

PROFILE

Perception and Attitude of Residents Toward Urban Green Spaces in Guangzhou (China)

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ABSTRACT / Fast economic and social changes in recent years in China have brought massive expansion, redevelopment, and restructuring of cities. These changes offer cities the opportunity to improve environmental quality through urban green spaces (UGSs) and to address the challenges of meeting community aspirations. This study explored peoples' minds concerning UGSs in Guangzhou city in south China in relation to the following: (1) knowledge and perception of 25 ecosystem services and 8 negative impacts; (2) attitude toward site condition and management; (3) expectation of landscape design; and (4) preference ranking of venues. A questionnaire was designed to solicit opinions from 340 respondents randomly chosen from residents living in the study area. The results indicated wide-

spread recognition of ecosystem services and strong support of UGS programs. Negative responses were weakly expressed. Amelioration of urban microclimate and environmental quality were emphasized. Environmental functions stressed in publicity programs, together with aggravating environmental problems in the city, tended to focus respondents' attention on UGS benefits. Wildlife habitat, species conservation and other natural ecosystem services drew limited concerns. Awareness of economic benefits was very low. Visual-landscape contributions with strong preference for naturalistic design and recreational benefits were highlighted. Compared with other countries, Guangzhou residents were characterized by visual-scenic-recreation orientation and pragmatic-utilitarian perception of UGSs, reflecting underlying differences in the understanding of inherent ecosystem services of green spaces. Relevant UGS policies and practices could adopt the approaches of market survey, citizen participation, and precision planning in order to meet increasingly mature and refined demands. Citizens' understanding of high-order ecosystem services could be enhanced to encourage appreciation of nature and their associated benefits.

Most human settlements contain some green areas regardless of differences in age, size, cultural background, and geographical location. Green space provision is probably as old as settlements. Human desire for greenery is often expressed as appreciation of the benefits and an urge to connect with nature (Miller 1997). Green spaces, as key components of urban ecosystems, contribute to sustainable development, landscape and environmental quality, quality of life, and citizen health. They generate many tangible and less tangible ecosystem services (a comprehensive list is given in Table 1), including outdoor recreational opportunities, amenities, air

pollutant removal, balancing atmospheric oxygen and carbon dioxide contents, microclimatic regulation, rainwater retention, soil moisture and groundwater recharge, flood control, cleansing of return water flow, wildlife habitat, and physical and mental health promotion (Baines 2000; Bolund and Hunhammar 1999; De Vries and others 2003; Dwyer and others 1994; Grey and Deneke 1986; Miller 1997; Rowntree 1986, Takano and others 2002). Natural green areas (natural vegetated areas with little human disturbance) could furnish the benefits with little input or assistance from humans. Urban green spaces (UGSs; open space situated within city limits with a good vegetation cover planted deliberately or inherited from preurbanization vegetation and left by design or by default) receive frequent human use and impact. They require continual management and could bring negative impacts.

Enlightened city governments have continually improved the quantity, quality, location, and spatial spread of UGSs, successfully creating some livable green cities (Garvin and Berens 1997; Harnik 2000). Some cities are lagging behind and, in extreme cases,

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retrogressing. As a major developing country, China faces challenges of expanding and redeveloping its cities while providing enough UGSs and associated ecosystem functions. Some Chinese cities have encountered difficulties in this endeavor. UGSs have been degraded due to replacement by artificial surfaces, reduction in size, fragmentation, isolation, and poor intersite connection. Since the 1990s, increasing awareness of benefits and alarming decline of UGSs in China have stimulated institutional measures to conserve existing sites and develop new ones (He and Ning 2002; Jim and Liu 2001; Peng 2003).

Urban green space provision should aim squarely at users; yet many cities, especially in developing countries, exclude citizen wishes in the determination of location, design, and management. Professional assumptions that lack theoretical or empirical basis commonly dominate decisions on UGSs. Without public support and involvement, UGSs could fail to meet consumer needs, bar certain sectors of people, and attract undesirable elements or activities. In extreme cases, they are abandoned by users (Burgess and others 1988; Hayward and Weitzer 1983). Engaging residents in UGS planning and management could bring more benefits to more people (Dunnett and others 2002; Marcus and Francis 1998). The continual evolution in community composition and outlook needs corresponding adjustments in UGS design. Policy-making under the centralized political and administrative structure in China, however, would seldom consider public preferences and opinions. Recent economic growth and associated societal changes have generated demands for more and better public goods. Old parks with anachronistic design or poor upkeep call for renovation. City governments have many chances to incorporate citizen preferences and expectations into the decision stream (Lorenzo and others 2000). A market-research type of study could provide the basis to win the support and foster empathy of the stakeholders in delivering welcomed products.

