The Urban Parks and Rivers Contribute to the Citizen Satisfaction and Utilization in Uijeongbu City

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ABSTRACT

This research aimed at measuring Park and Green Satisfaction (PGS) using subjective indicators of 'surface, line and spot' green evaluated by citizens. Also frequency of visits to park and green measured using objective indicators (number of visits) to find the relationship with PGS. A conceptual model of PGS was developed to relate evaluation to satisfaction and finally to utilization of open spaces.

A sample of 500 questionnaire survey was employed for Uijeongbu City in Korea. A Structual Equation Modeling (AMOS) techniques was used to test the hypothesized relationship among factors (construct).

As a result, first, PGS was explained by three latent factors of 'urban park' (γ =0.54), 'linear facilities' (γ =0.25), and 'surface green' (γ =0.15) respectively. These three exogenous construct was found very useful classification system for open spaces of cities. Second, PGS (γ =0.34) was found as a mediating variable to utilization of open spaces and also PGS was closely related to citizens Environmental Quality Satisfaction (EQS), such concept as, 'livability' and 'aesthetic quality'. The more satisfied with park and green the more people use the space. The PGS was an important QOL indicator together with the subjective indicator of 'livability'. Third, jogging and walking trails and bike ways along the river corridor was the most important green facilities contribute to the PGS and EQS. The near the distance (within 500m) the more number of visit to river corridor (green way). The river corridor promote accessibility to nature and other parks.

Key Words: Satisfaction Model, Livability, Quality of Life, Open Space, Frequency of Use

Ⅰ. Introduction

In 2005 Korean Government enforced the Act on Urban Parks, Greenbelts, etc. According to the act and regulation the citizen's survey on open spaces was a requirement for the formulation of Basic (Comprehensive) Plan for Park Green Area. This institutional system of planning enable the planner to propose a comprehensive green plan which is suitable to local conditions and needs of people, and which contains the matters concerning the supply of, and demand for, Park Green areas (article 6(1): 5).

The definition (article 2) of the terms used in this Act shall be as follows: The term 'Park Green area' means a space or facility falling under any of the following items, which are used to create a pleasant urban environment and to foster residents' sense of restfulness and peace: (a) Urban parks, greenbelts, amusement parks, public vacant land, and reservoirs; (b) Urban natural park areas; (c) Spaces in which vegetation such as trees, lawn and flowers, ground cover, etc., (hereinafter referred to as 'vegetation'), grow; and (d) Other spaces and facilities which are used to create a pleasant urban environment and to foster residents' feelings of restfulness and peace and as prescribed by Ordinance of the Ministry of Land, Transport, and Maritime Affairs.

The city of Uijeongbu, surrounded by forested mountains and penetrated by rivers like many other cities of Korea, is

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preparing the Basic Plan for Park Green Area. The citizens's survey on open spaces was made with a sample of 500 questionnaires. The data on perception, evaluation and satisfaction with open spaces was gathered and subjected to more theoretical analysis. How people perceive, evaluate, and use parks and greens is the focus of open space issues.

The satisfaction model developed by Marans and Rodgers (1975) and Marans (2003) based on psychological theories of attitude and behavior, and have been contributed mainly to the domain of residential satisfaction, neighborhood satisfaction, environmental quality and QOL studies. Many studies extended the model to the domain of Park and Green Satisfaction (PGS). However most studies on PGS (Kim and Kim, 1989; Park, 1991; Huh, 1999; Kim, 2005; Shim *et al.*, 2010) put PGS as a final dependant variables, and few Korean studies have extended the domain from PGS to Quality of Environment Satisfaction (EQS) or QOL.

This research aimed to test the hypothesis that the frequency of use to open spaces is influenced by overall PGS and that the PGS is influenced by Park Green Evaluation (PGE).

II. Literature Reviews

1. The Satisfaction Model

The early models of satisfaction were mostly residential satisfaction models measured by post occupancy evaluation. Marans and Sprekelmeyer (1981), Weidemann and Anderson (1985), Kim (1988), Chin (1990), Kim (1997) developed useful conceptual model to understand the relationship between objective environment to subjective satisfaction in residential environment.

The basic conceptual framework is presented in Figure 1. This framework explicitly recognizes the physical environment by indicating that objective attributes of the particular environment have an influence upon a person's satisfaction through the person's perceptions and assessments of those environmental attributes. In addition, this model recognizes another element of the trilogy-behavior. It states that a person's behavior is influenced by satisfaction, the perceptions and assessments of the objective environmental attributes, and the objective attributes of the environment itself. Satisfaction can be seen to serve either as a criterion for evaluating the quality of the residential environment or as a predictor (Weideman

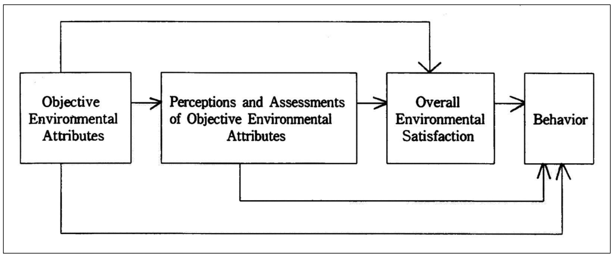

Figure 1. Basic conceptual model of residential satisfaction
Data: Marans and Spreckelmeyer, 1981: 122.

