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Attitudes toward urban green spaces: integrating questionnaire survey and collaborative GIS techniques to improve attitude measurements

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Abstract

Attitudes influence behavior towards urban green spaces. But determining attitudes toward urban green spaces is not well operationalized in urban planning research. A study was conducted in the West Island, Montreal, Canada to elaborate the design and development of a valid and reliable instrument to measure the dimensions of citizen attitudes toward urban green spaces. The use of qualitative and quantitative phases in the instrument design strengthened the operationalization of the attitude concept. In the qualitative stage, a novel approach integrating collaborative geographic information system (GIS) techniques and informal interviews generated complementary insights about the spatial and non-spatial factors influencing attitude towards urban green spaces. Affinity analysis aggregated the issues into three homogeneous categories that guided the construction of questionnaire items. A self-administered mail-back questionnaire was developed and distributed to 322 households using a multistage cluster sampling strategy; 179 questionnaires were returned (55.6%). In the quantitative phase, factor analysis and reliability analysis were applied to the items set to create a valid attitude measurement scale. The analysis shows that households are characterized by a two-factor attitude structure towards urban green spaces: behavior and usefulness. It is concluded that urban green spaces attitude is a multi-dimensional construct. The implications for green spaces planning are outlined.

Keywords: Attitude; Collaborative GIS; Factor analysis; Questionnaire; Urban green spaces; Urban planning

1. Introduction

The collective evidence from environmental psychology and landscape research has pointed to individual attitude as an influential factor in shaping land use transformation (Erickson et al., 2002; Jacobson and Marynowski, 1997; Luzar and Diagne, 1999). Attitude is conceptualized in many ways from it being a state of readiness for mental and physical activity, to

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the inclination for an individual to evaluate objects or aspects in a favorable or unfavorable manner (Dawes, 1972). This study considers attitude as a learned and summary evaluation that influences thoughts and actions (Ajzen and Fishbein, 1980; Gerd and Wänke, 2002). In this interpretation attitude is a complex construct with cognitive (knowledge), affective (feelings) and conative (behavioral) components (Walmsley and Lewis, 1984). As such attitude is formed and affected by socio-economic, cultural and biophysical interactions. Attitude is also a powerful predictor of behavior and thus an important tool in determining human response to policies and planning decisions (Kaiser et al., 1999; Tuan, 1990). Also, attitudes at the local scale can impact aggregated level observations as individuals are behaviorally and psychologically distinct because of genetic and environmental influences.

Measuring individual attitude towards urban green spaces has received sparse coverage in the environment and planning literature. One reason may be due to the greater importance that natural forests have occupied in global environmental concerns with the result that local land use types such as urban green spaces have not been comprehensively studied. Another reason is that local environments have complex social characteristics and it has been technically easier and more cost-effective to generalize research results using coarser scales of analysis. However, this approach risks incurring ecological and exception fallacy problems (Trochim, 1999). In the ecological fallacy, inferences from aggregate to individual measures are unreliable and not able to capture the intricate local attitude dynamics. In the exception fallacy, outlier measurements distort the degree to which aggregated data can represent reality. Accurately characterizing the complexity of individual attitude can better support the integration of all interest groups, optimize local benefits, and increase success in community planning efforts by using cooperative management strategies (Gerd and Wänke, 2002).

Attitude is not directly observable and therefore strategies such as inferred cues and interrogation using questionnaire surveys have been the methods of choice in attitude measurements (Dawes, 1972). Therefore, effective attitude measurement depends on its systematic behavior and the reliability of the system used to measure it. In measuring attitude, local scale analysis and multivariate statistical analysis approaches are needed to simultaneously explore the dimensions of the attitude construct in order to produce more accurate and robust local scale representations. The evidence in environmental psychology indicates that attitude towards the environment is a multi-dimensional construct with the common components being value orientations, demographics, knowledge, and context (Blake, 2001; Lakhan and Lavalle, 2002; Schultz and Zelezny, 1999). The usual questionnaire approach to measure urban green spaces attitude is to include a range of semantic-differential (with good/bad options for example) and Likert items (with agree/disagree options for example) to operationalize the attitude construct. Correlations and aggregate scores of the item responses are used to assess attitude. But one challenge is how to select representative items for inclusion in the questionnaire as attitude may also be influenced by the spatial environment surrounding the individual (Downs and Stea, 1977).

Collaborative geographical information systems (GIS) provide a foundation to integrate the spatial component into attitude measurements. A collaborative GIS is a networked collection of computer hardware, geographical software, and interest groups within a traditional workshop type setting (Armstrong, 1994). The purpose is to capture, store, manage and visualize spatial data and knowledge to guide unstructured problems towards solutions and new learning opportunities. During the collaborative GIS process, participants combine knowledge and share, explain, analyze, and visualize map-based data to elaborate issues and challenges (Faber et al., 1996). The foundation of the collaborative GIS approach is rooted in the theory of communicative action where discourse or language based communication and argumentation are used as formal procedures to elaborate ideas and agree on decisions (Habermas, 1984). Digital maps are used to support and document knowledge and provide an environment for oral and visual stimulation of attitudes. The collaborative GIS provides benefits such as real-time interactions, inclusiveness, social learning, and awareness about the shared challenges that need common solutions (Balram et al., 2003; Godschalk et al., 1992; Roche and Humeau, 1999). But focus group workshops and interviews applied separately can reveal different valuation information (Kaplowitz and Hoehn, 2001). By integrating these in a spatial context using the collaborative GIS, a broad range of

spatial and non-spatial issues associated with attitude is addressed. The integration creates opportunities to improve content validity by making all the issues associated with urban green spaces attitude clearer.