This article explores people's interface and interaction with UGSs in the China context with reference to the following: (1) knowledge and perception of ecosystem services; (2) knowledge and perception of negative impacts; (3) attitude toward current UGS condition and management; (4) expectation of landscape design; and (5) preference ranking of existing venues. Implications of the findings on UGS planning and management will be discussed. Guangzhou, as the premier city in south China that is undergoing rapid growth and transformation, is adopted as a case study.

Study Area and Methods

Study Area

The study focused on 235.5 km² of land in the central built-up portion of Guangzhou, the capital of Guangdong province. The city is situated in the north of the Pearl River Delta, which forms the major coastal plain in south China. The subtropical location is dominated by oceanic monsoon climate with hot and humid summers and cool and dry winters. As the largest city in south China, Guangzhou has a population of 3.22 million (Guangdong Census Office 2002). After China's implementation of its open and reform policy in the 1980s, the fast-expanding economy has raised people's disposable income, leisure time, and expectation for a better quality of urban life.

In 2001, 73.66 km² of UGSs covered the study area, occupying about one-third of the land area. The UGS coverage ranks among the highest in Chinese cities. Recent rapid urban growth has damaged and eliminated some green sites, especially in the central old town. Meanwhile, increasing demands for recreational venues have brought heavy patronage to many green sites. Like other Chinese cities, the Guangzhou government owns the land and controls the management of most municipal services and resources. One government unit, the Guangzhou Landscape Bureau, takes charge of almost all UGS development and management. The lack of public involvement and participation in relevant decision-making might introduce or perpetuate mismatches between resident expectation and facility provision.

Questionnaire Design

A questionnaire survey, based partly on similar studies elsewhere (Garrod and Willis 1999; Lewan and Söderqvist 2002; Lorenzo and others 2000; Tyrväinen 2000), was designed to investigate resident perception and attitudes toward UGSs. The professional staff of the Guangzhou Landscape Bureau, with first-hand insights and experiences, provided some expert inputs in the questionnaire design. The first part of the questionnaire listed study objectives, answering instructions, and UGS definition to help respondents understand the rationale of the research and the questions. At the end of each group of questions, the interviewer asked respondents for open-ended opinions. Some 25 ecosystem services and 8 negative impacts related to UGSs were identified based on the work by Miller (1997), other studies, and our own experience in Guangzhou. The questions were "localized" to facilitate understanding by Guangzhou residents. An ordinal scale with

numerical scores measured the degree of recognition of UGS benefits and negative impacts: very important (2), important (1), unclear (0), and not important (-1).

The questionnaire then probed attitudes toward the state of UGSs in four aspects: vegetation diversity, percentage of green areas, management quality, and landscape design. On an ordinal scale of 1 to 4 (1 being unclear and 4 being excellent), respondents rated the overall performance of existing UGSs in Guangzhou. They chose from four dominant landscape styles to assess landscape preference. They then selected and ranked 3 of the most desirable venues from a list of 37 major public green spaces in the study area.

The remaining part of the questionnaire gathered socioeconomic information of respondents, including gender, age group, educational level, place of residence, and monthly income. Such data could tell whether the sample was representative of the general population (Bateman and others 2002; Garrod and Willis 1999) and the relationships between socioeconomic status and knowledge of ecosystem services. Statistical analyses, including Student's *t*-test, one-way analysis of variance (ANOVA), and the chi-square test, were performed using SPSSPC version 11. The Chinese currency Renminbi (RMB) was used, with an exchange rate at about US\$1.00 = RMB8.26.

Questionnaire Survey

The clustered sampling framework provided a suitable and cost-effective approach to evaluate large populations (Bateman and others 2002; Jakobsson and Dragun 1996). The Guangdong Census Office (2002), which collected demographic information of residents, helped to randomly choose 34 residential street blocks. Then the resident committees of the identified street blocks, which kept basic information on residents, randomly chose residents for interviews in February and March of 2003. A pilot test provided real-world experience and feedback to refine the questionnaire. Six postgraduate students, trained in the procedures and etiquette of conducting the survey, served as research assistants. During training, they conducted the survey together as a group under supervision and coaching to ensure consistency in approach. The main survey successfully interviewed 340 respondents face-to-face. Where necessary, the interviewers provided explanations; otherwise the respondents completed the questionnaires independently. After completing the survey, each respondent received a small gift as a token of appreciation.

Results and Discussion

Response Rate and Composition of Respondents

Face-to-face interview generated a high response rate of 92.4%. The enthusiastic response could be explained by the increasing interest in UGSs in recent years and the certain novelty elements for residents who rarely have the chance to express opinions about public affairs. Almost equal proportions of male (49.7%) and female (50.3%) respondents were interviewed. The 31–50 age bracket (43.6%) was the main group, followed by 18–30 (38.0%) and 51–70 (18.4%). Some 23.1% stated university education or a higher degree. For monthly income, less than RMB1000 (43.2%) was dominant, with RMB1000–3000 (40.4%) following closely, and then more than RMB3000 (16.4%).

