



HOKKAIDO UNIVERSITY

Title	Influence of Background Factors of Respondents on Assessment of Greenery in Urban Residential Areas
Author(s)	Asakawa, Shoichiro; Lee, Youngdae
Citation	Environmental science, Hokkaido University : journal of the Graduate School of Environmental Science, Hokkaido University, Sapporo, 12(1), 37-45
Issue Date	1989-06
Doc URL	https://hdl.handle.net/2115/37237
Type	departmental bulletin paper
File Information	12(1)_37-45.pdf



Environ. Sci., Hokkaido University	12 (1)	37~45	June 1989
------------------------------------	--------	-------	-----------

Influence of Background Factors of Respondents on Assessment of Greenery in Urban Residential Areas

Shoichiro Asakawa and Youngdae Lee

Department of Floriculture and Landscape Architecture, Division
of Environmental Conservation, Graduate school of
Environmental Science, Hokkaido University,
Sapporo, 060, Japan

Abstract

This is a study of methods for setting standards of greenery planning based on satisfaction of residents. Three questionnaire surveys were performed to make clear the influences of age, house type of residents and the other backgrounds of residents on their satisfaction with local greenery. The results of the surveys indicated that age and house type of respondents should be taken under consideration when setting greenery planning standards.

Key words; Residential area, Greenery, Planning standards, Character of residents

1. Introduction

The satisfaction of residents with greenery in urban area is one of the growing issues of interests in urban open space planning. In recent years, some investigations have been made to clarify the standards of the quantitative greenery in residential areas, based on the response of residents. These studies are focused on the relationship between the satisfaction or assessment of residents and the greenery ratios of their residential areas. According to the relationship, some minimum standards or attainable goals for planning of residential areas have been proposed (*e.g.*, Araki, 1974; Shinji, 1975; Takahashi and Noda, 1975; Aoki, 1975; Environmental Agency, 1975; Asakawa, 1976; Tabata *et al.*, 1984).

A few studies, related to this field, have reported some different responses by subgroups of residents. For example, Aoki (1975) showed that "feeling tired or not" was the most influential variable to the degree of satisfaction of greenery. The Environmental Agency (1975) reported that people living in an individual house with a garden or in a big housing lot size showed a relatively higher satisfaction with greenery than people living in a smaller housing lot size or apartment house. Maruta *et al.*, (1979) showed the importance of "house type." Also the author (1976) showed that satisfaction of residents with greenery was influenced by some variables, such as "garden size of their house." The relationship between greenery and satisfaction does not change much by subgroups of different background. However, since these small differences can influence planning standards, we must examine the many variables which determine residents' satisfaction.

In this paper, the authors have intended to clarify these variables based on a few questionnaire surveys made in Sapporo and Hirosaki.

2. Method

Three questionnaire surveys were analysed independently and the results were compared with each other. The first survey was carried out in August 1979 in fifteen typical residential areas in Sapporo which were chosen to include a variety of greenery attribute. The size of each study area is surrounded by main streets or some other natural boundaries and covers an area of about 300m×300m. About 200 samples of households (mainly househeads or housewives) were drawn in each area by proportion to a population, from a map which shows the family name and the location of each home. The second survey was held in August 1981 in the other fifteen residential areas in Sapporo. Although the survey method was similar to the first one, the survey areas were chosen with varying distances from three neighborhood parks. The third survey was done from September to October of 1980 in five typical residential areas in Hirosaki. This city was selected for comparison with Sapporo, it is located in a snowy area like Sapporo, but is different in its historical and cultural background. The survey method was similar to the first one. The outline of the survey areas was described in the previous papers (Asakawa and Okumura, 1981; Asakawa and Tonosaki, 1982 ; Asakawa, 1984).

In these surveys, residents were asked to rate their satisfaction with greenery on the following scale: extremely satisfied, satisfied, neutral, unsatisfied, and extremely unsatisfied. They also assessed the functionality of their neighborhood green spaces on a scale of five: extremely good, good, neutral, bad, and extremely bad. At the same time the residents were asked to rate the quantities of greenery on a scale of six: extremely abundant, abundant, neutral, sparse, defficient, and no greenery. The respondents' backgrounds which were used in this analysis are; survey area, sex, age, home town, house type, length of living age, plan for moving out, strolling and outing to the suburbs. These variables were selected from previous papers on this subjects (Asakawa, 1976; 1984).

3. Results and discussion

1) *Satisfaction with greenery*

We classify overall satisfaction of people with greenery into three categories: satisfaction with neighborhood greenery, suburb greenery and central area greenery. All three categories, together with overall satisfaction, were analysed. The data were analysed for variance with respect to survey areas and background of respondents with a two-way variance, in order to extract the effect of background. Three levels of significances are shown in Table 1.