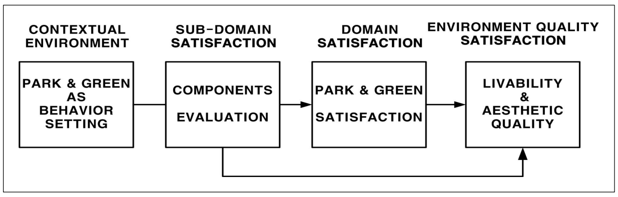

Figure 2. Conceptual model of park and green satisfaction
Data: Kim *et al.*, 2010: 66.

and Anderson, 1985).

Kim *et al.* (2010) developed a conceptual model of PGS which was borrowed from Maran's Model (2003) showing residential domain satisfaction and overall quality of life experience. In the Figure 2 the domain of PGS and domain of EQS are included as final dependent variables. In this model, PGS was influenced by evaluation of parks and greens facilities and finally EQS was affected by PGS.

However Kim (2010)'s PGS Model have limitation which could not explain behavior as a sequential process of satisfaction. Integrating behavior in the study is a big progress ,but not a easy work because of the discrepancy between attitude and behavior. One of the best documented and most discussed issues in the literature dealing with attitude is the finding that attitude often do not directly predict behavior. Fishbein and Ajzen (1975) referred to as 'behavioral intention' to diminish this attitude-behavior discrepancy.

Figure 3 shows our hypothetical or conceptual model which was designed to measure frequency of use-*behavior* which was affected by PGS-*attitude*.

In the proposed PGS and Utilization Model two domain satisfactions which are positioned in the middle can be used ei- ther as a criterion for evaluating the quality of the open space or as a predictor of behavior. In this study three steps of Evaluation-Satisfaction-Behavior are subject to the analysis by Structural Equation Modelling (SEM) technique.

2. Urban Parks

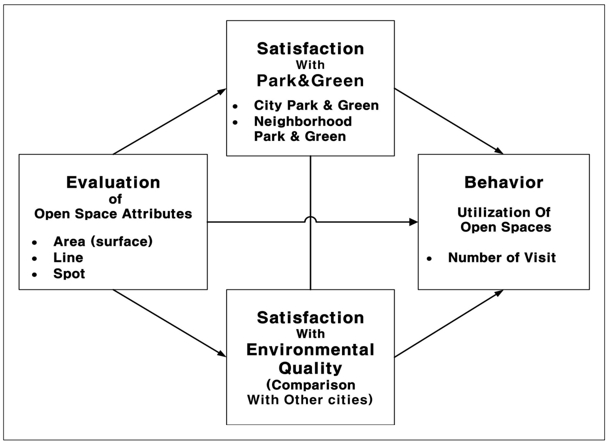

Figure 3. Conceptual model of PGS and utilization

Many Korea research have explored the evaluation and satisfaction studies on open space quality, and found main reasons of park and green satisfaction mostly in community or city level (Kim, 1995; An, 1999; Lee, 2000; Mun, 2001; Park and Kim, 2003; Shim *et al*., 2010; Jung, 2009; Jun, 2010).

It is strongly believed that developing more sustainable cities is not just about improving the abiotic and biotic aspects of urban life, it is also about the social aspects of city life, that is, among others, about people's satisfaction, experiences and perceptions of the quality of their everyday environments (Beer, 1990).

A research (Pharr, 2001) on the Arigona citizen's community satisfaction implied that parks and recreation amenities influenced individual's community satisfaction.

Park (1991) investigated factors and variables which have significant effect on user's satisfaction with recreational activities at Daeshin Natural Park in Pusan city. The static open space, linear walking facilities and recreation facilities are sources of satisfaction.

Park *et al*. (2007)studied relationship between various green space infrastructure and the level of satisfaction of residents with their green spaces of three cities (Gwacheon, Uiwang, and Hannam). Park suggests that the locations and accessibilities to green space and park are more important factor for satisfaction than amount of green spaces.

In many urban parks research report that people use park for nature contact (Özgüner and Kendle, 2006), recreation (Owens, 1997; Oguz, 2000) and perceived accessibility to parks are important (Jim and Chen, 2006).

Chiesura (2004) found people's motives for urban nature and its importance for people's general well being. The research results confirm that the experience of nature in urban environment is source of positive feelings and beneficial services.

In Korea many studies concentrated on the issues of satisfaction with parks and user behavior of that parks (Kim and Kim, 1989; Hur, 1999; Lim, 2001; Lee, 2001; Kim, 2004; Kim, 2005; Kong; 2008; Ju, 2008). However they study satisfaction and behavior respectively without close relationship between them. Therefore in this studied the relationship between the level of satisfaction and frequency of use will be explored through the proposed conceptual model.

3. River Corridor as a Greenway

In many urban areas planners are working to develop systems of greenways-linear open spaces along natural or artificial corridors, such as river fronts, streams, ridge lines, abandoned railroad right-of-ways, canals, or scenic roads. Many greenways include trails for active recreational use, including walking, running, bicycling, and skating (Lindesey, 1999).