Chi-square analysis compared survey results with the corresponding information from the 2000 Guangzhou census. Gender, age, and monthly income of respondents were not significantly different. However, the survey registered more respondents attaining tertiary education (23.1% versus 12.01% of the census). This difference in educational attainment could be explained by the general reluctance of residents with less education to be interviewed, whereas the better educated were more interested in the study issues.

Perception of Ecosystem Services Generated by UGSs

Most respondents opined that UGS ecosystem services were important, with some services rated notably higher. On average, 81.1% of the respondents rated the benefits either very important or important. The very important and important responses to individual services varied from 47.2% to 96.5% (Table 1). Understanding of ecosystem services was strong and unequivocal. Division of 25 ecosystem services into 6 groups and calculation of average scores revealed the relative importance attached to different attributes and groups. Average scores varied widely from 0.15 to 1.61.

Two related groups of ecosystem services were ranked the most important (average score >1.0), namely amelioration of urban microclimate and environmental quality. Six of their nine services ranked 1st to 10th by average scores (Table 1). The residents stressed the contribution of UGSs to the overall environmental quality of the city and associated influence on human health. The less tangible and indirect services, such as oxygen release and carbon dioxide sequestration, attracted the highest average scores. Shading and lowering of air temperature also secured high scores. They are associated with human comfort

Table 1. Residents' perception of the importance of ecosystem services generated by green spaces in Guangzhou (percent of valid respondents)

Ecosystem services	Respondents' rating ^a				Average score		
	Very important	Important	Not important	Unclear	Value ^b	Rank ^c	Standard deviation
Microclimate							
O ₂ release	67.2	29.3	2.4	1.2	1.61	1	0.64
CO ₂ sequestration	51.2	39.3	5.4	4.2	1.36	4	0.80
Lower air temperature	28.1	55.0	11.5	5.3	1.00	8	0.89
Shading	40.7	50.7	7.7	0.9	1.24	7	0.82
Increase relative humidity	22.6	51.3	19.6	6.5	0.77	11	1.01
Wind protection	17.0	47.2	31.9	3.9	0.49	19	1.11
Group average	37.8	45.5	13.1	3.7	1.08	8.3	0.88
Environmental quality							
Air pollutant absorption	48.7	41.8	5.7	3.9	1.33	5	0.80
Noise abatement	42.6	40.8	12.1	4.4	1.40	3	0.97
Glare and reflection control	17.5	53.0	23.1	6.5	0.65	13	1.02
Group average	36.3	45.2	13.6	4.9	1.13	7.0	0.93
Environmental function							
Ground water recharge	17.7	45.8	19.5	17.1	0.62	14	0.99
Flood abatement	18.2	40.8	26.5	14.6	0.51	18	1.07
Wastewater management	19.9	32.6	27.3	20.2	0.45	20	1.10
Soil erosion prevention	32.3	44.2	18.4	5.0	0.91	9	1.05
Wildlife habitat	21.4	44.8	26.7	7.1	0.61	15	1.10
Species conservation	19.4	43.3	23.0	14.3	0.59	16	1.05
Group average	21.5	41.9	23.6	13.1	0.62	15.3	1.06
Recreation and landscape							
Places for recreational activities	42.9	49.1	6.8	1.2	1.28	6	0.80
Opportunities to know and contact nature	27.8	51.9	16.4	3.9	0.91	10	0.98
Cultural and educational connotation	24.8	46.8	19.9	8.5	0.76	12	1.04
Aesthetic enhancement	55.8	38.6	5.0	0.6	1.45	2	0.75
Screening undesirable view	11.7	38.1	43.2	6.9	0.18	23	1.12
Demarcation of landscapes	7.7	39.5	38.0	14.8	0.17	24	1.03
Group average	28.5	44.0	21.6	6.0	0.79	12.8	0.95
Economic benefit							
Economic product value (wood, fruit, etc.)	8.6	39.9	41.7	9.8	0.15	25	1.07
Property value increase	16.4	46.3	25.1	12.2	0.54	17	1.04
Group average	12.5	43.1	33.4	11.0	0.35	21.0	1.06
Other function							
Traffic control	12.9	42.8	35.3	9.0	0.33	22	1.09
Fire-hazard reduction	15.7	34.7	31.8	17.8	0.34	21	1.09
Group average	14.3	38.8	33.6	13.4	0.34	21.5	1.09
Overall average	27.6	43.5	21.0	8.0	0.79	13.0	0.98

^aAssignment of numerical scores to the respondents' rating: very important = 2, important = 1, not important = -1, unclear (neither important nor not important) = 0.

^bInterpretation of the average score: > 1.0 = very high, 0.75–1.0 = high, 0.5–0.75 = medium, < 0.5 = low.