As we expected, the effects of survey area were with the neighborhood and the overall greenery satisfaction stronger than to the suburb and central area greenery satisfaction. And the results suggested that the satisfaction with overall greenery is affected by more variables than the other categories of satisfaction, namely background of respondents.

Table 1. Significance of the effect of background factor of respondents on the satisfaction of greenery, the cognition of amount of greenery and functional assessment of greenery

		Satisfaction				Amount						Function							
		Neighborhood	Central area	Suburb	Overall	Overall	Housing lots	Streets	Parks	Some facilities	Vacant lots	Natural locations	Resting or strolling	Protecting from fire or safety spaces	Contact with nature	Air purification	Outside exercises or sports	Forms good landscape	Children's play
Survey area																			
Survey	1	A	—	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
	2	A	—	B	A	X	A	A	A	A	A	A	A	A	A	A	A	A	A
	3	A	—	—	A	A	A	A	A	—	A	A	A	A	A	A	A	A	A
Sex																			
Survey	1	—	—	—	—	—	—	C	—	C	—	—	—	B	—	—	—	—	—
	2	B	—	—	—	X	—	—	—	B	—	—	C	—	—	—	—	—	C
	3	—	—	—	—	—	—	A	—	—	—	—	—	C	—	—	—	—	—
Age																			
Survey	1	B	A	—	A	B	B	B	—	—	C	—	—	—	—	—	—	—	—
	2	A	A	—	A	X	A	—	—	—	—	—	A	A	A	A	A	A	A
	3	—	—	B	—	—	—	—	—	—	C	—	—	B	—	—	—	—	—
Home town																			
Survey	1	C	—	—	—	B	C	C	—	C	B	A	—	B	—	—	C	C	B
	2	—	—	C	—	X	—	—	—	—	—	—	C	—	—	—	—	—	
	3	—	—	—	—	C	C	—	—	—	—	B	—	—	—	—	—	—	
Occupation																			
Survey	1	—	C	—	—	—	—	—	—	C	—	C	—	—	—	—	—	B	—
	2	B	B	—	—	X	—	—	—	—	—	—	—	—	C	—	—	—	
	3	C	—	C	C	C	—	C	—	—	—	C	—	—	C	C	—	—	
Annual family income																			
Survey	1	—	—	—	C	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	3	—	B	—	—	—	—	—	—	—	—	—	—	C	—	—	—	—	C
House type or Housing lot size																			
Survey	1	—	—	—	A	A	A	—	—	—	—	—	—	C	—	B	—	C	—
	2	B	B	—	A	X	A	—	—	—	—	—	—	B	B	B	B	A	A
	3	—	C	—	B	—	—	—	—	—	—	—	—	C	—	—	—	—	—
Length of living age																			
Survey	1	—	—	—	B	B	B	C	—	—	B	—	—	—	—	—	—	—	—
	2	B	—	—	A	X	A	—	—	—	C	—	C	A	B	B	A	B	B
	3	—	—	—	—	—	—	—	—	—	—	—	—	C	—	—	—	—	—
Plan for moving out																			
Survey	1	—	—	—	A	B	A	—	—	—	—	—	—	C	—	C	—	C	—
	2	A	C	—	A	X	A	—	A	B	—	B	A	A	A	A	A	A	A
	3	—	—	—	—	—	—	C	—	—	—	—	—	—	—	—	—	—	—
Strolling																			
Survey	1	—	C	C	—	—	—	—	C	—	B	B	A	C	A	A	A	A	C
	2	—	—	—	C	X	—	—	B	—	B	B	A	A	A	A	B	B	A
	3	C	—	—	C	—	A	C	A	—	C	B	A	C	B	A	C	A	B
Outing to suburb																			
Survey	1	—	—	—	—	—	—	—	C	—	—	—	A	C	B	—	C	C	—
	2	—	C	—	—	X	—	—	—	C	C	—	—	—	—	—	—	—	—
	3	—	—	—	—	—	—	—	—	—	—	—	—	C	—	—	—	—	—
Interst in nature																			
Survey	1	A	A	B	A	—	—	C	—	A	—	—	—	—	—	—	—	—	—
	2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	3	C	C	B	—	—	—	C	—	B	C	—	—	C	—	—	—	—	—

Note: A; significance level <.001, B;<.01, C;<.05, X;no data

The reason why "house type" was more influential to the overall greenery than the neighborhood greenery may be due to the result that there were some people who excluded greenery of neighborhood housing sites.