Greenways are linear open spaces that could perform ecological and social functions such as maintaining biological diversity, protecting water resources and promoting recreational and social cohesion, all by providing the crucial connectivity among green urban areas and other remnant vegetation patches across a landscape (Frischenbruder and Pellegrino, 2006; Quayle, 1995). And most people used greenway trails for recreation but that trails differed in user types and activities based on location and policy. Users felt that these urban greenway trails were contributing most to community quality of life through resident health/fitness, the natural areas they provide, better land use and resident pride(Shafer *et al*., 2000).

Many researches confirmed that greenway must have accessibility in urban and ecological network(Von Haaren and Reich, 2006), walking network(Toccolini *et al*., 2006), connectivity in urban(Taylor *et al*., 1995), waking trail's convenience (Gobster, 1995; Lindesey, 1999; Tan, 2006).

Gobster (1996) found that trail location relative to home strongly influenced how a greenway trail was used, who used it, how often it was used, and other factors, and he concluded that local rather than regional trails should form the basic framework of a metropolitan system. He also concluded that more research was needed to understand how the location, design, and management of metropolitan trails affect use patterns, perceptions, and preferences (Marcus and Francis, 1998).

4. Distance of Access and Frequency of Use

Several studies have shown that proximity to green space and parks is one of the most important predictors of use of green apace (Björk *et al*., 2008; Giles-Corti *et al*., 2005; Nielsen and Hansen, 2007; Coles and Bussey, 2000). Schipperijn *et al*.(2010a) found that If the nearest urban green space also is the most used green space, having a dog is the only factor that significantly increases the frequency of use. Further research is needed to determine what it is that makes people use an area more, if the basic conditions of a reasonable size (>5ha) within a reasonable distance (<600m) are fulfilled.

Convenience of woodland location is critical in achieving maximum social value, where woodlands should ideally be located within 5~10 min walk of the home, be of suitable size to create a woodland environment (minimum of 2ha) and have an open space structure (Coles and Bussey, 2000).

In Korea Kwon and Kim (1993) studied the enticing area according to the catchment of urban community parks. They found that the catchment distances from parks differ from city to city as follows: 359~392m for Cheongju city, 419~480m for Suwon city, 509m for Cheonan city and 210~620m for Seoul city as findings for good used zone for parks ; 210~270m, 320~340m, 300m, and 180~320m as findings for closed zone for parks. They concluded that the criteria for catchment distance should be less than 400m.

A distance of 300~400m is near as a typical threshold value of after which the use frequency start to decline (Nielson and Hanson, 2007). The accessibility right to open space within 300m distance and minimum 2ha size should be a criteria in England (Harrison *et al*., 1995). European Environment Agency (EEA) recommended that parks and open spaces should ideally be accessible within 15 min. walk and 900~1,000m distance from the home (Stanners and Bourdeau, 1995). Public Health Office Copenhagen (2006) adopted a strategic plan that enable 90% of the population should be accessible to green space within 400m by 2015.

Schipperijn *et al*. (2010b) made research progress based on data from a nationwide study of 11,238 randomly selected adult. Results show that 66.9% of the respondents live within 300m of green space, 43.0% visit green space every day and 91.5% visit green space at least once a week. Only 0.9% never visit green space. To enjoy the weather and get fresh air is the most important reason for visiting green space for 87.2% of the respondents. Distance to green space is not a limiting factor for the majority of the Danish population and for that reason we recommend a thorough analysis of a neighbourhood or city, its population, and the available green spaces, before deciding on a viable strategy to increase the use of green space.

III. Research Method

1. The Study Area

Uijeongbu city is a mountainous and fortress city in the Northern region of Gyeonggi province. Jungrang River running through the center part of the city from north and south, Mt. Surak is standing on the eastern part and Mt. Dobong is on the western part of the city. The total area of the city is 81.59km^2.

Uijeongbu municipal parks are 346 milion m^2(142 spaces) and amount of green area per person is 8.22m^2/person.

2. Data

1) Survey Instrument

A questionnaire was developed as the survey instrument. Development of the measurement items and scale for each construct in the model proceeded through a series of steps.

A review of the relevant literature was first conducted to identify available items. The original questionnaire used for comprehensive park and green plan have more extensive items than this present measurement scales as shown in Table 1. Second, the orignal questionnaire items are reduced for our research purpose: three steps of Evaluation, Satisfaction and finally Behavior. The items were measured on a five point Likert's scale with anchors ranging from very satisfied (5) to very dissatisfied (1) or very good (5) to very bad (1) in order to ensure high statistical variability among survey response. The final survey instrument that was judged to exhibit high content validity.

2) Sample

The subject of this study are the citizens of Uijeongbu City. Empirical data was obtained through random citizens survey, most of whom (70%) live in apartment housing and 20% in detached house. The sample was selected by stratified ran-

Figure 4. Site map

dom sampling method. A total of 500 questionnaire was collected from six urban district in proportion to their housing type and socio-economic character.

3. Data Analysis

First, In order to achieve the research objectives, SEM techniques was performed.