^cThe average score was used to rank the 25 ecosystem services in ascending order.

and concern about the bioclimatic condition in the tropical city, especially during the hot summer days. Air pollutant removal and noise abatement by vegetation were ranked high despite limited realization of these ecosystem services in the compact city milieu (Fang and Ling 2003; Harris and Cohn 1985). This result suggested a common perception of fresh air and quietude benefits of green spaces that contrasted with polluted and noisy built-up areas. Wind protection, increase in relative humidity, and glare and reflection

control were perceived as unimportant by residents. In the predominantly high-rise city, the wind protection function of UGS has limited applicability in most places. The results indicated that messages on UGS benefits communicated to residents through publicity and public education programs attracted more support. Moreover, recent aggravation of environmental problems in Guangzhou, especially air pollution, has accentuated awareness and concern on environmental quality.

The environmental function group (services related to the improvement of environmental quality) did not secure high scores (Table 1). Soil erosion prevention at 0.91 is the highest score in the group. The three services related to urban hydrology (groundwater recharge, flood abatement, and wastewater management) ranked rather low, probably because their benefits have to be realized indirectly through the complex pathways of intermediaries. Thus, such functions were psychologically remote to residents in comparison with the more direct health and comfort benefits. The important ecosystem services of wildlife habitat and species conservation were ranked rather low at 15th and 16th. It could be hypothesized that the highly compact urban environment has quite effectively excluded wildlife both physically from built-up areas and mentally from people's minds. The lack of encounters or contacts with wildlife has diminished their importance.

For the recreation and landscape group (Table 1), aesthetic enhancement was emphasized with a high score of 1.45 and ranked second among the 25 ecosystem services. The stress on visual and landscape benefits denoted general treatment of greenery as ornaments that decorate the otherwise dull and gray cityscape. Green spaces were strongly recognized as recreational venues (score 1.28 and rank sixth). The increasing income, leisure time, and expectation for a better quality of life by Guangzhou residents would boost demands in this regard. The opportunity to know and contact nature attracted a moderately high score of 0.91, suggesting that some residents relished such intrinsic functions. This perception, however, contradicted with the lower scores attached to the related services of wildlife habitat and species conservation. The lack of a lateral mental connection among the related attributes implied a possible conceptual gap. This missing link could be induced by a limited understanding of intricate ecological associations in green spaces. Two less common ecosystem services, namely screening undesirable views and demarcation of landscapes, were rated near the bottom (ranks 23rd and 24th). Residents were unfamiliar with these rather subtle benefits, reflecting the fact that most people dwell in high-rise tenement blocks rather than houses where vegetation screening might be important in maintaining privacy. The use of green spaces to demarcate different types of landscape and land use was hardly noticed or appreciated by residents.

In the economic benefit group, the product value of UGSs was ranked last (25th). Residents were unaware of the actual or potential economic value of urban

vegetation, although it has been given due attention in some overseas cities (Last and others 1976). Despite the general perception of UGSs as nonmarket and nonprized public goods, their contribution to adjacent or nearby property value has been studied in some North American and European cities mainly by contingent valuation and hedonic pricing methods (Cummings and others 1986, Geoghegan 2002; Luttik 2000; Tyrväinen and Väänänen 1998). Although similar studies have not been attempted in China, the gradual shift from a centrally planned to a market-driven economy could in due course raise awareness of the monetary value of green spaces. The low score of this economic service reflected the current lack of awareness, with implications on the sale and rental value of properties and tax income. At present, many residents apparently were unable to link their good understanding of environmental-ecological services to economic benefits.

The remaining two practical functions received little support. To some residents, UGSs might be construed as a fire hazard because of the combustible organic litter and living vegetation. The less direct role of UGSs in influencing traffic was given a low rank (22nd). Although green spaces quite commonly define and direct pedestrian and vehicular flows in the study area, most residents were oblivious of this subtle utility. In essence, roadside trees and other vegetation were interpreted as largely environmental and ornamental objects.

Overall, 21% of the respondents chose not important, ranging from 2.4% for oxygen release to 43.2% for screening undesirable view (Table 1). On average, 8% of the respondents chose the unclear rating, with the high proportion (>12%) mainly associated with the environmental function group. Some respondents might have chosen the unclear answer because they found the question irrelevant to them. Within this group, the three services related to water drew the largest proportion of unclear replies, namely wastewater management (20.2%), groundwater recharge (17.1%), and flood abatement (14.6%). Wastewater in the study area is collected and treated using conventional means, and green spaces seldom serve this special function. Similarly, green spaces are rarely used proactively and purposely to facilitate groundwater recharge and flood abatement, although they might play an auxiliary or incidental role. The two services associated with other organisms (wildlife habitat and species conservation) and demarcation of landscape were less well understood. In contrast, microclimate and environmental groups drew the smallest proportion of unclear responses.