The goal of this study is to design and develop a valid and reliable survey instrument to measure attitudes towards urban green spaces by integrating traditional survey methods with collaborative GIS techniques. A key strategy in the implementation is the use of a local level analysis that links attitudes about finer scale "home areas" with coarser scale "city areas" to capture a broad perspective about attitudes towards urban green spaces. The specific objectives are to:

(a) review existing research on measuring urban green spaces attitude;
(b) integrate spatial understanding into the attitude measurement process;
(c) develop a survey instrument to measure urban green spaces attitude;
(d) evaluate the reliability and validity of the measuring instrument;
(e) discuss the findings and implications for urban green spaces planning.

2. Attitudes toward urban green spaces

Urban green spaces provide various social, economic and ecological roles including therapeutic benefits, a desired surrounding for raising children, social integration, conservation easements, and community development potential (Hague and Siegel, 2002; Miller, 1997; Milton, 2002). In this study, urban green spaces are considered as urban areas now covered with vegetation, natural or maintained, public or private, as opposed to areas that are paved or have buildings on them. Community parks, forested lands, and woodlots are examples of green spaces that occur in the urban milieu. There is increasing awareness among planners that citizens value green spaces more for their non-market characteristics rather than the economic and utilitarian benefits that have guided planning and management endeavors (Hague and Siegel, 2002). Indeed, citizens are making greater demands for a more active role in the planning and decisions that are made about the green spaces in their communities. These demands are motivated by reasons such as: a desire to improve the quality of community life; environmental protection; participation in decisions that will affect their lives; concern for social conditions; need for satisfaction with their surroundings; pride in inter-generational legacy; and mistrust of representations made by elected officials (Roseland, 1998; Simonsen and Robbins, 2000).

Measuring citizens' attitudes towards urban green spaces has been achieved largely though structured questionnaire surveys. The dominant use of questionnaire surveys to characterize environmental attitudes is described in several studies that explore, for example, attitudes toward urban growth (Henwood and Pidgeon, 2001), quality of life (Bonaiuto et al., 2003), community conservation (Mehta and Heinen, 2001), forestry (McFarlane and Boxall, 2000), rural woodlots (Erickson et al., 2002), and energy use (Knight, 1990). These studies are valuable as they act at a local level and address fine scale social complexities and attitude dynamics.

The research literature has explored attitude either alone or as value–attitude or attitude–behavior linkages. In a study in the rural USA, investigators used a questionnaire to explore the motivations for some non-industrial private forest landowners to retain and protect their woodlots (Erickson et al., 2002). Wooded patches or woodlots are dynamic green spaces and provide important ecosystem functions. The questionnaire items measured seven factors deemed related to landowners' motivations. However, the procedure for selecting items for inclusion into the final questionnaire was not explicit. The items were classified into categories using factor analysis, and scales constructed to measure respondents average rating on each category. These categories are the respondent's attitude structure. The factor analysis showed the existence of multiple attitude dimensions. Support was found for the notion that non-economic characteristics such as aesthetics and environmental protection are key motivators for retaining woodlots.

McFarlane and Boxall (2000) explored forest attitude using a bottom–up approach in which the cognitive hierarchy model of value–attitude relationships was used to examine forest values and attitudes between forest user groups. Values are consistent knowledge and belief about the worth or importance of an object. A survey questionnaire with socio-economic, values, attitude, and knowledge items were used to

explore the different dimensions associated with values and attitudes. In their study, the authors found that socio-economic factors, social influences, and knowledge had little influence on attitude (McFarlane and Boxall, 2000). However, it was established that forest values—what people believe to be true about forests—were strongly related to attitude. This confirmed research evidence the measurement of attitudes must consider individual characteristics that influence personal values. Other published studies have supported the value–attitude link in different contexts (Gotmark et al., 2000; Schultz and Zelezny, 1999; Tarrant and Cordell, 1997; Vaske and Donnelly, 1999).

The consensus seems to be that many factors affect attitude, and that environmental attitude research serves to provide lists of possible factors that can be tested in new contexts to explore the effects of these factors on attitude. Lakhan and Lavalle (2002) attempted to isolate significant factors influencing environmental concern by using a semi-structured survey. Categorical data analysis showed that age and education formed significant factors (Lakhan and Lavalle, 2002). But there was no support for gender and residential location. Another study on environmental attitude found age and education to be significant, but not gender and marital status (Kasapoglu and Ecevit, 2002). The role of demography (Hartup, 1994), access and equity (Lindsey et al., 2001), perceptions (Trakolis, 2001), utility and amenity value (Henwood and Pidgeon, 2001; Solecki and Welch, 1995), and community conservation (Mehta and Heinen, 2001) in environmental attitude studies are documented. These studies suggest that attitude is context dependent and local analysis is needed for its accurate measurement.