Data analysis was performed in three stages. In the first stage, exploratory factor analysis (EFA) was conducted using SPSS Ver 15.0 (SPSS Inc., 2007) to evaluate the stability and consistency for measured items. In the second stage, formulation of measurement models for each variable involved using AMOS Ver 18.0 (SPSS Inc., 2009) to conduct confirmatory factor analysis (CFA) for each set of items. In the third stage, the evaluation of goodness-of-fit indices for the proposed structural equation model and testifying hypotheses were performed by using Analysis of Moment Structure.

Second, The relationship between PGS and Utilization was analyzed by two accessibility distance groups of inside 500m and outside 500m. To analyze the differences in frequency of use between two distance groups, t-test was performed to compare them.

Ⅳ. Result and Discussion

1. Park and Green Satisfaction Model

1) Exploratory Factor Analysis of PGE

An exploratory factor analysis (EFA) was executed by maximum likelihood extraction method, with varimax rotation. In order to decide the number of factors to be extracted and rotated in the Parks and Greens Evaluation three methods were used: (1) A cut point of 0.4 and no significant cross loading criteria, and (2) Consideration of Eigenvalue magnitude and discontinuity (Eigenvalue>1), (3) Reliability analysis allows Cronbach's α>0.60(social science) (Hair *et al.* 1998).

As Table 2 indicates, EFA results of the Urban Parks and Greens Evaluation suggest a clean five-factor solution corresponding to factor 1 'PGS', factor 2 'Linear Facilities', factor 3 'Urban Greens', factor 4 'Urban Parks', and factor 5 'EQS' (with item loading>0.40 and small cross loading). The total variance explained by the five factors is 63.5%, all factor Cronbach's Coefficient Alpha was more than the value 0.60. Then, a five-factor model with all indicators of these five constructs and conceptual model of Parks and Greens Satisfaction was estimated using confirmatory factor analyses (CFA).

Table 1. The survey items and construct measurement

Construct	Item measurement in questionnaire
PGE	- How do you satisfied with *following green facilities* or *green area* considering amount of green and use of green facilities where you live? Spot green: 5 items (shown in Table 2) Linear green: 5 items (shown in Table 2) Surface green: 5 items ((shown in Table 2)
PGS	- City level overall PGS: Judging from comprehensive view, How do you satisfied or dissatisfied with overall parks and greens in your city? - Neighborhood level PGS: considering scale of park, maintenance, program and aesthetics quality, How do you satisfied with park and green you frequently visit? - Amount of greens in city: How do you think about the amount of green in your city comparing to other cities? - Amount of greens in neighborhood: How do you think about the amount of green in 10~15 min walk from your home?
EQS	- Livability: How do you think about the livability of your city comparing to other cities in metropolitan area? - Aesthetic quality: How do you think about overall city scape of your city comparing to other cities in metropolitan area?
User Behavior	- Number of visit to neighborhood park /Jik-dong, Chu-dong park,/ children's park, /riverside bike way and trail,/ mountain forest and trail, /school and public facilities, /cultural facilities,/ physical exercise and recreation facilities

2) Confirmatory Factor Analyses

The confirmatory factor analysis was completed with maximum likelihood estimation. The measurement model offered an acceptable fit to the data. For this uses and gratifications measurement model, the Goodness-of-Fit (GFI), Adjusted Goodness-of-Fit (AGFI), Root Mean square Residual (RMR), Normed Fit Index (NFI) and Turker-Lewis Index (TLI) were 0.91, 0.88, 0.06, 0.88 and 0.90 respectively, therefore indicating an adequate model fit.

Item factor loadings and squared multiple correlation from confirmatory factor analysis completed on the data collected in parks and greens evaluation is shown in Table 3.

Table 4 shows the correlations between the latent variables and the Average Variance Extracted (AVE) of each construct is shown on the diagonal. Fornell and Lacker (1981) prescribe that the squared correlation between constructs must be less than the AVE of each underlying construct in order for the constructs to have discriminant validity. Fornell and Lacker (1981) also suggest that convergent validity exists when item factor loadings are greater than 0.7 and item squared multiple correlations are greater than 0.5. But 'utilization' factor's reliability is lower than 0.5 in Table 4. For this reason, five constructs could not explain utilization sufficiently.

It is necessary to discuss more on this issues of convergent validity. Convergent validity does not exist when item factor loadings are smaller than 0.7 and item squared multiple correlations are lower than 0.5. In this study factor loadings are low (0.61~0.69) and variance extracted is low (0.30). However theoretical issues are emerging to explain this discrepancy between subjective construct (evaluation and satisfaction) and objective construct (frequency of use). The