General Discussion on Perception of UGS Ecosystem Services

Some findings were different from similar studies conducted elsewhere. A study of urban park use in England and Wales indicated overwhelming popularity of natural features that are reminiscent of the ideal rural arcadia (Walker and Duffield 1983). An urban forest study in Finland found that the benefits related to nature were valued most. Outdoor activities and exercise were rated important. Climate and environmental quality such as pollution mitigation and noise abatement were considered the least important (Tyrväinen 2001). The study of resident attitudes toward the urban forestry program in Mandeville city (New Orleans, LA) showed that aesthetic value and shading were ranked the most important. Wildlife habitat, amelioration of urban climate, and increase in property value were rated important. The benefits related to environmental quality such as control of dust, wind, and stormwater, were ranked low (Lorenzo and others 2000). However, the economic value of UGSs was considered the least important in both the Finland and New Orleans studies.

Several factors could have jointly contributed to the differences between the findings of Guangzhou and overseas studies. First, to most Chinese people, urban living is superior to the prevalent poverty in rural areas. Benefits related to nature are usually not thought of as important as those that bring direct material improvement to living conditions. Second, environmental problems are more serious in the study area, which focus attention on ecosystem services that could bring relief. In contrast, the overseas studies were conducted in cities with much fewer environmental problems. Third, differences in the composition, structure, design, and management of UGSs could influence perception of ecosystem services. In different societies, the interplay of social, cultural, and environmental factors could account for discrepancies in perception toward UGSs. Some ecosystem services have a universal appeal that traverses cultural divides, such as outdoor recreational opportunities and aesthetic contributions. Other services tend to be tied to the society's collective psyche and outlook, which continually evolve in the spatial and temporal dimensions. City administrations need to monitor changes in the community's perception and respond accordingly.

The study found that strong preference was given to ecosystem services that have been advocated in publicity programs. Many people do not have a fixed set of preferences when they participate in a complicated exercise of value judgment (Gregory and others 1993;

Lewan and Söderqvist 2002). The possession or lack of relevant knowledge could affect attitude and behavior. To improve the recognition of UGS ecosystem services, appropriate information could be included in public education and publicity programs for communication through formal and informal channels (Costanza and Folke 1997; Fraser and Kenney 2000; Lewan and Söderqvist 2002).

Of the four socioeconomic attributes, age and education were significantly associated with the recognition of ecosystem services based on the chi-square test. Gender and income did not show a significant relationship. The young age group (<30) gave the highest rating in the very important category, much higher than the 30–50 and >50 groups. Respondents with a university and higher education chose more very important assessments, and the reverse is true for the less educated. Female respondents outnumbered male in the very important rating by a large margin (39.7% versus 25.1%), but the reverse was true for the important category (50.9% versus 63.5%). In summary, the demographic profile of Guangzhou residents who would emphasize the importance of UGS ecosystem services was the following: gender-neutral, younger than 30 years, with a university degree or higher level of education, and an income more than RMB3000/month.

Perception of Negative Impacts of UGSs

Eight negative impacts of UGSs were included in the survey, and 14.8% of the respondents stated no negative impacts (Table 2). The not important answer was dominant, chosen by an average of 54.3% of the respondents, in a range of 28.7% to 73.1%. Only the liability attribute attracted more respondents in the important category. The very important and important responses together constituted an average of 39%. Negative average scores denoted that the attribute was considered not important (Table 2). Green spaces keeping out sunshine was rated the least important, followed by obstacles and intrusions, organic litter problem, and attracting insects or pests. Guangzhou has long hot summers with strong sunshine, commonly considered undesirable. Shading provided by greenery could offer welcome relief. As most urban trees are evergreen (without marked seasonal falling of leaves and twigs), organic litter was not regarded as a problem. Moreover, most households are situated at a distance from UGSs and in multistoried buildings; hence, they are not affected by organic litter generated by nearby green sites. The issue of incurring management cost carried a low score of -0.06 , implying that it was

Table 2. Residents' perception of the importance of negative impacts of green spaces in Guangzhou (percent of valid respondents)

Negative impacts ^a	Respondents' rating ^b				Average score	
	Very important	Important	Not important	Unclear	Value ^c	Standard deviation
Keeping out sunshine	3.2	21.0	73.1	2.6	-0.46	0.93
Organic litter problem	2.9	30.2	64.9	1.9	-0.29	0.99
Attracting insects or pests	4.8	20.3	53.5	21.3	-0.23	0.93
Obstacles and intrusions	4.9	22.7	69.1	3.2	-0.36	0.99
Security risk (darkness)	9.7	33.2	49.7	7.4	0.03	1.10
Security risk (burglar access)	15.3	37.5	43.6	3.6	0.24	1.16
Management cost	7.0	31.0	50.8	11.2	-0.06	1.04
Liability	20.0	48.4	29.7	1.9	0.59	1.11
Average	8.5	30.5	54.3	6.6	-0.07	1.03

^aNo negative impacts was reported by 14.8% of the respondents.

^bAssignment of numerical scores to the respondents' rating: very important = 2, important = 1, not important = -1, unclear (neither important nor not important) = 0.