3. Study context

The study area was the communities at the western end (West Island) of Montreal Island, Canada (Fig. 1). Before 2002 the West Island consisted of 11 municipalities (Dorval, Roxboro, Pierrefonds, Dollard-des-Ormeaux, Point-Claire, St. Genevieve, Kirkland, Senneville, Beaconsfield, St. Anne-de-Bellevue, and Baie-D'Urfe) with varying physical size, landscape characteristics, and demographics. These variations create different demands on the physical and environmental needs of these communities and are

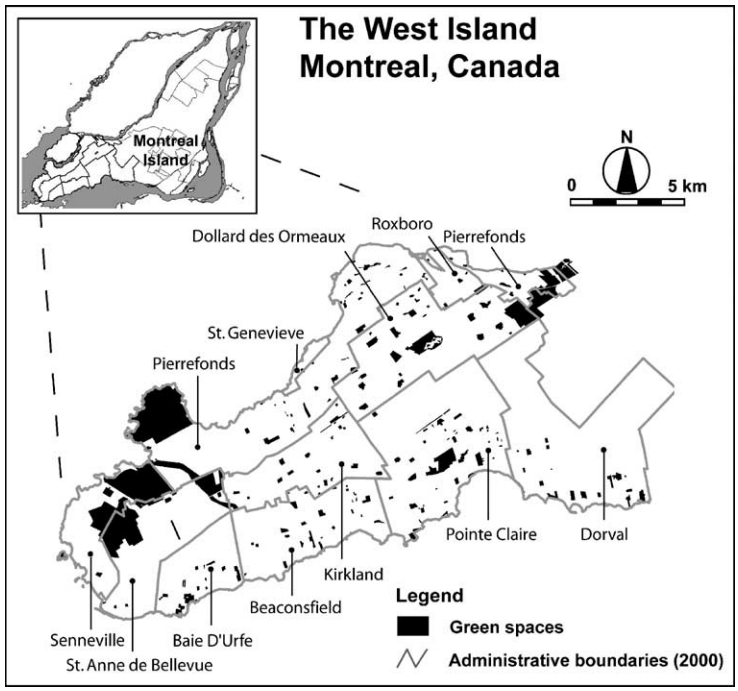

Fig. 1. The West Island, Montreal, Canada.

characterized by conflicting preferences. The eleven municipalities cover a total land area of about 130 km^2. The municipal decision-making structure consisted of an elected mayor and councillors. Each municipality forms a decentralized part of a larger Montreal Urban Community (MUC). In 2002, after the field work for this research was completed, the geographic boundaries of some West Island municipalities were aggregated and the administrative structure updated through municipality mergers.

Before the 1960s, farmlands and large swaths of green spaces dominated the West Island region. In contrast, the eastern and central parts of the Island were in various stages of infrastructure development as principal centers of economic and urban growth. The large amounts of untouched green spaces had defined the landscape characteristics of this region. Large lots and semi-detached houses complete the sub-urban features of the West Island. The early 1960s was characterized by an intense wave of urban development, driven by trade, commerce and urbanization from the central and eastern parts of the Island. There was a leveling-off of urban development during the 1970s and 1980s. But the pattern of urban expansion had already begun and new roads and service facilities paved the way for easier access to new lands. Studies of land use change shows green spaces to be declining, particularly in areas around road corridors and waterfronts (Adams, 1992). With the exception of Pierrefonds (17.1%), Dollard-des-Ormeaux (11.6%), Senneville (38.2%) and St. Anne-de-Bellevue (22.1%), each municipality had on average a 4% green spaces land base in 2000 (CUM, 2002).

Population trends for the period 1971–2000 showed an increase in almost all the West Island municipalities with the largest increase in population density for the period occurring in Kirkland (581%), Dollard-des-Ormeaux (90%) and Pierrefonds (65%) (Statistics Canada, 2003). One consequence is that residential areas have become more homogeneous, making green spaces disjoint and further depreciating their ecological and utility value. At the end of 2000, there were almost 200,000 citizens in the West Island region (about 13% of the island's population).

Improving the knowledge base and integrating diverse perspectives in the planning process can provide a foundation for more effective management of green spaces in the communities of the West Island. In response to informal queries from non-governmental organizations and municipalities, the McGill University Community based Environmental Decision support group (CBED, 2002) began a process to address green spaces concerns. This paper reports on the attitude surveys and workshop components designed to explore conservation-development trade-offs, organization cooperation, and strategic planning for urban green spaces in the communities.

4. Method

4.1. Overall research strategy

The attitude measurement instrument was developed within an integrated multi-method process involving qualitative and quantitative stages (Fig. 2). Explicitly representing the spatial and non-spatial aspects in the design process integrated a broad range of factors that can improve the reliability of the attitude measurement. Reliability refers to the consistency with which a measurement can be replicated (De Vaus, 2002). The qualitative stage used semi-structured interviews and a collaborative GIS workshop to elicit the spatial and non-spatial issues citizens associate with green spaces. Qualitative categories were generated by affinity analysis and represented the range of issues associated with green spaces attitude. These categories were used to formulate the questionnaire items. The qualitative strategy allowed for comparative analysis across research investigations and provided the basis to extend the line of inquiry in this study.

The final survey instrument was developed using the total design method (TDM) for conducting high quality mail surveys (Dillman, 2000). The TDM method is a comprehensive set of design and implementation procedures to improve questionnaire return rates and quality by making the perceived questionnaire benefits greater than the perceived costs of responding. The quantitative stage of this study used factor analysis and reliability analysis to develop a robust and valid measurement instrument. This overall design was chosen to provide a greater link between the theoretical attitude concept and the perceptions citizens have about green spaces.