Table 2. Exploratory factor analysis of PGE and PGS

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Amount of greens in neighborhood	0.82	0.11	0.09	-0.01	0.01
Amount of greens in city	0.77	0.15	0.14	0.23	0.06
Neighborhood level PGS	0.67	0.16	0.13	0.06	0.29
City level overall PGS	0.54	0.36	0.27	0.26	0.32
Road and street green	0.48	0.06	0.23	0.44	0.23
River / riverside green	0.40	0.37	0.28	0.22	0.17
Jogging and walking way	0.20	0.79	0.11	0.20	0.09
Bike way	0.16	0.79	0.08	0.28	0.05
Pedestrian mall	0.20	0.77	0.16	0.22	0.04
Mountain forest / trail	0.02	0.53	0.52	-0.03	0.17
Commercial area green	0.16	0.06	0.78	0.11	0.06
Industrial area green	0.17	0.09	0.71	0.40	0.04
Farm land and greenbelt area	0.06	0.41	0.63	-0.05	0.11
School / public facilities	0.21	0.07	0.63	0.36	-0.03
Residential (Apt.) green	0.22	0.12	0.50	0.38	0.13
Cultural facilities	0.02	0.28	0.12	0.73	0.12
Physical exercise facilities	0.07	0.46	0.16	0.64	0.08
Neighborhood park	0.49	0.13	0.21	0.57	0.19
Children's park	0.32	0.19	0.33	0.56	0.10
Livability	0.16	0.08	-0.04	0.16	0.82
Aesthetic Quality	0.18	0.11	0.22	0.10	0.79
Eigenvalue	3.04	3.01	2.95	2.62	1.72
Total variance (%)	14.48	14.31	14.05	12.46	8.19
Cumulative variance	14.48	28.80	42.84	55.30	63.49

Table 3. Confirmatory factor analysis and convergent validity

Construct	Variable			
	Variance	Standard Loading	Reli-ability	AVE
PGS	City level overall PGS	0.85	0.76	0.51
	Neighborhood level PGS	0.64		
	Amount of greens in city	0.67		
Urban Park (Spot Type)	Neighborhood park	0.82	0.74	0.59
	Children park	0.78		
Linear Facilities (Linear Type)	Jogging and walking way	0.82	0.82	0.60
	Bike way	0.80		
	Pedestrian mall	0.82		
Urban Green (Surface Type)	Industrial area green	0.65	0.81	0.52
	Commercial area green	0.84		
	School & public facilities	0.73		
	Residential(Apt.) green	0.62		
EQS	Livability	0.79	0.76	0.61
	Aesthetic quality	0.62		

Table 4. Correlation matrix of factors

Construct	Urban Park	Linear Facility	Urban Green	PGS	EQS	Utilization
Urban Park	(0.59)	-	-	-	-	-
Linear Facility	0.58	(0.60)	-	-	-	-
Urban Green	0.69	0.50	(0.52)	-	-	-
PGS	0.79	0.64	0.64	(0.51)	-	-
EQS	0.51	0.37	0.41	0.66	(0.61)	-
Utilization	0.29	0.23	0.35	0.32	0.20	(0.30)

Correlation coefficients are significant at p=0.05 level
( ): The average variance extracted(AVE) of each construct is shown on the diagonal

most discussed issues in attitude is that attitudes often do not directly predict behavior. Therefore the low value of variance extracted can not be a serious problem for utilization factor.

On the basis of these results, this study summed the scores on the items of each construct. The mean, standard deviations, and correlation matrix are shown in Table 4.

3) The Overall Model Fit and the Test of Each Research Hypotheses

The following are the overall model fit and tests of each research hypotheses. As shown, the results of the full model (structural and measurement models) indicated fit indices: χ^2 =2.76, degree of freedom=201, provability level=0.000, GFI =0.904, AGFI=0.880, RMR=0.066, NFI=0.876, TLI=0.904, CFI=0.917. The adequacy of the structural equation models was evaluated on the criteria of overall fit with the data.

The effect of Urban Park on PGS was significant (standardized estimate γ =0.54, $p<0.01$). The effect of Linear Facilities on PGS was significant(γ =0.25, $p<0.01$), The effect of Urban Greens on PGS was significant(γ =0.15, $p<0.05$). These results showed that the effect of Urban Parks on PGS is very influent and Linear Facilities is the second factor effecting on PGS. In sum, Urban Parks, Linear Facilities, Urban Greens was positively related to PGS.

The effect of PGS on Utilization was significant(γ =0.34 , $p<0.01$). The results thus demonstrate that PGS is a predictor of Behavior(Utilization).

Finally, It is concluded that the latent construct of 'Urban Park', 'Linear Facilities', and 'Urban Green' are indirectly influencing on the frequency of use through the intervening variable of PGS.

2. The Reasons for Satisfaction

In PGS&Utilization Model for Uijeongbu City, PGS is well explained by the 'Spot', 'Linear', and 'Surface' green system and the intervening variable PGS become a predictor of EQS. The more people satisfied with parks and greens the better people think about the urban quality and the more frequently visit the open spaces.

This results are more or less the same with the case of Anyang City researched by Kim *et al.* (2010) in a way that, first the classification of open spaces of a city as spot, line and surface green can be generally acceptable, second, PGS seems to be a predictor of EQS in both cities of Uijeongbu and Anyang.

Generally, PGS and Utilization Model explain the causal relationships among constructs. However the environment characteristic and personal characteristic mentioned in Marans's conceptual model (1976; 2003) are not included in the model. To overcome this kinds of deficiency and to find out basic sources of PGS, a regression model is proposed to include all personal and environmental characteristic variables (dummy).