Relatively higher F values were found in "age," "length of living age," "plan for moving out," "house type" and "interest in nature." These results corresponded with those of a previous paper (Asakawa 1976). In detail, the following tendency of subgroups is clear: elderly people, people who do not have plans to move, or people who do not have strong interests in nature are more satisfied with greenery. But it is noteworthy that there were some relationships between "age," "house type," "length of living age" and "plan for moving out" variables. That is to say, the older people are living in individual houses with garden, living longer, and furthermore do not plan to move.

Using the Quantification Theory II (Hayashi, 1952), we examined the effects of these variables on the three ratings of satisfaction with greenery. We can compare the importance of the background variables, according to the partial correlations, and we can examine the differences of subgroups of each variable by examining their weights. For example, Table 3 shows the difference of subgroups in the case of the overall satisfaction based on the Survey 2 data. As the partial correlations of the satisfaction in Table 2 shows, "age" has the greatest influence on satisfaction, next to "survey area." And the scores in subgroups of age show that those aged 25 to 39 are less satisfied with overall greenery. Importance of "housing type," "length of living" and "plan for moving out" variables correspond to the previous results of a two-way variable analysis. Besides, the partial correlation of the "survey area" of the similar analysis based on Survey 1 is higher than Survey 2. This is due to the greater difference of amount of greenery in residential areas of Survey 1.

2) Cognition of amount of greenery

Greenery in residential areas is mainly composed of vegetations in housing lots, streets (street trees), parks, sites of some facilities (*e.g.*, school, hospital, company etc.), vacant land under development, and natural locations (*e.g.*, hills or mountains which can be seen from the neighborhood, forest vegetation along river sides etc.). How much of each type of greenery do people estimate they feel in their neighborhood? Are there any differences in the perception and cognition of the greenery between respondents of different background subgroups? Table 1 shows the three levels of significance of F values in the same method as the previous section. We can easily suggest that the significances of

Table 2. Partial correlations of the respondents' background factors according to the Quantification Theory II analysis of the ratings of the satisfaction with greenery

Background factor	Neighborhood	Central area	Suburbs	Over all
Survey area	.321	.096	.119	.280
Sex	.138	.102	.084	.047
Age	.072	.094	.031	.108
Home town	.054	.051	.067	.032
House type	.031	.034	.015	.071
Length of living age	.032	.044	.044	.084
Plan for moving out	.051	.056	.036	.087
Strolling	.049	.047	.024	.042
Outing to suburb	.071	.049	.052	.043
η	.371	.210	.182	.361
N	1751	1630	1533	1696

Note: This analysis was based on Survey 2

Table 3. Weight of each subgroup of the background factors of respondents according to the Quantification Theory II analysis

Background factor		Weight	N
Survey area		omitted	
Sex	male	.17	563
	female	-.09	1133
Age	15-24	-.14	231
	25-29	.30	277
	30-39	.31	530
	40-49	-.37	305
	50-	-.31	353
Home town*	a)	.02	773
	b)	.02	488
	c)	-.11	122
	d)	-.16	210
	e)	.20	103
House type	individual	-.22	816
	apartment	.21	880
Length of living age	20-	-.54	219
	10-19	.26	318
	2- 9	.02	845
	- 1	.07	314
Plan for moving out	have	-.29	739
	no	.26	708
	do not know	.13	249
Strolling	often	-.04	402
	some times	-.10	611
	rare	.04	374
	no	.21	309
Outing to suburb	often	.17	458
	some times	-.05	595
	rare	-.13	411
	no	.00	232

Note: The data of the total satisfaction with greenery of the survey 2 were used as the outsider criterion. The mean weights of respondents who satisfied and unsatisfied were $-.294$ ($N=1019$) and $.443$ ($N=677$) respectively. *a)country with much nature, b)small or medium city with much nature, c)small or medium city with little nature, d)large city with relatively much nature, e)large city with little nature.

the greenery in "house type" is due to the difference of house with garden and apartment house or rental rooms without garden. As mentioned above, the significances in "age," "length of living age" and "plan for moving out" may be influenced by the close relation of them to "house type."

We found a higher level of significances in "strolling" than the result of the analysis of the satisfactions. This means that the people who stroll around often notice more of the greenery in parks, natural greenery and greenery in vacant lots. Some can say that the respondents' behaviors influence their perception and cognition of greenery. There were

some relationships for which reasons were not clear, such as difference in "home town" in the natural greenery or "plan for moving out" in ratings of some kinds of greenery. If we examined the significance in "plan for moving out," the people who do not have a plan to move out tended to feel more the presence of greenery in parks, in some facilities sites and natural greenery. Although Table 1 shows some significances in "home town," we can not explain the difference between the subgroups. Although significance in "interest in nature" showed that the people who had a strong interest in nature felt that there was less greenery in the facility sites, but the reason is not so clear.

