Degrees of Concern in Components of Waterfront Parks by Conjoint Analysis*

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Abstract

The Tokyo Metropolitan Government established "Seaside park plan" (1970) and "Tokyo municipal seaside park ordinance" (1975). The Tokyo Metropolitan Government considers that the conservation of seaside, riverside and urban parks make the creation of places where residents of Tokyo can come in contact with nature. However, it seems that the planning and construction of those parks have been carried out by the administration from one-side view. The waterfront parks are public and have been used by many people. As there have been no data what components of parks are important for users of parks, eight seaside parks called waterfront parks were watched, degrees of satisfactory of eighty two residents who live in metropolitan area about components of parks were surveyed, and degrees of concern about components of the parks have been obtained by conjoint analysis. Those waterfront parks are located at Odaiba near the Tokyo bay. Here, the components of parks are as follows; 1) Hydrophile, 2) Rest space, 3) Public transport and conditions of location, 4) Recreation, 5) Scenery and outlook, 6) Maintenance, 7) Monument, and 8) Openness. The following main results have been obtained from the research. : a) Male and female think scenery and outlook, and hydrophile are important. b) Rest space is less important than other components for the twenties, but important for the thirties, forties and sixties. c) Public transport and location is not much important for teenager, but important for the others. d) The fifties make a point 1) Hydrophile, 3) Public transport and condition of location, and 5) Scenery and outlook.

Key words: Waterfront Park, Conjoint Analysis, Component, Degrees of Concern, Questionnaire

1. Introduction

Tokyo settled on "Sea park plan" in December, 1970, and enacted "Tokyo sea park ordinance" in October, 1975⁽¹⁾. So that this recovers, maintains sea in Tokyo port that is citizen of Tokyo's valuable property and nature in waterside line, and creates place where citizen of Tokyo can touch sea. And, it was assumed that it was necessary to work from a basic aspect "Activation of the park use", "Reproduction of nature", and "Cooperation of labor with the citizen of Tokyo" to the measure to assume "The way it should be of the sea park" in the future to be "Waterside space that rich green it overflowed in vigor brought up with the citizen of Tokyo", and to achieve this. Waterfront parks begin to be reviewed like this. Then, this research aims to know the degrees of concern of waterfront park

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components by park users. A lot of parks were the one that the plan was advanced and offered by the administration one-sidedly. Because it is a general person who uses the park, we expect that degrees of concern of park users are considered and referred in the plan of waterfront parks.

Nomenclature

t : evaluation variable of a component, hydrophile of a park
 u : evaluation variable of a component, rest space of a park
 v : evaluation variable of a component,
 public transport and conditions of location of a park
 w : evaluation variable of a component, of recreation of a park
 x : evaluation variable of a component, scenery and outlook of a park
 y : evaluation variable of a component, monument of a park
 z : evaluation variable of a component, openness of a park
 U : total utility of a waterfront park
 α : importance degree of hydrophile
 β : importance degree of rest space
 γ : importance degree of public transport and conditions of location
 δ : importance degree of recreation
 ε : importance degree of scenery and outlook
 ζ : importance degree of monument
 η : importance degree of openness

Subscript

i : the name of waterfront park (A, B, C, D, E, F, G, H)

2. Evaluation Procedure

First, the questionnaire survey extracts the components of the parks and makes panels in the questionnaire forms and the park photographs of the components. Next, the testees fill in the evaluation of the satisfaction rating to the components of the parks and the inclination order of each park from the panels. Finally, degrees of concern are evaluated from the results of the questionnaires.

2.1 Components of waterfront park

The following eight components thought to be should consideration in the plan of the waterfront parks are evaluated by five grades of 1(Very dissatisfaction), 2(Dissatisfaction), 3(Medium), 4(Satisfaction), and 5(Very satisfaction).

- 1) Hydrophile
- 2) Rest space
- 3) Public transport and conditions of location
- 4) Recreation
- 5) Scenery and outlook
- 6) Maintenance situation
- 7) Monument
- 8) Openness

The maintenance situation was excluded from the evaluation object because the object parks are maintained, and it depended on other components. At the end of the questionnaire, there is overall inclination order of eight waterfront parks.

2.2 Questionnaire forms and panels

Table 1 shows the number of people in this questionnaire survey. 82 people who in live

in Kanto area in Japan returned questionnaire forms, and the valid responses were 65. Figure 1 shows the questionnaire form, Fig.2 -Fig.9 are the panels of Park A - Park H, and Fig.10 is the panel of layout drawing of the parks. Nine questionnaire forms, eight panels of waterfront parks (A3 size), and the layout drawing of the parks are handed to the examinees. The overall inclination order of eight waterfront parks is recorded at the end of the questionnaire.