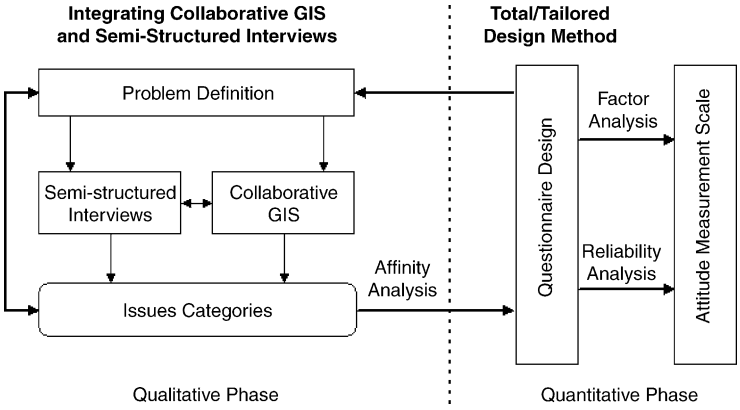

Fig. 2. Research strategy for the attitude measurement instrument.

4.2. Spatial and non-spatial issues of concern

A semi-structured survey was conducted in early November 2000 in the study region to explore the facets of citizen attitudes toward urban green spaces. A random sample of 135 residents was interviewed. The questions were general and open-ended to stimulate respondents to express their opinions freely. Respondents were asked to focus on the issues related to the conservation and management of green spaces in their surroundings and the wider area. Citizen's notions of urban green spaces were also elicited to establish a context-based definition.

A collaborative geographical information system workshop was organized for 1 day in late November 2000 to identify the spatial and temporal concerns of citizen groups. The collaborative GIS process allowed participants to identify common goals and strategies for urban green spaces conservation using structured deliberations anchored around digital map-based information and knowledge. In the workshop arrangement, stakeholders use the network computer arrangement to explore the available baseline data about the problem (Fig. 3). A customized collaborative GIS software based on ESRI's Map Objects technology provided tools to aid the exploration, spatial drawing, and annotation needs. Sub-groups of participants discussed a series of focused questions and presented their response maps in a plenary session. The regions of interest were identified by drawing polygons on a digital map in responses to focused questions such as: "What are the area(s) that would benefit most from collaborative inter-municipality cooperation and agreement? Example: the best potential areas for new conservation or recreational corridors". Restricting the number of polygons drawn and their total area limited participants from identifying large regions on the map so as to give their selected regions a greater chance of overlapping with those from other participants. A common visual display enabled the group to visually understand and deliberate on the multiple perspectives of the issue. A facilitator structured the discussions towards common agreement. An overlay map provided an indication of common interests and stakeholders assessed reasons (anchored around ratings for the utility, ecological, and amenity benefits of a selected green space) using weight-of-evidence arguments to support valid perspectives.

Workshop participants were selected to capture the diversity of conservation-development perspectives

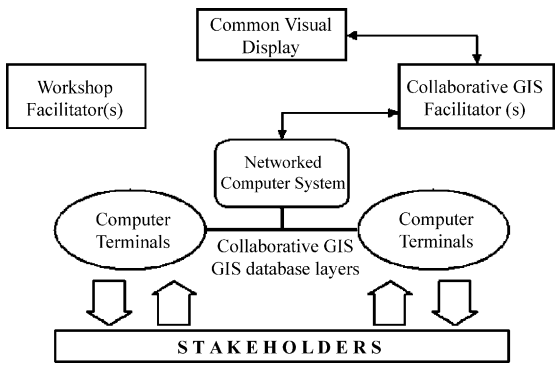

Fig. 3. The collaborative GIS workshop arrangement.

that exist when dealing with land use issues. The experiences from an ongoing community–university partnership (McGill University, Geography Department, CBED) was drawn on to target potential participants. Municipal decision-makers were formally invited to represent the perspective of their municipality. Business and commercial interests were represented by an organization that has membership across Montreal Island. Environmental non-governmental interests were represented by an organization that is active in environmental planning across many municipalities in the study area. Citizen's perspectives were represented by an active resident knowledgeable about the environmental issues in the region, and who has been involved in promoting environmental awareness in the West Island for nearly 15 years. Ten participants accepted to attend the workshop.

The issues identified during the semi-structured interview and the collaborative GIS workshop were grouped using affinity analysis. In affinity analysis qualitative data is collated into logical groups, followed by uniquely labeling each group, and then refining items based on their relevance to the groups (Frigon and Mathews, 1997). The procedure is recursive and evolves into the generation of nearly homogenous categories. The semi-structured interview captured individual interests while the collaborative GIS workshop brought community interests into focus. By integrating the two approaches a diverse range of concerns is captured and addressed.

4.3. Structuring the questionnaire

The questionnaire survey instrument explored the dimensions of attitude towards green spaces. These dimensions were established by literature research, personal communication with expert researchers, semi-structured interviews, and the collaborative GIS workshop with residents of the study area. The affinity analysis procedure classified the issues into categories with increasing specificity and clarity. Questions were developed to address each category. Thirteen attitude items were presented in a 5-point Likert format with responses from 1—completely agree to 5—completely disagree and a 3—undecided option. The undecided option ensured that respondents are able to provide honest answers to the items. One drawback is that many undecided answers for an item can lead to it not appearing in the factor analyzed dimensions. But the benefits of a more representative response outweigh the drawbacks. Items were piloted in two rounds to improve the format, clarity, and wording.