3) *Functional assessment of green spaces*

As to the functional assessments of green spaces, respondents were asked to rate 6 functional scales respectively. Besides the significance of the survey areas, "strolling" and "care of potted plants" clearly influenced the functional assessments. Generally, the people who stroll often or take care of plants were more positive in the assessments. But "age" and "interest in nature" which had great influences on satisfaction with greenery rarely influenced the functional assessments. It may be due to the fact that although some activities, which relate to perceptions of greenery influence the assessment, are less subjective than the satisfaction. Because of lower ratings by female, clear significance of "sex" was found in the function of "protecting from fire or safety spaces." We suggest that it is due to the earnest wish for safety in the neighborhood. And this result corresponds to that of a previous paper (Asakawa, 1984).

To clarify the importance of the variables and difference of the subgroups in the typical three functional assessments, Table 4 shows the results of the analysis by the Quantification Theory II. In these analyses, we combined "sex" and "age" to make one variable, and added "care of potted plants" for another. We can point out the following remarks from the result shown in Tables 1 and 4:

(1) Cognition of greenery in the neighborhood and assessment of some functions are more influenced by the difference of greenery in survey areas than the satisfaction with greenery in the neighborhood. Thus we can suggest that cognition of greenery is relatively objective compared to satisfaction and assessment. (2) In general, "age" (in this case combined with sex) is a relatively influential variable in the overall analysis. (3) Behaviour characteristics of the people, such as "strolling or not," influence the functional assessments of green spaces. (4) Attitudinal variables, such as "interest in nature" may be more influential to satisfaction with greenery than the cognition of greenery and the functional assessments. (5) There are some variables which influence the ratings for unknown reasons.

4) *Influence of background factors to the planning standards*

Our main interest is to know the influence of some background characteristics of respondents, having significant effects on the satisfaction of greenery, on the planning standards of greenery. As "age" and "house type" variables are most two influential to the satisfaction with the overall greenery, we examine the differences of satisfaction among three age subgroups and two house types.

Table 4. Partial correlations of the background factors according to the Quantification Theory II analysis of the ratings of the three typical functional assessment of green spaces

Background factor	Outdoor exercises or sports		Forms good landscape		Protection from fire or safety space	
	Survey1	Survey3	Survey1	Survey3	Survey1	Survey3
Survey area	.447	.584	.641	.548	.391	.428
Sex and Age	.070	.111	.070	.165	.111	.164
Home town	.051	.071	.053	.066	.080	.115
Occupation	.029	.094	.080	.071	.049	.079
Annual family income	.036	.130	.039	.145	.059	.103
Housing lot size	.059	.067	.081	.044	.069	.143
Length of living age	.067	.093	.060	.067	.071	.093
Strolling	.136	.151	.096	.189	.098	.115
Care of potted plants	.073	.064	.072	.109	.019	.033
Interest in nature	.036	.081	.040	.067	.036	.089
η	.494	.617	.665	.597	.429	.506
N	1981	781	1960	739	1813	682

Table 5. Differences of multiple equations between age subgroups and house type subgroups

Background factor		Tree covered area (%)	Building coverage (%)	Constant	R ²
Over all		.0317 (.007)	-.0309 (.007)	3.6511	.68
Age	15-29	.0217 (.008)	-.0299 (.008)	3.5813	.53
	30-49	.0294 (.009)	-.0360 (.009)	3.7610	.60
	50-	.0343 (.009)	-.0245 (.008)	3.6345	.58
House type	individual	.0266 (.008)	-.0227 (.008)	3.6749	.49
	apartment	.0350 (.011)	-.0319 (.010)	3.3770	.52

There is no decided method for setting the greenery standards in neighborhood areas, but some planners are using 50% satisfaction ratio as a minimum standard, and 80% as an attainable goal. In this context, the previous paper showed that it was possible to estimate the satisfaction ratio of respondents by tree-covered and building coverage ratios in their residential area. Based on this relationship, if building coverage is 20% or 30%, tree-covered area of 13% or 17% is required as the minimum standard respectively (Asakawa, 1976).

Using the data on 30 survey areas of the Surveys 1 and 2, we derived a regression equation of the subgroups showing the relationship between the mean ratings of the satisfaction to greenery, tree-covered, and building coverage ratios. In this analysis, we used the mean ratings instead of the satisfaction ratio, because the number of samples in each subgroup was limited.