^cInterpretation of the average score: > 1.0 = very high, 0.75–1.0 = high, 0.5–0.75 = medium, < 0.5 = low.

close to the neutral stance, or evenly split between important and not important. The infestation by insects and pests attracted the largest proportion of unclear responses (21.3%), suggesting that residents were largely unperturbed by this negative impact or that they were unsure about it.

Residents were concerned about the security risk associated with UGSs. They rated the darkness factor slightly important and emphasized the burglary threat. The dense planting of trees and shrubs coupled with poor management could induce a sense of insecurity. The liability concern was strongly expressed. Individual citizens might worry about the potential financial burden because liability could incur financial responsibility. As all UGS lands in the study area are owned by the state, citizens do not have the chance to participate in development and maintenance to bring appropriate improvements to reduce liability (Fraser and Kenney 2000).

Research in other cities showed significant differences in the attitude toward negative UGS impacts. In a study of green spaces in Salo and Joensuu in Finland, many residents, 66% and 46%, respectively, expressed no negative effects (Tyrväinen 2001). In comparison, only 14.8% of the respondents in Guangzhou stated no negative impacts. It could imply that UGSs were more appreciated or less misunderstood in Finland than in Guangzhou. In Finland, the main negative concerns were attraction of antisocial people, security, maintenance cost, shading, organic litter, and falling branches (Hunter 2001; Tyrväinen 2001; Tyrväinen and Väänänen 1998). It seems that security is a common anxiety regardless of geographical location and cultural background. Finland is a high latitude location where sunshine is dearly appreciated. The shade cast

by mature trees situated near a house was considered undesirable. The organic litter problem in Finland was rated more important due to the common juxtaposition of UGSs and homes (Tyrväinen 2001), whereupon public litter could drift onto private lands. In a similar study in Mandeville city (New Orleans, LA), the negative effects that ranked important included falling tree branches, roots clogging sewers, and tree diseases (Lorenzo and others 2000), which were rather pragmatic issues related to hazards and nuisances. These findings highlighted the differential perception of UGS problems in different countries. The outlook of a people, being the expression of the underlying social-cultural bedrock, could bring notable differences in perception toward the universal public good of UGSs.

Overall, negative impacts were rated less important than ecosystem services. Despite some weakly expressed negativity, most residents appreciated and enjoyed the UGS benefits. Similar empirical studies also found the prevalence of multiple benefits over negative externalities (Smardon 1988; Tyrväinen 2001). The associations between perception of negative impacts and socioeconomic variables of respondents were statistically not significant.

Attitude Toward the Condition of UGSs

The UGS condition in Guangzhou was rated fairly well. The respondents returned excellent and good ratings at an average of 87.0%, although 16.4% gave the poor grade (Table 3). In general, satisfaction was recorded for vegetation diversity, management, and landscape design. The largest share of the poor rating (23%) was linked to the amount of green areas, suggesting a general perception of inadequate UGSs in Guangzhou (Li 1999; Yang and others 1989) and a

Table 3. Residents' attitudes toward the condition of green spaces in Guangzhou (percent of valid respondents)

Condition of green space	Excellent	Good	Poor	Unclear
Vegetation diversity	19.9	62.3	12.5	5.3
Percentage of green areas	13.7	55.2	23.0	8.1
Management of green spaces	20.3	57.0	15.8	6.9
Landscape design	18.3	61.1	14.4	6.3
Average	18.1	58.9	16.4	6.7

Table 4. Residents' preference for the design style of green spaces in Guangzhou assessed by socioeconomic attributes (percent of valid respondents)

Socioeconomic variables	Respondents' preference				Chi-square test	
	Oriental	Western	Oriental–Western integration	Naturalistic–ecological	Cramer's <i>V</i>	Probability
All respondents	19.1	7.2	29.0	44.7		
Gender						
Male	22.8	6.6	30.5	40.1		
Female	15.8	7.6	27.5	49.1	0.114	0.224
Age						
< 30	12.6	7.8	29.3	50.3		
30–50	23.5	8.4	29.4	38.7		
> 50	26.9	5.8	26.9	40.4	0.096	0.397
Education level						
University and higher	21.8	3.8	30.1	42.3		
Others	18.5	8.1	28.1	45.4	0.046	0.872
Monthly income						
< RMB 1000	21.2	5.5	26.7	46.6		
RMB 1000–3000	16.8	7.3	29.9	46.0		
> RMB 3000	20.0	10.9	32.7	36.4	0.086	0.544

desire to have more. Although about one-third of the study area has been designated as UGSs, which is a notable ratio by ordinary yardsticks, the high population density translates the provision to merely 7.7 m²/person. Whereas the UGS acreage is high in comparison with other Chinese cities that have a customary compact urban form, it is low by international standards and by rising expectations of a relatively prosperous city. The cramped living and working conditions in Guangzhou have induced a strong urge to find escape and leisure opportunities in public green spaces. On average, 6.7% of the respondents were unclear about the UGS condition. The percentage of green areas attracted the largest number of unclear responses at 8.1%. Some residents were unsure of UGS quality standards, making it difficult to judge site management. In addition, some residents hardly used green spaces, partly due to the lack of venues near their homes or work places.