The final questionnaire was organized into clearly marked sections dealing with attitudes at the neighborhood, municipal, and West Island scales of analysis. In the first section, respondents were asked about quality of life and attitudes towards green spaces in their neighborhoods. An operational definition of neighborhood was taken to be the area around the respondent home that is within a 15 min walking distance (Miller, 1997). The next section explored types of green spaces, level of concern to changes in green spaces, and solutions for protecting municipal green spaces. Further sections dealt with use of green spaces in the West Island region, demographics, and environmental concerns. A modified version of the New Ecological Paradigm (NEP) scale (Dunlap et al., 1993) was included with the expectation that correlation will exist between the NEP and the green spaces attitude scale. The NEP measures environmental concern using questions about beliefs about limits to development, balancing nature, and biocentricism. The green spaces survey variables and their description are presented in Table 1.

Table 1
Variables and their measurement scale

Variables	Description	Measurement scale
Green spaces attitude	Disposition to respond positively to green spaces	Five-point Likert
Environmental concern	The new environmental paradigm (NEP) scale	Five-point Likert
Gender	Stated gender of respondent	Dichotomous
Age	Number of months since birth	Categorical
Education	Highest academic achievement	Categorical
Income	Total annual household income before taxes	Categorical

4.4. Sampling design

The target population was defined as all residents of the West Island region while the sampling unit was head of households. In developing the sampling strategy, it was assumed there exists a homogeneity of demographic characteristics at the micro-scale level and therefore a totally randomized survey technique would have been difficult, and interpreting the results more uncertain (Franklin et al., 2001). Therefore, a spatial stratification of the study area was used in the sampling design and based on average household income and the estimated amount of green spaces that are both expected to influence the attitude dependent variable.

Average household income from the 1996 Canadian Census (Statistics Canada, 2003) was mapped at the enumeration level using the ArcView GIS software. Seven income classes were created using natural data breaks with the lower three and upper three classes aggregated and labeled as low income and high income, respectively. Green spaces were classified by a manual procedure using digital images, maps, and field visits. A 1:50,000 scale land use map showing urban green spaces in the study region for 1999 was used to identify the urban green spaces. For temporal accuracy, these green spaces were compared with 1:40,000 scale black and white digital orthophotographs for the year 1999 and modified in extents using the orthophotographs as the "true" representation. Visual on-screen analysis and manual digitizing provided an estimate of the extent of the existing urban green spaces. A manual rule-based process was used to classify the green spaces as high or low such that a high distribution of green spaces for a particular community occurred when at least an estimated 3% of a circle of radius 1 km centered on that community is covered by green spaces. Low green spaces distribution occurred when 1% or less of a 1 km circle is covered with green spaces. The rationale for the mapping was that residents living near to large amounts of green spaces are more likely to have intense and well-formed attitudes about green spaces (Lober, 1995; Lober and Green, 1994). A well designed sampling strategy is able to capture a representative range of attitudes towards green spaces.

In order to define the community, a random point was selected on the map and a 1 km circle drawn around the point. Four communities in the study area were defined such that they satisfied the condition of being in unique municipalities and collectively covering the entire range of possibilities of the interactions between the income (high income, low income) and green spaces (high green spaces, low green spaces) variables. An additional three randomly selected sites regardless of their income or green spaces classification were included to form the complete sampling frame. For each of the 7 sites, 46 questionnaires were systematically distributed to households on either side of a randomly selected street. This produced a total random sample of 322 (7×46) households. Distributing the same number of questionnaires in each study site ensured the sites are equally weighted in the sample. This strategy achieved the dual goal of random sampling and minimizing errors due to selection bias (Deaton, 1997).

4.5. Administering and coding

The final questionnaire instrument was hand delivered for 4 weekday evenings in early November 2001 during 6:00–9:00 pm when citizens were most likely to be at home. Citizens were given a standard narrative that identified the distributors and their official affiliation, and outlined the purpose for the survey in either French or English. Citizens were able to choose either an English or French language version of the questionnaire. The distributing groups were balanced for gender, ethnic origin, and language fluency. These strategies are considered important in maximizing the questionnaire return rate (Dillman, 2000). Households who refused to accept the questionnaire were asked to provide responses to six shorter questions to determine general support or non-support for green spaces conservation management. Citizens were given 2 weeks to complete and mail back the questionnaire using a return-address stamped envelope.

The responses were entered into a Microsoft Excel database with a custom-coding template on the front-end. Each case was coded for 120 attributes. A subset of this database was used for the analysis in this paper. Inter-coder reliability was not an issue as only one data entry operator was involved with the coding. During the initial pilot coding process, randomly selected questionnaires provided the basis to refine case entries and resolve conflicts and ambiguities. In

the final coding, random samples of 18 cases (10% of total cases) were selected at regular intervals and checked against the original questionnaires. The literature provides little guidance on a suitable number of cases to use. Ten percent of the cases were used based on efficiency and the sample size. All errors were corrected before drawing the next sample.

4.6. Factor analysis

The questionnaire items were factor analyzed to explore the dimensions in the data. Factor analysis is a family of multivariate methods that tries to explain inter-correlations among observable variables based on underlying factors not directly observable (Kim and Mueller, 1978). Factor analysis can be classified into two paradigms: confirmatory factor analysis that involves testing hypotheses and exploratory factor analysis that involves factor identification and scale construction. Exploratory factor analysis is usually the method used in human attitude analysis as the researcher is not likely to have any a prior knowledge about the attitude structure in the particular context. One requirement for factor analysis is that sufficient shared variance among the variables as determined by the Kaiser–Meyer–Olkin (KMO) statistic and the Bartlett test must exist (Perry and Robertson, 2002). The KMO indicates the power of the variables to represent the concept, and the Bartlett chi-squared test assesses the validity of the null hypothesis—there is no difference in the variance of the correlation of the variables. The factor analysis procedure gives insights about the underlying dimensions of the attitude concept.

