Research on Improvement of Utilization of Open Space: Through Demonstration Experiment Focusing on Spatial Elements

Yuka Kimura¹, Yuichi Sueshige², Eisuke Aoki³, Yusuke Inaduka⁴ and Hideaki Takayanagi⁵

1. Graduate School of Environmental and Information Studies, Tokyo City University, 8-9-18-2405 Todoroki, Setagaya, Tokyo 158-8586, Japan

2. Department of Urban Life Studies, Tokyo City University, 8-9-18-2405 Todoroki, Setagaya, Tokyo 158-8586, Japan

3. NIPPON ENGINEERING CONSULTANTS CO., LA Tower 11F, 11-2 Shintoshin, Chuo, Saitama-shi, Saitama 330-6011, Japan

4. NIPPON ENGINEERING CONSULTANTS CO., LA Tower 11F, 11-2 Shintoshin, Chuo, Saitama-shi, Saitama 330-6011, Japan

5. Department of Urban Life Studies, Tokyo City University, 8-9-18-2405 Todoroki, Setagaya, Tokyo 158-8586, Japan

Abstract: Along with the rise of buildings, a large number of public open spaces have been created for the purpose of mitigating hatching restrictions and the like. However, many of them are used at low levels, and there remain very few known public open spaces. In this research, we set up a resting place to demonstrate the effect of elements and placement in order to obtain knowledge for appropriately managing and utilizing such low use open public spaces. The survey means analyzed the presence/absence of the attraction/retention degree based on the cross-sectional traffic volume by video analysis and a hearing questionnaire survey for the users of the resting place. From the results, we have found that placement methods and effects that exceed the expectation value of each element, regionality, and attachment, occur by continuing experiments.

Key words: Public open space, low usage area, rest area, social experiment, spatial element.

1. Introduction

1.1 Background

In recent years, urban development has been promoted in neighborhoods of metropolitan areas. However, many underutilized lands in land-area consolidation projects were discovered because of the population decline. Moreover, when developing residential spaces in urban areas, such as the revision of the Green Production Law, we are faced with the issue that green space projects should be comprehensively introduced into the area management business [1, 2].

Targeting such vacant, low, and unused lands. In order to develop a model of implementation measures that can contribute to community activities of local

residents, various design elements were replaced, and objective evaluations such as staying time, user recognition, and retention were conducted. This research focuses on areas where public green spaces and parks are scarce, and utilizes places and walks that are familiar to citizens, such as land and low/unused land generated in the process of land readjustment projects, etc. The point is to find a way to temporarily maintain it as a resting facility for the elderly [3, 4]. In addition, in the demonstration experiment, we conducted a behavioral survey and survey of pedestrians regarding functions, elements, and placement required for pedestrian rest facilities. From these analyses, we were able to elucidate that the construction model suitable for the location could be clarified experimentally, a portion of which is discussed in this paper.

Corresponding author: Yuka Kimura, graduate student, research fields: urban and architect planning.

1.2 Purpose

In this study, we aim to clarify the elements and arrangements that contribute to the effectiveness of a given space in encouraging pedestrians to stop by and stay on the front road, in order to obtain knowledge on properly managing and utilizing low-use open spaces.

We observe the state of users in the study space in a low-use open space, study the effect of each design element, and examine the model of the practical policy in the low-use land.

1.3 Overview

In this experiment, we swap various design elements to plan a practical policy model for low-use areas in order to contribute to the effective use of low, unused land. We objectively evaluate the following four items: contact type, recognition/fixation level, stay status, and continuity.

2. Research Method

2.1 Survey Site

Fig. 1 shows survey sites which are usually used for parking. For pedestrians along the front road, the

reactions to various elements (Table 1) installed on the site were recorded by fixed point observation using a digital video camera [5].

2.2 Survey Schedule

We conducted surveys at this survey site on 5/23, 6/13, 7/4, 7/11, 9/19, 10/10, 10/17, 10/31 in 2018.

Every survey was conducted from 10 AM to 4 PM on Wednesdays. We did not carry out surveys on rainy days.

2.3 Survey Schedule

The survey method was shown in Fig. 2.

Method 1: Fixed Point Survey

A single point-of-view observation using digital video cams was conducted during the survey period.

Fig. 1 Site map of the study area.

Table 1 List of installed.