In order to clarify the comparison, using the next regression equation, we can convert the mean ratings to the satisfaction ratios under the assumption that the relationships are not different between subgroups:

$$Y = 37.722X - 68.543 \quad R^2 = 0.976$$

where Y = percentage of people who are satisfied with the overall greenery

X = mean rating of the 5 point scale

If we get 3.143 and 3.938 on the 5 point scale, 50% and 80% of respondents will be satisfied with the overall greenery.

Based on the equation coefficient of the total sample, if the building coverage is 20%, approximately 3% tree-covered ratio is the minimum standard and approximately 28 tree-covered ratio should be the attainable goal. Similarly, if the building coverage is 30%, 13% and 38% tree-covered ratio is required respectively. These tree-covered ratios are similar to those of the previous paper, except in the case of 20% building coverage and 50% satisfaction. Although the reason of the exception is not clear, this is due to the rate of higher satisfaction in the area of lower building coverage.

If we examine the tree coverage which satisfy 50% of residents in the building coverage area of 30%, there are great differences in the following subgroups: overall respondents, 13%; age 15–29, 21%; age 30–49, 16%; age 50 or over, 7%; respondents who live in individual houses, 6% and respondents who live in apartment houses or rental rooms, 21%. Older people and residents who live in individual houses require less tree-covered area. But this result does not directly indicate that the less greenery (tree-covered area) is required in an area where many older people live. Because, as already mentioned, older people live in individual houses with gardens much more frequently than younger people. Therefore an area where many older people live in apartment houses or rental rooms requires more greenery.

4. Conclusion

The results of this research show that, although some variables which had significant influence were different among the three questionnaire surveys and the kinds of assessments, some variables such as "age" and "house type" had greater influence generally. For example, if we examine the relationship between the satisfaction ratio of residents with overall greenery and tree-covered ratio, the ratio which satisfies 50% of residents or a minimum planning standard is different by age subgroups and house type subgroups. Then, we should consider certain residents' background factors such as age and house type when we set the standard of greenery in a planning area.

References

- *Aoki, Y. (1975). A study on the method of measurements of green environment in residential area. *Papers of 10th Annual Conference of the City Plann. Inst. Jpn.*: 163–168.
- *Aoki, Y. (1979). The results of an investigation on the desires and wants of green space of the people. *Green Age*, 11: 37–44.
- **Araki, M. (1974). A study of metaphysical effects of green in urban residential area. *Papers of 9th Annual Conference of the City Plann. Inst. Jpn.* 187–192.
- **Asakawa, S. (1976). Analysis of people's feeling about open spaces in Sapporo(II), The relationship between people's content and open-space indices. *J. Jpn. Inst. Landscape Archit.*, 40(1): 1–11.
- **Asakawa, S. and Okumura, M. (1981). Analysis of the attitude of residents toward housing gardens in urban areas. *Hokkaido City*, (18 · 19): 1–22.
- **Asakawa, S. and Tonosaki, K. (1982). Green construction in residential quarters, A case study in Sapporo city. *Environ. Sci. Hokkaido*, 5(1): 61–77.
- Asakawa, S. (1984). The effect of greenery in the feeling of residents toward residential neighborhoods. *J. Fac. Agri. Hokkaido Univ.*, 62(1): 83–97.
- Asakawa, S., and Komatsu, M. (1985). An experimental study on the effects of greenery in the assessments of residential streets scenes using scale-models. *Environ. Sci. Hokkaido*, 8(1): 61–74.
- Hayashi, C. (1952). On the prediction of phenomena from mathematico-statistical point of view. *Annals. Inst. Statistical Mathematics*, 3: 69–98
- **Maruta, Y. et al. (1979). Studies on green spaces in city planning (II). *Papers of 14th Annual Conference of the City Plann. Inst. Jpn.* 415–420.
- *Morioka, T., and Kubota, Y. (1973). Environmental planning indicated by green. *City Planning Review*, 76: 64–74.
- **Shinji, I. (1975). Study of limit of natural surfaces in our living environment. *J. Jpn. Inst. Landscape Archit.* 38 (4): 16–31.
- *Tabata, S. et al. ed.(1984). Greenery and residential environment. Kokon-shoin, Tokyo, 132pp.
- **Takahashi, R. and Noda, T. (1975). Studies on the standardization of natural green amenity index in urban environment. *J. Jpn. Inst. Landscape Archit.*, 39 (4): 10–19.
- **Takahashi, R. (1982). Structure and style of green spaces as an essential in human environment. *J. Jpn. Inst. Landscape Archit.*, 46 (2): 140–146.
- Environmental Agency, (1975). Studies on planning standard of natural environment.
- * in Japanese
- * * in Japanese with English summary or abstract