5. Results and discussion

5.1. Demographic profile

The overall response rate for the survey was 55.6%. This high percentage controlled for response bias effects and can be attributed to two main sources: the relevance of the topic to citizens, and the direct contact of the researchers with citizens when delivering the questionnaires. Those who refused to accept the main questionnaire also refused to answer a shorter questionnaire. The combined strategy of creating a professional survey instrument, minimizing respondents efforts to complete the questions, highlighting the value of the study topic to respondents, and outlining the university–community links of the work contributed to improving the response rate. The demographic profile shows that respondents were evenly distributed across the levels of the measured independent variables (Table 2). This suggests the questionnaire survey succeeded in representing all categories of the demographic variables.

5.2. Qualitative phase

The qualitative phase using the semi-structured interview and the collaborative GIS procedure produced an extensive list of concepts and topics that citizens associated with urban green spaces conservation. In the collaborative GIS workshop green spaces attitudes were structured within political, economic,

Table 2
Demographic profile of respondents

Demographic variables	Number	Percentage (%), $n = 179$
Gender		
Female	86	48
Male	93	52
Age (years)		
15–24	5	2.8
25–34	12	6.7
35–49	96	53.6
50–64	45	25.1
Over 65	21	11.7
Education		
Up to High school	3	1.7
Diploma	70	39.1
Bachelors	63	35.2
Masters	20	11.2
Professional	12	6.7
PhD	11	6.1
Income		
Less than 25000	4	2.2
25000–49999	17	9.5
50000–74999	34	19.0
75000–99999	48	26.8
100000–124999	29	16.2
125000–149999	13	7.3
More than 150000	28	15.6
(Missing observations)	6	3.4

biophysical, and social dimensions using principles of fairness and competence. In the summative workshop evaluation the participants agreed the spatial dimension allowed a holistic and connected understanding about green spaces, and clarified their value in urban quality of life. Also, there was the general feeling that the connected understanding was developed through a social learning process involving the combination of multiple participant perspectives. Workshop participants expressed concern about the rapid residential developments occurring around green spaces, the loss of local planning control due to the imminent municipality mergers, the lack of regulations especially along shorelines, and zoning policies that are out of touch with ecological principles. Fig. 4 shows the regions and degrees of agreement on the question of identifying areas for inter-municipality cooperation. Cooperation was taken to be mechanisms that promote sustainable management. Darker colored regions indicate stronger support for their use in cooperative management. The shoreline was identified as one of the key regions that can encourage joint preservation and management of green spaces and nature corridors as a means of integrating issues and developing stronger cooperation. The overlay map reinforces the notion of nature corridors and integrated shoreline management as tangible strategies that can result in positive inter-municipality cooperation (Fig. 4).

The semi-structured interviews revealed a general desire to improve the management and design of urban green spaces in the study area, and suggested that attitude might be important in explaining stated behavior. All the issues produced from the interview and workshop was grouped into three dimensions using affinity analysis. The first dimension was “behavior towards urban green spaces” and relates to stated behavior responses. The second dimension was “affection/feeling towards urban green spaces” and deals with the emotional attachment to urban green spaces. The third dimension was “usefulness of urban green spaces” and relates to the personal or collective worth and value of urban green spaces.

5.3. Quantitative phase

The quantitative analysis was done using the SPSS software program (SPSS, 2002). The initial set of 13 questionnaire items were analyzed for accuracy by the Churchill’s item purification method (Churchill, 1979). Items with a ‘corrected-item-total’ correlation of less than or equal to 0.3 are insignificant and removed from the items set. Thus, the items “Urban green spaces make me feel close to

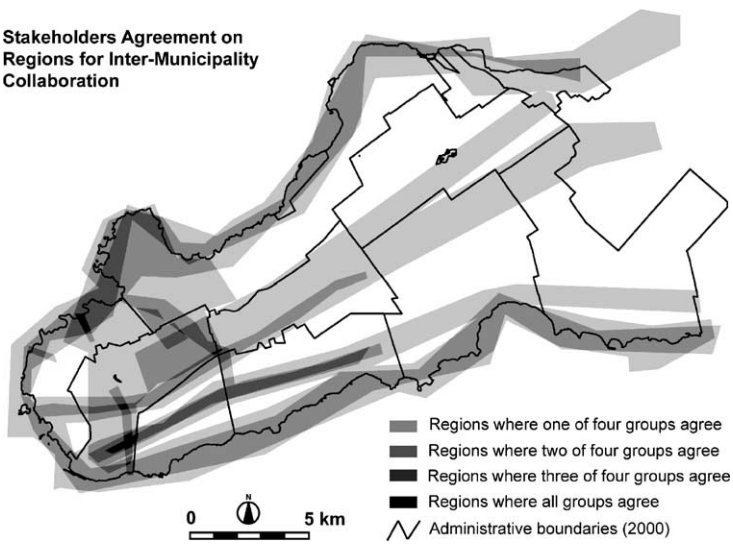

Fig. 4. Prioritized regions for inter-municipality cooperation in the West Island.