Preference for UGS design

Vegetation plays a crucial role in characterizing the UGS landscape and influencing visitor perception.

Vegetation type, abundance, dimension, shape, color, density, configuration, location, seasonality, and management could define social and private spaces. These attributes provide a living texture that contrasts with the geometrical regularity and rigidity of built features (Arnold 1993; Bradley 1995; Smardon 1988). The design style reflects how such key objectives could be realized. Respondents were asked to indicate their preferences for four principal landscape styles of UGSs in Guangzhou (Table 4).

The naturalistic–ecological style was the most strongly preferred by 44.7% of the respondents, followed by the hybrid oriental–Western integration. The pure oriental and pure Western styles were less preferred at 7.2% and 19.1%, respectively (Table 4). These findings implied that traditional or mainstream landscape cultures have been suppressed. Instead, an adventurous spirit of experimenting with new and cross-bred styles has emerged. Meanwhile, vernacular culture continued to exert its influence by preserving the oriental gardening style, but it has been diluted by a desire to introduce modern Western elements. The surfacing of a fusion type of landscape fashion ex-

plained the preference for the oriental–Western style. The naturalistic–ecological style was preferred, although some intrinsic ecosystem services might be irrelevant to residents' daily life. This landscape inclination reflects an underlying close relationship between nature and humans. It also brings the satisfaction of mystery, variety, and intimacy of nature, which is missing in artificial surroundings.

Naturalism has been highlighted in many aspects of urban life in recent years in China. The rising trend in landscape design stresses natural processes that shape landscapes as well as the roles played by landscapes in these processes. The essence is to preserve nature, keep disturbance to nature to a minimum, and restore, create, or emulate nature where it does not exist. In contrast, artificial features have been trimmed in landscape design. This approach could help to sustain or enhance nature in urban areas and contribute to sustainable development in the long run.

The four socioeconomic attributes had no statistical association with landscape preference (Table 4). The percent of respondents who appreciated oriental design style increased with age, with the elderly adhering to tradition. The younger respondents more earnestly espoused the naturalistic–ecological approach. The appreciation of Western and oriental–Western integration tended to be age-neutral.

Choice of the Most Desirable Green Spaces

The questionnaire asked for the most desirable green spaces in Guangzhou. Baiyun Mountain Park, Yuexiu Park, and Ersha Island were specified by 59.3%, 52.9%, and 41.6% of the respondents, respectively. The results matched residents' strong preference for naturalistic–ecological and hybrid oriental–Western design styles.

Baiyun Mountain Park represents a precious natural green space that has been preserved at the edge of Guangzhou's built-up areas, linked to the contiguous countryside to its north. It is a fine example of a natural green wedge or green finger that extends into the city (Frey 2000; Jim 2004). To maintain its natural setting, only essential visitor facilities have been installed at several confined localities. The rich floral and faunal endowment indicates an exceptionally high degree of naturalness of the park (Yang and others 2002; Zheng 1995). Yuexiu Park is an urban park located in the center of the study area surrounded by built-up lands. It represents an oriental–Western landscape style. Ersha Island was built by sediment accumulation in the Pearl River, which drains through the city. The landscape design is typically Western, punctuated occasionally by Chinese elements. Neatly manicured turf

plots occupy a large proportion of the green spaces, accompanied by a modernized promenade and fine mature trees. Its popularity is explained by good leisure facilities, including a sports center, a museum, and a concert hall, in an attractive setting of an exotic landscape and historical residential precinct.

Other UGSs are less preferred than these three venues. UGS size also explains their popularity. All other venues listed in the questionnaire except one are smaller than the above three. Congestion is often experienced during peak use hours in many UGSs. The South China Botanical Garden is large but situated far from the city, and as a research base, it has minimal recreational facilities to attract visitors. Poor maintenance could impair UGS attraction. With only several parks in the study area adequately funded by the government, the chronic financial stringency has compromised maintenance quality. Furthermore, the stereotyped design of some public green spaces has dampened their recreational appeal and use.

Implications and Conclusion

The study indicates that Guangzhou residents harbor a positive attitude toward UGSs, with widespread recognition of their ecosystem services. Responses to negative impacts were relatively subdued. In general, they are satisfied with site management. The positive image of UGSs, which will encourage use, could be harnessed by the government as community endorsement to develop and fund better facilities (Hayward and Weitzer 1984). Respondents' socioeconomic factors were not significantly associated with their perception or attitudes toward the services. These findings are consistent with similar studies conducted elsewhere. UGSs are usually perceived to bring multiple benefits rather than negative impacts (McPherson and others 1999; Tyrväinen 2001; Tyrväinen and Väänänen 1998).