	E le m e n t	D i m e n s i o n s	
A t t r a c t i n g	B a r g a i n W a g o n T y p e P l a n t i n g		S e e d p l a n t i n g t r i a l 20%, E x p e c t a t i o n s f o r t r a i n i n g
	C r o s s I s l a n d T y p e P l a n t i n g		S e e d p l a n t i n g t r i a l 20%, E x p e c t a t i o n s f o r t r a i n i n g
	T e r r a c e d I s l a n d T y p e P l a n t i n g		S e e d p l a n t i n g t r i a l 20%, E x p e c t a t i o n s f o r t r a i n i n g
S t a y	4-s e a t t a b l e	770 × 1330 × 710 (mm)	R e s t i n g p l a c e
	2-s e a t t a b l e	800 × 560 × 720 (mm)	R e s t i n g p l a c e
	P a l a s o l	3000 × 2460 (mm)	S u n s h a d e, R e s t i n g p l a c e
	A r t i f i c i a l g r a s s A	3000 × 3000 (mm)	C i r c u l a r, E f f e c t o f R e l a x a t i o n
	A r t i f i c i a l g r a s s B	3000 × 3000 (mm)	S q u a r e, E f f e c t o f R e l a x a t i o n
L i n e-o f- S i g h t C o n t r o l	P o t t e d t r e e s L	1100 (mm)	P a k i l a, H o n g K o n g K a p o k, E f f e c t o f R e l a x a t i o n
	P o t t e d t r e e s M	700 (mm)	C r e s t, S i l k j a s m i n e, E f f e c t o f R e l a x a t i o n
	S i g n b o a r d A	870 (mm)	P r o j e c t r e c o g n i t i o n
	S i g n b o a r d B	870 (mm)	P r o j e c t r e c o g n i t i o n

Attracting element: spatial element that is installed for the purpose of directing attention to the target area (direct-view event);

Stay element: spatial element installed for the purpose of stopping at the target site (stop event).

Fig. 2 Defining elements in behavioral surveys.

The presence/absence of attraction and retention was investigated based on cross-sectional traffic volume.

Method 2: Hearing Survey

Interviews and questionnaires to visitors by investigators (questions on cognition, repeat rate, attachment, expectation, creativity, etc.).

Method 3: Environmental Survey

Measure temperature, wind speed, and noise using a measuring instrument.

2.4 Installed Element

As shown in Table 1, two types of three elements, namely, an attracting element, a staying element, and a line-of-sight control element, were installed.

3. Consideration of Direct-View Events on Site and Layout Elements

An experiment was carried out based on the research method described in Section 2, and an analysis was conducted according to the behavior of pedestrians walking in front. In this section, we focus

on the person who looks directly at the site and layout elements among the pedestrians on the front walkway. Table 3 and Fig. 4 show the results of walker behavior measurement.

An analysis was conducted according to $r2a \cdot r2b \cdot r2c$ in Fig. 3, focusing on the ratio of passersby to the attracting element. As a result, we found that pedestrians tend to look at the one closest to them, regardless of size. In addition, when comparing the planting with the table, the planting gathered more attention than the table. From this, the planting can be considered an element that contributes to attracting.

Next, an analysis was conducted according to $r2d$ ①· $r2d$ ②· $r2e$ in Fig. 3, focusing on the percentage of passersby who looked at the stay elements. The table with parasols gathered the most attention throughout the experiment. One factor is the presence of elements.

4. Consideration of Drop-In to Site and Layout Elements

Continuing from Section 3, this section focuses on those who walked to resting areas among pedestrians on the front walkway. Table 3 and Fig. 5 show the results of walker behavior measurement.

First, we focused on the number of passersby who visited the attracting element and analyzed it. According to the figures of the 1st to the 5th experiments in Fig. 3, the terraced island type planting, which was located closest to the sidewalk and was easily accessible, had the highest number of stops. There were many other cases where people stopped by looking at the flowers without taking a break. In addition, there were cases where they enjoyed conversations with flower-lovers. From this, the attracting element can also create communication between others in a short time, and will be an element that contributes to their stay.

5. Findings from the Entire Experiment

5.1 Evaluation of Continuous Experiments

In this section, we focused on the recognition in the area by continuing experiments on the same site.

We then interviewed and analyzed the passersby as to whether they had seen the project site before. The rate of recognition increased from 0% to 27% in the 1st to the 4th rounds, but dropped to 18% in the 5th round.

After that, the 6th to 8th recognition rate stabilized at about 30%, and all of them answered that they had seen it before. Between the 4th and the 5th rounds, the two-month period was vacant, and the recognition rate dropped; it became clear that the recognition rate was maintained by regular holding.

Moreover, after the 6th experiment, we interviewed four users who had some reaction in the experiment site or regular users who became acquainted through

the experiment. Table 2 shows the results. From this, we can see that every time they see a resting place, they are somewhat interested, confirming the recognition and attachment of local residents and users. Fig. 3 shows the hearing results for changes to repeaters.