Table 3
Items retained in the factor analysis and the ratings of each question

No.	Items retained	Corrected-item-total correlation	Factor 1 loadings, behavior	Factor 2 loadings, usefulness	Rating (mean ± S.D.)
1	I would like to participate in the management of green spaces in my neighborhood	0.62	0.78		2.8 ± 1.1
2	I would pay more municipal taxes in order that the existing green spaces are protected	0.48	0.73		2.5 ± 1.2
3	I think the local history of my neighborhood should be included in the management of its green spaces	0.44	0.72		1.9 ± 1.0
4	Having easy access to information about green spaces in my neighborhood will encourage me to be more involved in its planning and management	0.49	0.64		2.5 ± 1.1
5	I would like to see green paths connecting all the green spaces across the West Island	0.44	0.55		2.1 ± 1.0
6	I use the green spaces in my neighborhood to relax	0.61		0.89	1.7 ± 0.8
7	I use the green spaces in my neighborhood for recreation	0.50		0.82	1.7 ± 0.9
8	The green spaces in my neighborhood contribute to my quality of life	0.34		0.74	1.4 ± 0.8
9	I would support keeping the existing green spaces in my neighborhood as they would increase my property value	0.34		0.48	1.7 ± 0.9

nature" and "My neighborhood has enough public green spaces" were removed. Factor analysis was applied to the remaining items to examine the attitude structures.

A strong KMO statistic (77%) and significant Bartlett test ($P = 0.000$) indicates sufficient aggregate variance to use factor analysis. Factor analysis improved validity by removing two items that loaded on multiple factors with a value of 0.4 or greater. Validity refers to the accuracy with which the scale items represent the construct being measured (De Vaus, 2002). The items removed were "Green spaces provide an inexpensive means for neighborhood recreation and relaxation" and "If I move to a new housing development, I would accept living on smaller house lots so there could be larger amounts of green spaces". Principal components analysis was the means of factor extraction and aided by the rules: remove factors with an eigenvalue less than 1, search for simplicity in factor structure, and use varimax rotation to improve factor interpretation. This resulted in nine valid items. The items show statistically significant item-total correlations and acceptable skewness, reflecting symmetry about the mean (Table 3). The respondents to items ratio of 19:1 was better than the recommended 10:1 ratio (Nunnally, 1970).

The extracted factors were named *behavior* (factor 1) and *usefulness* (factor 2) based on the themes concentrated in each factor. Factor loadings range from 0.89 to 0.48 and together they explain 58.1% of the total data variance. The questionnaire was also tested for internal consistency. The Cronbach alphas or coefficients of reliability indicate a high level of internal consistency for the factors (each of value 0.74) and the overall questionnaire (0.79). The extent to which the green spaces attitude scale is consistent with other related scales was also used as a measure of validity. A positive and significant rho (ρ) correlation of 0.20 ($P = 0.05$) between the new environmental paradigm (NEP) scale and the developed attitude scale lends to converging confidence in the results. Moreover, inter-correlations between the two attitude sub-scales of the green spaces instrument were moderate and significant.

5.4. Urban green spaces planning implications

The combination of multiple opinions within collaborative settings supports the integration of diverse perspectives and their objective rationalization towards policy and decision-making. Urban green spaces development strategies that fail to include citizen participation are a reflection of the neglect of social and environmental functions that form a context for economic activities. The method presented in this study is a mechanism to integrate diverse perspectives into the urban green spaces planning process. Through the integration, planners become more aware of the importance citizens place on the non-economic values of urban green spaces, and similarly citizens become more aware of the complex trade-off decisions planners have to consider to optimize planning benefits. While this integration might seem a source of further conflict, structured discussions based on weight-of-evidence reasoning and the use of indicators to aid decision-making are two ways to focus the collaboration process towards meaningful outcomes. Moreover, the data and policy outputs of the collaborative process add to strategies for comprehensive data collection. In the collaborative GIS workshop, joint stewardship of green spaces and other shared resources such as shorelines were identified as means to foster inter-municipality cooperation. The formal and informal sharing of technical skills and experiences, data, and the explicit spatial connectivity of green spaces were elaborated by participants as benefits that can emerge from a joint management program.

At the individual level, attitude studies allows for the complex details of the local dynamics to be incorporated in the early stages of the planning process. Aggregating citizen expectations and needs across demographic variables (such as income and age levels for example) can result in isolation and surprises. Fig. 5 shows that depending on age, urban green spaces are valued along different dimensions.

Significant percentages of respondents in the 35–49 and 50–64-year age groups show positive attitudes toward urban green spaces, with greater support for the usefulness component over the behavior component. This suggests that overall citizens recognize the overall benefits of green spaces, but are less willing to participate in actions to manage these green spaces. This highlights the fact that consideration of local scale dynamics is necessary for inclusive participation. Knowledge about the specific preferences of age groups can inform more effective education and awareness strategies about green spaces. Fig. 6 indicates strong support for urban green spaces among the CAN$ 50k–99.9k income groups. Support for the usefulness of green

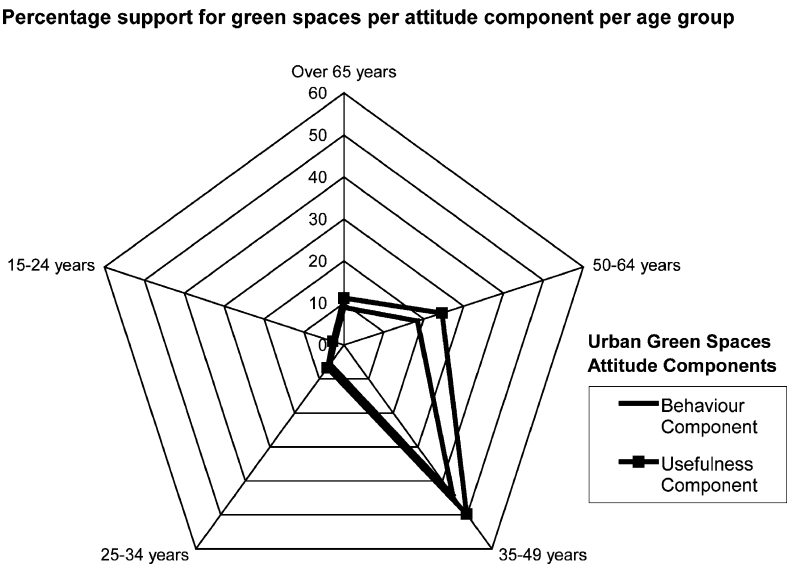

Fig. 5. Support for urban green spaces moderated by age.