Table 5 shows the result of regression analysis that includes subjective indicators and objective indicators in the PGS regression model. The regression analysis shows more

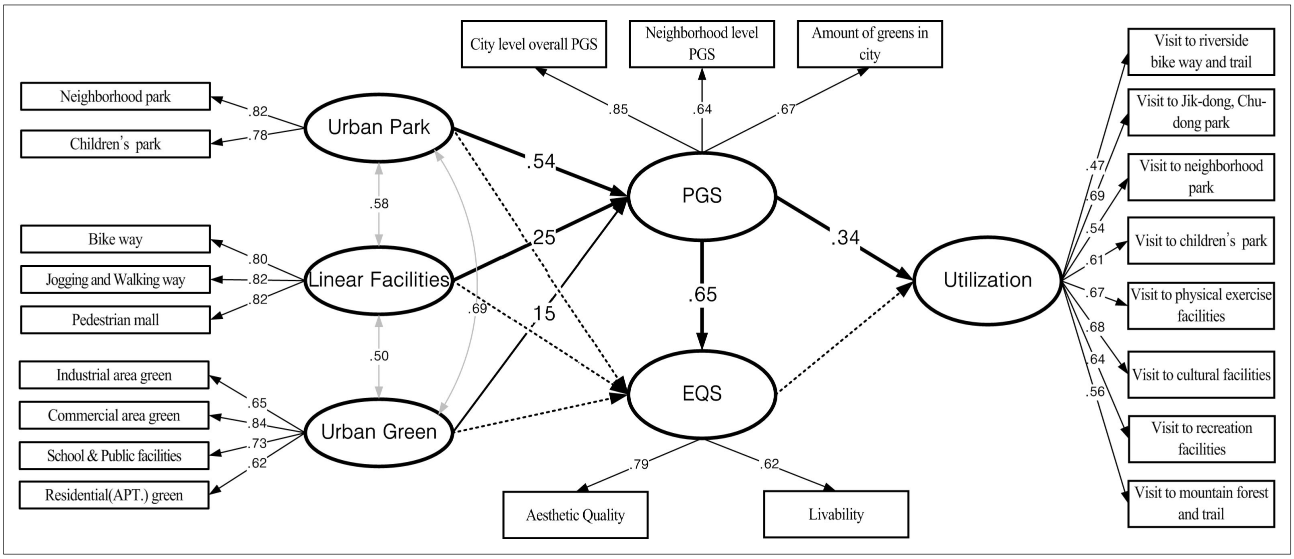

Figure 5. Model of PGS and utilization

Legend: ——— $p<0.01$, ——— $p<0.05$, ------- not significant

Table 5. Predictors of PGS (regression analysis)**

Variable	Simple R	Std. coeff.	Adj. R^2
Neighborhood level PGS	0.55	0.25	0.30
Jogging and walking way	0.52	0.21	0.45
Aesthetic Quality	0.47	0.18	0.51
Neighborhood park	0.55	0.09	0.55
School & public facilities	0.44	0.11	0.56
Amount of greens of overall	0.54	0.14	0.58
Farm land and greenbelt area	0.39	0.08	0.58
Demand for urban nature park	0.11	0.08	0.59
Children's park	0.52	0.10	0.59
Purpose of visit-walking*	0.09	0.08	0.60
Improve image-traffic*	-0.02	-0.07	0.60
Frequency of visit (urban park)	0.24	0.06	0.60

*: Dummy variable.
**: Missing value used is mean, value in the analysis(n=500), significant level of F changes at p=0.05

specific reasons of PGS than does the AMOS.

The result of regression analysis are as follows:

1) The more people satisfied with neighborhood park & green that means good accessibility to nearby greens the better thinks of the livability of the city. Jim and Chen (2006) support our results of this study.
2) PGS is well explained by variables of 'satisfaction with the cityscape' and 'amount of green space in the city.' This means that aesthetic and quantitative quality of open spaces contributes to the PGS.
3) Jogging and walking facilities, neighborhood park, school and public greens are the sources of PGS, Therefore more facilities and program should be provided.
4) The farmland and mountain woodland in green belt zone increase the level of satisfaction and meet the desire for contact with nature (Özgüner and Kendle, 2006).
5) The citizens whose purpose is walking in visiting open space are more satisfied, and who wants to improve accessibility condition seems to be dissatisfied.

3. The Role of River Corridor and Parks

1) The Role of Rivers and Parks for QOL

The PGS and Utilization Model (Refer to Figure 5) indicated that the effect of 'linear green' on use PGS was significant (γ = 0.25 , p<0.01). The latent variable of 'linear green' are measured by 'jogging and walking way' (standardized estimate: 0.82), 'bike trail' (standardized estimate: 0.80), 'pedestrian road' (standardized estimate: 0.82).

Gobster (1995) and Shafer *et al.* (2000) found same conclusion that PGS ultimately include the QOL concept. The stream corridor provide opportunity for jogging, walking & biking (Frischenbruder and pellegrino, 2006; Quayle, 1995) to increase EQS and ultimately well-being and healthy life.

The latent construct 'EQS' was made two measured variables of 'livability compared with other cities' and 'satisfaction with cityscape compared with other cities' If we assume 'the standard of comparison' as an individual belief or perception in everyday life, this will effect on the evaluation process of an individual person, then effect on PGS of a person. The role of the EQS in the model can be seen as a *dependant variable* or a '*standard of comparison*' as noted in Marans's Model (1976). Rapoport (1977) defined this as 'Filters' and 'Match'.

