-Dunne, J.P.M., Burch, W.R., Cadenasso, M.L., Pickett, S.T.A., 2006. Characterization of house-holds and its implications for the vegetation of urban ecosystems. Ecosystems 9, 578–597.

Hague, M., Siegel, N., 2002. Municipal parks in New York City: Olmsted, Riis, and the transformation of the urban landscape, 1858–1897. In: Backhaus, G., Murungi, J. (Eds.), Transformations of Urban and Suburban Landscapes: Perspectives from Philosophy, Geography, and Architecture. Lexington Books, Lanham, MD, pp. 153–191.

Hendrey, G.H., Ellsworth, D.S., Lewin, K.F., Nagy, J., 1999. A free-air enrichment system for exposing tall forest vegetation to elevated atmospheric CO_2. Global Change Biology 5, 293–309.

Hino, A.A.F., Reis, R.S., Ribeiro, I.C., Parra, D.C., Brownson, R.C., Fermino, R.C., 2010. Using observational methods to evaluate public open spaces and physical activity in Brazil. Journal of Physical Activity and Health 7, 146–154.
Jackson, L.E., 2003. The relationship of urban design to human health and condition. Landscape and Urban Planning 64, 191–200.
Jansson, M., Fors, H., Lindgren, T., Wiström, B., 2013. Perceived personal safety in relation to urban woodland vegetation – a review. Urban Forestry and Urban Greening 12, 127–133.
Jim, C.Y., Chen, W.Y., 2010. External effects of neighborhood parks and landscape elements on high-rise residential value. Land Use Policy 27 (2), 662–670.
Jorgensen, A., Anthopoulou, A., 2007. Enjoyment and fear in urban woodlands – does age make a difference? Urban Forestry and Urban Greening 6, 267–278.
Kaya, B., Kubat, A.S., 2007. Space and fear of crime relation in urban green areas case study: MaÇka Demokrasy Park. In: Proceedings 6th International Space Syntax Symposium, Istanbul.
Kendal, D., Williams, N.S.G., Williams, K.J.H., 2012. Drivers of diversity and tree cover in gardens, parks and streescapes in an Australian city. Urban Forestry and Urban Greening 11, 257–265.
Konijnendijk, C.C., Annerstedt, M., Nielsen, A.B., Maruthaveeran, S., 2013. Benefits of Urban Parks. A Systematic Review. A Report for IFPRA, Retrieved from: http://www.ifpra.org/images/park-benefits.pdf (15.05.12).
Koskela, H., Pain, R., 2000. Revisiting fear and place: women's fear of attack and the built environment. Geoforum 31, 269–280.
Kuchelmeister, G., 1998. Urban Forestry in the Asia-Pacific Region: Status and Prospects. In: Asia-Pacific Forestry Sector Outlook Study Working Paper Series No. 44. FAO, Forestry Policy and Planning Division, Rome, Retrieved from: ftp://ftp.fao.org/docrep/fao/003/X1577E/X1577E00.pdf (10.02.14).
Lafortezza, R., Carrus, G., Sanesi, G., Davies, C., 2009. Benefits and well-being perceived by people visiting Green spaces in periods of heat stress. Urban Forestry and Urban Greening 8, 97–108.
Lafortezza, R., Davies, C., Sanesi, G., Konijnendijk, C.C., 2013. Green Infrastructure as a tool to support spatial planning in European urban regions. iForest 6, 100–106.
Laverne, R.J., Winson-Geiderman, K., 2003. The influence of trees and landscaping on rental rates at office building. Journal of Arboriculture 29, 281–290.
Li, F., Wang, R., Paulussen, J., Liu, X., 2005. Comprehensive concept planning of urban greening based on ecological principles: a case study in Beijing, China. Landscape and Urban Planningn 72, 325–336.
Lo, A.Y.H., Jim, C.Y., 2010. Differential community effects on perception and use of urban greenspaces. Cities 27, 430–442.
Louzã, A.C., 2007. The sharing of urban areas by man and animals. In: Seabro Pereiro, M. (Ed.), A Portrait of State of the Art Research at the Technical University of Lisbon. Springer, Dordrecht, pp. 479–490.
Madge, C., 1997. Public Parks and the Geography of fear. Tijdschrift voor economische en sociale geografie 88, 237–250.
Matsouka, R.H., Kaplan, R., 2008. People needs in the urban landscape: analysis of landscape and urban planning contributions. Landscape and Urban Planning 84, 7–19.
Mckenzie, T.L., 2002. The use of direct observations to assess physical activity. In: Welk, G. (Ed.), Physical Activity Assessments for Health-related Research. Human Kinetics, Champaign, IL, pp. 179–195.
McPherson, E.G., Simpson, J.R., 2003. Potential energy savings in buildings by an urban tree planting programme in California. Urban Forestry and Urban Greening 2, 73–86.
Millennium Ecosystem Assessment, MEA, 2005. Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC.
Milton, K., 2002. Loving Nature: Towards An Ecology of Emotion. Routledge, New York.
Ministry of Internal Affairs, 2013. Organized Crime. Crime Statistics for Spain 2012 and Advance 2013. Government of Spain, Retrieved from: http://portal.protecturi.org/balance-2012-sobre-el-crimen-organizado-y-avance-enero-mayo-2013 (03.01.14) (in Spanish).
More, T.A., 1985. Central City Parks: A Behavioral Perspective. School of Natural Resources, University of Vermont, Burlington, 74 p.
Nagendra, H., Gopal, D., 2010. The diversity, distribution, history and change in urban parks: studies in Bangalore, India. Urban Ecosystem 14, 211–223.
Nowak, D.J., Dwyer, J.F., 2007. Understanding the benefits and costs of urban forest ecosystems. In: Kuser, J.E. (Ed.), Urban and Community Forestry in the Northeast. , 2nd ed. Springer, New York, USA, pp. 25–46.