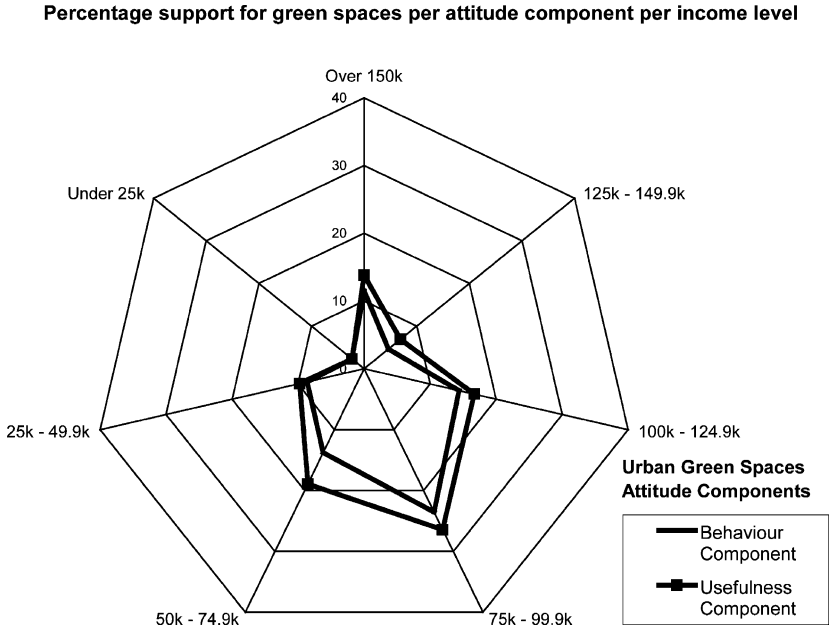

Fig. 6. Support for urban green spaces moderated by income.

spaces is again greater. This reinforces the idea that strategies to encourage participation rather than public awareness should be given greater consideration.

The survey results showed that for each question item the mean score was smaller than the central neutral rating value suggesting that citizens have an overall positive attitude towards urban green spaces (Table 3). But planners and decision makers may need to refine strategies to be more participatory so citizens concerns can be addressed early in the development process. As citizens become more aware of the role of green spaces in well-being and health, it is expected that more collaborative participation and planning will be demanded. The relationship between land value, taxes, and proximity to green spaces may also moderate citizen participation in green spaces management. A report outlining the workshop outcomes and recommendations was presented to municipal planners. Workshop participants resolved to continue the discourse and interactions under the structures of their agencies. But sweeping changes in administrative structures in the West Island in 2002 has hampered the timely feedback from urban planners.

6. Conclusion

This study has outlined a comprehensive approach to measure the concept of attitudes toward urban green spaces. The urban green spaces attitude concept was not well operationalized in previous studies. A novel multi-method approach that integrated insights from semi-structured interviews and a collaborative GIS workshop produced an objective set of connected issues. Integrating the semi-structured and collaborative GIS data-gathering activities was significant in that spatial perspectives were added into the attitude elicitation process to create opportunities for a wider range of issues to become explicit thereby improving content validity. Also, the use of interactive digital maps during the GIS process created a new awareness among the participants about the interconnections between their “home areas” and “city areas”. The affinity analysis technique categorized these issues. Factor analysis and reliability analysis produced a valid and reliable green spaces attitude measurement instrument. The multi-method approach improved the confidence in the results and provides an enhanced mechanism to incorporate public attitudes and opinions

in the planning and development of urban green spaces.

Two main findings were presented. First, a set of nine question items grouped into three factors were identified. These items form a valid and reliable instrument to measure attitudes toward urban green spaces. The outcome shows that attitude toward urban green spaces is a multi-dimensional concept. Two dimensions were supported in the quantitative phase of the analysis: "behavior" towards urban green spaces and "usefulness" of urban green spaces. The nine item instrument is likely to be more acceptable to citizens as it requires minimal time to complete. Second, the mean score for citizens in each question item were all smaller than the central neutral rating value suggesting citizens have a positive attitude towards urban green spaces. Therefore, citizens in the study area are likely to be more willing to participate in plans and policy development of community green spaces.

The developed attitude instrument provides opportunities for several further research investigations in social integration which is needed for community cohesiveness and overall quality of life. Associations of green spaces location, demographic characteristics, and user attitudes can be fused to provide an indication of the social integration potential of these areas. In theoretical and applied research, scale and its implications have always been controversial and unresolved. Also, insights about the extent to which aggregate measures are a true representation of individual measures can be explored by comparing data from household surveys with aggregate ecological data from census surveys. In this context, household sample surveys can be used to identify variables that correlate with urban green spaces attitudes, and to establish predictor variables for behavior types. The validity of the results from this line of research is dependent on a valid and reliable measurement of attitude.

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