Urban green space ecosystem services in Guangzhou were not equally understood or appreciated. The commonly publicized benefits attracted more attention, including those directly related to personal health and comfort, such as microclimate and environmental quality. The use of UGSs as recreational venues also received a high importance rating. The comprehension of some intricate and indirect environmental, ecological, and landscape functions, however, was comparatively weaker. The findings denoted a pragmatic bend in the perception regime and an emphasis on practical uses that catered to the individuals. The residents accorded less importance to ecosystem benefits related to wider biotic–abiotic linkages. Similar studies in Western cities demonstrated differences in

UGS preferences among resident groups and regions (Fraser and Kenney 2000; Serpa and Muhar 1996; Tyrväinen and others 2003). The desire to accommodate the diversities of ecological and practical functions while fostering their harmonious coexistence will pose a challenge to UGS planners.

Some ambivalent responses beg further investigation. The weak recognition of wildlife habitat and species conservation roles contradicted the strong preference for naturalistic–ecological landscape design. Landscape is more inclined to be considered as a visual–scenic resource serving as a backdrop to recreational pursuits. The contribution of UGSs to urban ecological enrichment and the corollary of intermixing nature and city could have escaped the attention of Guangzhou residents. The lack of awareness of economic benefits indicates that the society as a whole needs to go through a learning process as it is shifting from a centrally planned to a market-driven economy and from public to private property ownership.

The innate affinity for nature, however, has been expressed through another channel in the choice of the most preferred green venues. The strong preference for naturalistic–ecological landscape design was matched by the top rank allotted to Baiyun Mountain Park, which is the most natural UGS in Guangzhou. Baiyun is largely composed of natural woodlands on hilly terrains situated in the urban-fringe countryside. Yuexiu Park, also strongly preferred, is a fine example of restrained modification of nature to create a hybrid landscape that is seminatural and a union of oriental and Western styles. Such choices of venues indicate predilection and fondness toward sites with rich natural ingredients.

The findings suggest that public preference and attitude concerning UGSs are circumscribed by two cardinal factors. First, there is the universal inborn human desire to reestablish the tenuous link with nature. Second, there is the acquired cultural influence on the role of UGSs in cities. The amount of information, knowledge, and experience and the extent that they are understood and assimilated would influence responses and behaviors. The first part of the questionnaire survey was able to probe mainly the acquired portion of the mind, but the questions on the choice of green venues exposed in a subtle way the innate desire for natural features. It will be helpful if the latent affinity with nature could be mobilized and blended with the conscious mind to nurture a more naturalistic approach to urban greening. To echo this strongly expressed community desire, future UGS policy could aim at preserving original natural components of green fields and converting brown fields

into fine emulations of nature (Jim 2004). The contribution of informal green spaces, including the natural pockets left or occluded by default in the urban matrix, could be duly recognized and incorporated into the UGS system planning.

The notable appreciation of UGS benefits among Guangzhou residents provides a sound basis for engaging the public in urban greening projects. This innovative approach can offer valuable insights for the government to factor in citizens' wishes and expectations. A synergistic partnership of providers and consumers could jointly develop and modify UGSs in the city. It can help to plot a long-term strategy to preserve valuable green sites in the face of acute development pressure. The formation of nongovernment organizations could help to gel citizens' awareness and efforts. They will facilitate a structured approach to communication and cooperation with the administration. The multiple benefits of UGSs could be more effectively communicated to the people through formal education channels and publicity measures. There is also a need to expand the horizon of government employees in charge of green space planning. UGS design could begin to incorporate these features in an integrated and citywide UGS plan.

In the quest to develop sustainable and healthy cities and to regenerate old neighborhoods (Urban Green Spaces Taskforce 2002), the quantity and quality of green spaces are well-recognized factors. Major recent changes in Chinese society have brought fundamental transformations in attitude and behavior toward many things, including a move away from the productive use of urban parks (Cranz 1979). Fast-growing cities, especially in the developing world, could adopt enlightened UGS planning and design by embodying the nature-in-the-city paradigm and residents' wishes. An ecological approach to land stewardship could extend from the countryside to cities. The deeply ingrained groundsman–gardener type of park management mentality, treating urban parks mainly as landscape–scenic venues (Burgess and others 1988), could shift to the ecological approach that is research based and user-oriented. In the study of countryside recreation, visitor attitudes and preferences have received much attention. Planners and managers have extensively incorporated relevant findings to enhance the quality of the recreational experience and cost-effectiveness of the programs (Hendee and others 1990). In comparison, similar market research on urban park patrons and patronage is lacking. More studies to explore the mindset of stakeholders could allow cities to build UGSs that are socially inclusive places (Jupp and others 2002) rather than

just spaces to serve narrow segments of the populace. A continual process of action and reaction to probe and influence the pulse of the community would constitute the foundation of an innovative precision planning–management regime for UGSSs.

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