Oguz, D., 2000. User surveys of Ankara's urban parks. Landscape and Urban Planning 52, 165–171.
Oku, H., Fukamachi, K., 2006. The differences in scenic perception of forest visitors through their attributes and recreational activity. Landscape and Urban Planning 75, 34–42.
Parra, D.C., McKenzie, T.L., Ribeiro, I.C., Ferreira Hino, A.A., Dreisinger, M., Coniglio, K., Munk, M., Brownson, R.C., Pratt, M., Hoehner, C.M., Simoes, E.J., 2010. Assessing physical activity in public parks in Brazil using systematic observations. American Journal of Public Health 100, 1420–1426.
Pataky, D.E., McCarthy, H.R., Litvak, E., Pincetl, S., 2011. Transpiration of urban forest in the Los Angeles metropolitan area. Ecological Applications 21, 661–677.
Peschardt, K.K., Schipperijn, J., Stigsdotter, U.K., 2012. Use of small public urban green spaces (SPUGS). Urban Forestry and Urban Greening 11, 235–244.
Pretty, J., 2004. How nature contributes to mental and physical health. Spirituality and Health International 5, 68–78.
Priego González de Canales, C., 2008. Culture and the Concept of Landscape. Instituto de Estudios Sociales Avanzados, IESA-CSIC, Córdoba, España.
Reyes Päcke, S., Figueroa Aldunce, I.S., 2010. Distribución, superficie y accesibilidad de las áreas verdes de Santiago de Chile (Distribution, area and accessibility of green areas of Santiago de Chile). EURE 36, 89–110 (in Spanish, with English summary).
Roy, S., Byrne, J., Pickering, C., 2012. A systematic quantitative review of urban tree benefits, costs, and assessment methods across cities in different climatic zones. Urban Forestry and Urban Greening 11, 351–363.
Sanesi, G., Chiarello, F., 2006. Residents and urban green spaces: the case of Bari. Urban Forestry and Urban Greening 4, 125–134.
Sanesi, G., Padoa-Schioppa, E., Lorusso, L., Bottoni, L., Lafortezza, R., 2009. Avian ecological diversity as an indicator of urban forest functionality. Results from two case studies in northern and southern Italy. Arboriculture & Urban Forestry 35, 80–86.
Savard, J.P.L., Clergeau, P., Mennechez, G., 2000. Biodiversity concepts and urban ecosystems. Landscape and Urban Planning 48, 131–142.
Simpson, J.R., 1998. Urban forest impacts on regional cooling and heating energy use: Sacramento County case study. Journal of Arboriculture 24 (4), 201–214.
Smardom, R.C., 1988. Perception and aesthetic of the urban environment: review of the role of vegetation. Landscape and Urban Planning 15, 85–106.
Spronken-Smith, R.A., Oke, T.R., 1998. The thermal regime of urban parks in two cities with different summer climates. International Journal of Remote Sensing 19, 2085–2104.
Streiling, S., Matzarakis, A., 2003. Influence of single and small clusters of trees on the bioclimate of a city: a case study. Journal of Arboriculture 29 (6), 309–316.
Takano, T., Nakamura, K., Watanabe, M., 2002. Urban residential environments and senior citizens longevity in megacity areas: the importance of walkable green spaces. Journal of Epidemiology and Community Health 56, 913–918.
Taylor, A.F., Kuo, F.E., Sullivan, W.C., 2001. Coping with ADD: the surprising connection to green play settings. Environment and Behaviour 33, 54–77.
Taylor, A.F., Kuo, F.E., Sullivan, W.C., 2002. Views of nature and self-discipline: evidence from inner city children. Journal of Environmental Psychology 22, 49–63.
Tyrväinen, L., Pauleit, S., Seeland, K., De Vries, S., 2005. Benefits and uses of urban forests and trees. In: Konijnendijk, C.C., Nilsson, K., Randrup, T.B., Schipperijn, J. (Eds.), Urban Forests and Trees. Springer, Berlin Heidelberg, Germany, pp. 81–114.
Tzoulas, K., Korpela, K., Venn, S., Yli-Pelkonen, V., Kazmierczak, A., Niemela, J., James, P., 2007. Promoting ecosystem and human health in urban areas using green infrastructure: a literature review. Landscape and Urban Planning 81, 167–178.
Van Herzele, A., Wiedemann, T., 2003. A monitoring tool for the provision of accessible and attractive urban green spaces. Landscape and Urban Planning 63, 109–126.
Van Herzele, A., De Clercq, E.M., Wiedemann, T., 2005. Strategic planning for new woodlands in the urban periphery: through the lens of social inclusiveness. Urban Forestry and Urban Greening 3, 177–188.
Van Renterghem, T., Botteldooren, D., 2002. Effect of a row of trees behind noise barriers in wind. Acta Acustica united with Acustica 88, 869–878.
Velande, M.D., Fry, G., Tveit, M., 2007. Health effects of viewing landscapes. Landscape type in environmental psychology. Urban Forestry and Urban Greening 6, 199–212.
Ward Thompson, C., 2011. Linking landscape and health: the recurring theme. Landscape and Urban Planning 99, 187–195.
Wendel, H.E.W., Zarger, R.K., Mihelcic, J.R., 2012. Accessibility and usability: green space preferences, perceptions and barriers in a rapidly urbanizing city in Latin America. Landscape and Urban Planning 107, 272–282.
Williams, K., Green, S., 2001. Literature Review of Public Space and Local Environments for the Cross Cutting Review: Final Report. Oxford Centre for Sustainable Development. Oxford Brookes University, Oxford, UK.