Beyond the discussion of positioning of EQS in the model the effect of PGS on EQS was significant, thus parks and greens contribute to increasing QOL in urban environment. The role of river corridor (green) in urban area is proved to be an important factor that enhance environmental quality: First, the river green have significant influence on PGS, on EQS and finally on QOL. Second, walking, jogging and bike way functions as a green spine or pedestrian spine of the city which promote accessibility to and utilization of open spaces.

2) Evaluation, Satisfaction and Frequency of Use

In Table 6, The measurement variables of linear facilities, such as bikeway, jogging and walking trail scored high (average value) in evaluation of each items. The reason for high evaluation score due to good accessibility and good networking and connectivity to the inner city area along the main rivers of Jungrang and Booyoung (Von Haaren and Reich, 2006; Toccolini *et al.*, 2006; Taylor *et al.*, 1995).

The relationship between evaluation score of linear facilities and number of visit is expected to prove that people merits convenience of green corridor for the purpose of moving and leisure walking (Gobster, 1995; Lindesey, 1999; Tan, 2006). However correlation coefficient between them proved to be low (Refer to Table 6): jogging and walking trail (γ =0.29), bike way (γ =0.29), pedestrian road (mall) (γ =0.23). This kinds of discrepancy between attitude and behavior is common and well documented in social psychology literatures, however this a limitation of our model which is designed to relate satisfaction with open spaces to number of visit to open spaces.

Table 6. The number visit by facility by frequency of use (Unit: %)

Use Facility	Frequency of Use					PGE Mean	Correlation
	Every day	1~2/ Week	1~2/ Month	1~2/ Year	Not use		
Neighborhood park	13	38	26	9	14	2.9	0.19[a] (0.23)[b]
Urban park	3	20	29	19	28	2.9	0.21 (0.23)
Children's park	3	13	19	19	46	2.6	0.23 (N.A.)
River green	16	35	24	10	15	2.9	0.21 (0.23)
Bikeway	16	35	24	10	14	3.2	0.26 (0.29)
Pedestrian road	16	35	24	10	15	3.0	0.19 (0.24)
Jogging/ waking facilities	16	35	24	10	14	3.3	0.30 (0.29)
Woodland	6	29	32	20	14	3.2	0.20 (0.20)
Physical acivity facilities	7	20	26	16	30	2.9	0.18 (N.A.)
Cultural facilities	2	10	29	37	22	3.0	0.24 (N.A.)
Recreation facilities	3	15	21	25	36	2.8	0.21 (N.A.)

[a]: Correlation between frequency of use and PGE.
[b]: Correlation between frequency of use and PGE for user group of preferred facilities.

As shown in Figure 6, the frequency of use for river corridor differ significantly between age groups: 68% of teenager, 48% of 30~39 years age group and 56% of 50 years or more age group use the river way every day or at least once-twice per week. This percentages of use are quite high comparing other facilities, such as parks and woodland.

3) Frequency of Use by Distance

Many studies confirmed that distance is the most important factor effecting utilization of open space, the more the distance the more frequently visit the park on outdoor recreation facilities. To measure the accessibility by distance the survey samples divided into two groups by accessibility distance from home. The samples who live within 500m from neighborhood parks, riverside access point, mountain side access point are selected as a good accessibility group, and who live outside 500m zone as poor accessibility group.

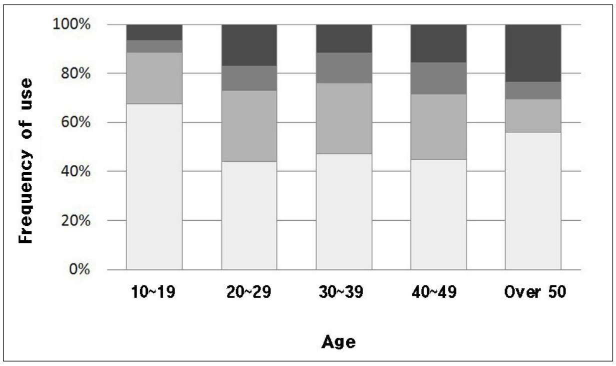

Figure 6. The number of visit by age for river corridor (%)
Legend: Everyday or 1-2/week 1~2/month 1~2/year non use

Table 7. The difference in numbers of visit among river, park and mountain green (mean score of total sample)

Green Facilities	Inside 500m	Outside 500m	*T*-test		
			t-value	*df*	Sig.
River corridor	3.56 (1.14) n=224	3.01 (1.34) n=271	4.85	492	0.00
Neighborhood	3.31 (1.16) n=192	3.29 (1.26) n=306	0.18	496	0.86
Mountain & woodland	3.00 (1.14) n=275	2.75 (1.13) n=219	2.44	492	0.02

Table 7 shows the differences in number of visit between user groups. The figures in the table are mean score measured by Likert scale: ① everyday=5, ② 1~2/week=4, ③ 1~2/month=3, ④ 1~2/year=4, ⑤ not use=1. As a result, riverside user group who live within 500m visit the riverside 1~2 time per week or month, and who live outside 500m visit the river 1~2 times a month. The mountain side user group showed considerable difference ($p<0.05$). The park user group showed no difference between distance groups ($p=0.86$).