5.2 Thoughts about Increasing the Accuracy of Utilization

In this section, we continued to experiment and investigate the needs. Main items that gathered the needs were sales of drinks, greenery, seating capacity, and fashionable items. However, with regard to sales and the number of seats, the ideal standard has been polarized, so it is important to adjust it to a standard that many people are satisfied with.

Fig. 3 Reply result as to whether it is easy to enter when there is person in site.

Table 2 Survey results on attachment.

A	Sex	Age	Dwelling	Remarks
	Male	30s	Tokyo	He sometimes comes to Komagome at work. The last time he didn't want to stop by the sun. "
	Have you noticed changes of open space?		What did you think about changes of open space?	
	No		He doesn't know what has changed, but it's fine if the sun goes down from the previous time for him.	
B	Sex	Age	Dwelling	Remarks
	Female	80s	Komagome	She often walks in front of open spaces when going to study.
	Have you noticed changes of open space?		What did you think about changes of open space?	
	Yes		She felt that the rest area was getting better and better.	
C	Sex	Age	Dwelling	Remarks
	Female	30s	Tokyo	Her workplace was in Komagome and she often saw a rest area.
	Have you noticed changes of open space?		What did you think about changes of open space?	
	No		I didn't notice a change in the rest area, but every time I saw it, I thought I was doing something strange.	
D	Sex	Age	Dwelling	Remarks
	Female	70s	Komagome	She runs a cleaning shop nearby. I stopped by every time during the experiment and helped with the flowers.
	Have you noticed changes of open space?		What did you think about changes of open space?	
	Yes		She came to visit because she was worried about the lack of flower soil. It was good that the soil was added properly in the next experiment that said there was little soil. In addition to placing flowers, the layout may be devised. Also, the planting is very good. We want you to make beautiful flower bed from now on.	

Table 3 List of usage status of installation elements.

Action type	1st round (5/13)		2nd round (6/13)		3rd round (7/4)		4th round (7/11)		5th round (9/11)		Action type	6th round (10/3)		7th round (10/10)		8th round (10/31)	
	Real number	Percentage	Real number	Percentage	Real number	Percentage	Real number	Percentage	Real number	Percentage		Real number	Percentage	Real number	Percentage	Real number	Percentage
1	478	57%	1150	44%	1215	40%	1199	42%	1395	43%	1	1441	39%	1573	44%	1816	46%
2a	84	23%	164	12%	195	11%	117	7%	129	7%	2a	497	23%	471	24%	567	27%
2b	228	63%	814	58%	836	47%	634	38%	1001	55%	2b	0	0%	0	0%	531	25%
2c	1	0%	135	10%	483	27%	540	33%	236	13%	2c	696	32%	731	37%	290	14%
2d	3	1%	74	5%	79	4%	176	11%	130	7%	2d①	511	24%	319	16%	97	5%
											2d②	3	0%	3	0%	190	9%
2e	46	1%	228	16%	203	11%	188	11%	322	18%	2e	453	21%	470	24%	419	20%
2	362	43%	1415	54%	1796	59%	1655	57%	1818	56%	2	2160	59%	1994	55%	2094	53%
3a	2	33%	1	3%	8	15%	1	4%	0	0%	3a	3	6%	1	3%	1	3%
3b	1	17%	14	42%	17	32%	14	52%	16	26%	3b	0	0%	0	0%	0	0%
3c	2	33%	4	12%	4	8%	4	15%	6	10%	3c	13	26%	4	13%	2	6%
3d	0	0%	1	3%	8	15%	6	22%	26	42%	3d①	15	30%	2	6%	11	34%
											3d②	4	8%	5	16%	2	6%
3e	1	17%	13	39%	16	30%	2	7%	14	23%	3e	15	30%	19	61%	16	50%
3	6	1%	33	1%	53	2%	27	1%	62	2%	3	50	1%	31	1%	32	1%
Total (1+2+3)	846		2598		3064		2881		3275		Total (1+2+3)	3651		3598		3942

Fig. 4 List of direct view finding rates.

Fig. 5 List of walking into rates.

6. Conclusion

First, it can be said that the following three items are important in the attracting elements: the elements in the space that have the effect of stimulating the senses and sensibility, the installation of elements with a presence that can be used as landmarks, and the usage situation that can be seen from the outside. For stay elements, it is important to accurately inform the pedestrian of the arrangement of tables that create a variety of usage methods, the securing of personal areas, the arrangement of elements that create communities, and the purpose of implementation. The findings from all experiments revealed that the number of elements that stopped by and the number of elements that stopped looking at were not proportional. The recognition/attachment of continuing experiments,

and the importance of the interval between experiment dates were also shown.

In future research, it is necessary to clarify whether this effect is produced even if the target site changes, or whether the results are limited by research limit points.

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