Table 8 shows the difference in number of visit by user group who seems to prefer most for one specific space. The figures in the table are mean score measured by Likert scale: ① everyday=5, ② 1~2/week=4, ③ 1~2/month=3, ④ 1~2/year=4, ⑤ not use=1. The result of this analysis is more solid to measure accessibility to park, river and mountain green. As a result, The river prefer user group ($p<0.00$), and neighborhood park preferred user group ($p=0.02$) who live within 500m are much more satisfied than average persons.

The mountain preferred user group who live outside 500m (78% of total group) visit the mountain 1~2 times a month, and who live inside 500m showed same number of visit to

Table 8. The difference in numbers of visit among river, park and mountain preferred user groups (mean score of groups who prefer most for one specific space)

User Group	Inside 500m	Outside 500m	*T*-test		
			t-value	*df*	Sig.
River corridor user	3.93(0.92) n=83	3.16(1.27) n=237	5.92	196	0.00
Neighborhood park user	3.74(0.71) n=34	3.39(1.15) n=284	2.49	56	0.02
Mountain & woodland user	3.19(1.09) n=69	2.99(1.03) n=245	1.41	312	0.16

moutain side woodland. Only 25% of inside 500m group visit the mountain frequently impling some constraints. This means that the accessibility conditions to mountain are poor and the access points are limited.

This is true that location of parks around home vicinity zone increases the frequency of use in general, and this means that distance is a most effecting factor on the utilization of park and open space (Björk *et al*., 2008; Giles-Cortib *et al*., 2005; Nielsen and Hansen, 2007; Coles and Bussey, 2000).

Catchment distance of 500m from home was used in this study to meet the requirement guided by planning regulation from the Urban Park Act. Different researchers and different nations proposed their own criteria or objectives : Kwon and Kim (1993) indicated 400m for good use zone in Korea, Coles and Bussey (2000) and Harrison *et al*. (1995) indicated 300m, Schipperijn *et al*. (2010a) indicated 600m as a maximum distance.

Figure 7 hows the frequency of use by distance for river and park user. 50% of river user visit the river corridor almost everyday or at least 1~2 times per week. 60% of river user who live within 500m and 40% of river user who live outside 500m visit the park more than 1~2 times a week. On the contrally 40% of mountain user and 30% of park user visit the parks almost everyday or at least 1~2 times a week. The mountain sides are so poor in accessibility compared to riversides that the frequencies of use are low.

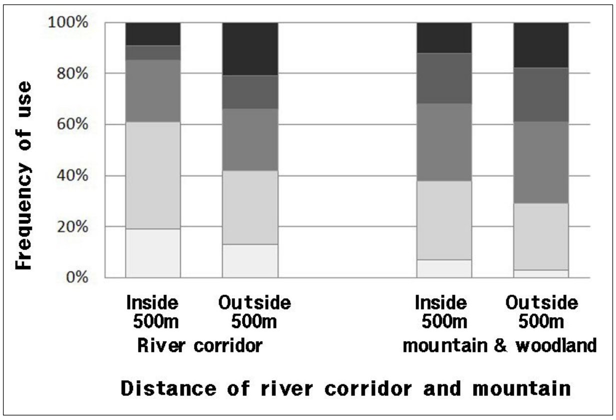

Figure 7. Frequency of use by distance of river corridor and mountain woodland
Legend: Everyday or 1~2/week 1~2/month 1~2/year non use

V. Conclusions

This research aimed at measuring PGS using subjective in dicators of 'surface, line and spot' green evaluated by citizens. Also frequency of visits to park and green measured using objective indicators (number of visits) to find the relationship with PGS. A conceptual model of PGS was developed to relate PGE to PGS and finally to Utilization of open spaces. A structural equation modeling techniques was used to test the hypothesized relationship among factors.

As a result, first, PGS was explained by three factors of 'urban park' (γ=0.54), 'linear facilities' (γ=0.25), and 'surface green' (γ=0.15) respectively. These three latent construct was found very useful classification system for open spaces of cities. This means that people perceive attributes of open space as a system with elements of 'point, line, and surface', and citizens' visual and imaginary cognition of the city greens enable them to live in a city more easily.

Second, The effect of 'urban park', 'linear facilities' and 'surface green' on PGS were significant. This means that the roles 'park' and 'linear facilities' are so important that it is beneficial to the health and well being of citizens. PGS(γ=0.34) was found as a mediating variable to utilization of open spaces. And also PGS was closely related to citizens Quality of Life, such concept as, 'livability' and 'aesthetic quality'. This means that the greater citizens PGS the more people think the city livable and the more people feel happiness. The PGS was an important QOL indicator together with the subjective indicator of 'livability'.

Third, jogging and walking trails and bike ways along the river corridor was the most important green facilities contribute to the PGS and QOL. The near the distance (within 500m) the more number of visit to river corridor. The river corridor as a symbolic green spine of the city promote accessibility to nature and other parks. One important environmental character of the city is that it has two beautiful rivers running through the city and recovering of these rivers as green and health corridor proved to be very successful and well utilized by citizens.

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