Table 1. No. of valid responses (No. of answers)

	Male	Female	Total
10's	3	7	10
20's	8	2	10
30's	3 (4)	8 (12)	11 (16)
40's	4	7 (8)	11 (12)
50's	5 (10)	8 (14)	13 (24)
60's	7	3	10
Total	30 (36)	35 (46)	65 (82)

公園番号 **A**

パネルを見て、それぞれの項目の数字に○をつけてください

1: とても不満 2: 不満 3: 普通 4: 満足 5: とても満足

① 親水性 (水になじむ性質のこと)

1 2 3 4 5

② 休憩スペース

1 2 3 4 5

③ 交通の便・立地条件

Fig. 1 Questionnaire form (example, in Japanese)

Fig.2 Panel of park A

Fig.3 Panel of park B

Fig.4 Panel of park C

Fig.5 Panel of park D

Fig.6 Panel of park E

Fig.7 Panel of park F

Fig.10 Layout drawing of the parks

3. Evaluation Method

3.1 Conjoint analysis

The conjoint analysis method⁽²⁾ is carried out by using the evaluation to the components of each park and the inclination order of the parks. The conjoint analysis method is a technique of requesting the utility of each attribute that has it to be selected by using the inclination order data. In addition, it is a technique for requesting the entire to the selection object utility. The best satisfaction degree of the object is assumed to be 1, and the badness to be 0, and the satisfaction degree of the object is shown by the number between 0 and 1. The selection object is assumed to be i , and the j th partial utility on attributes of the object is assumed to be u_{ij} .

The total utility of the selection is expressed in eq. (1).

$$U_i = F(u_{i1}, \dots, u_{ir}) \quad (1)$$

Here, r expresses the number of the attributes.

We suppose a total utility to be additive, and eq. (2) is used.

$$U_i = \sum_{j=1}^r u_{ij} \quad (2)$$

3.2 Analysis of waterfront parks

The evaluation variables of the component of the park are as follows.

Hydrophile: t_i , Rest space: u_i , Public transport and conditions of location: v_i , Recreation: w_i , Scenery and outlook: x_i , Monument: y_i , Openness: z_i .

Importance degree variable of each component: $\alpha, \beta, \gamma, \delta, \varepsilon, \zeta, \eta, k$

As a total utility, the evaluation order of the park is used. As there are eight parks, total utility values are the first; eight, second; seven, third; six, fourth; five, fifth; four, sixth;

three, seventh; two, and eight; one.

The utility from the above to each park can be shown by eq. (3).

$$U_i = \alpha t_i + \beta u_i + \gamma v_i + \delta w_i + \varepsilon x_i + \zeta y_i + \eta z_i + k \quad (3)$$

$$i = A \sim H$$

The following simultaneous eq. (4) is obtained from eq. (3), and the value of each testee of the parameter of the importance degree of each component put together on the evaluation order in eq. (5).

$$\left. \begin{aligned} U_A &= \alpha t_A + \beta u_A + \gamma v_A + \delta w_A + \varepsilon x_A + \zeta y_A + \eta z_A + k \\ U_B &= \alpha t_B + \beta u_B + \gamma v_B + \delta w_B + \varepsilon x_B + \zeta y_B + \eta z_B + k \\ U_C &= \alpha t_C + \beta u_C + \gamma v_C + \delta w_C + \varepsilon x_C + \zeta y_C + \eta z_C + k \\ U_D &= \alpha t_D + \beta u_D + \gamma v_D + \delta w_D + \varepsilon x_D + \zeta y_D + \eta z_D + k \\ U_E &= \alpha t_E + \beta u_E + \gamma v_E + \delta w_E + \varepsilon x_E + \zeta y_E + \eta z_E + k \\ U_F &= \alpha t_F + \beta u_F + \gamma v_F + \delta w_F + \varepsilon x_F + \zeta y_F + \eta z_F + k \\ U_G &= \alpha t_G + \beta u_G + \gamma v_G + \delta w_G + \varepsilon x_G + \zeta y_G + \eta z_G + k \\ U_H &= \alpha t_H + \beta u_H + \gamma v_H + \delta w_H + \varepsilon x_H + \zeta y_H + \eta z_H + k \end{aligned} \right\} \quad (4)$$

$$\begin{pmatrix} \alpha \\ \beta \\ \gamma \\ \delta \\ \varepsilon \\ \zeta \\ \eta \\ k \end{pmatrix} = \begin{pmatrix} t_A & u_A & v_A & w_A & x_A & y_A & z_A & 1 \\ t_B & u_B & v_B & w_B & x_B & y_B & z_B & 1 \\ t_C & u_C & v_C & w_C & x_C & y_C & z_C & 1 \\ t_D & u_D & v_D & w_D & x_D & y_D & z_D & 1 \\ t_E & u_E & v_E & w_E & x_E & y_E & z_E & 1 \\ t_F & u_F & v_F & w_F & x_F & y_F & z_F & 1 \\ t_G & u_G & v_G & w_G & x_G & y_G & z_G & 1 \\ t_H & u_H & v_H & w_H & x_H & y_H & z_H & 1 \end{pmatrix}^{-1} \begin{pmatrix} U_A \\ U_B \\ U_C \\ U_D \\ U_E \\ U_F \\ U_G \\ U_H \end{pmatrix} \quad (5)$$

4. Results

The results of the evaluation according to the generation are shown in Fig.11-Fig.16. The horizontal axis shows degrees of concern (the valuing level). Figure 17 shows degrees of concern according to male and female, and Fig.18 degrees of concern watched generally.

Fig. 11 Degrees of concern in 10's

Fig. 12 Degrees of concern in 20's

Fig. 13 Degrees of concern in 30's

Fig. 14 Degrees of concern in 40's

Fig. 15 Degrees of concern in 50's

Fig. 16 Degrees of concern in 60's

Fig.17 Degrees of concern according to male and female

Fig.18 Degrees of concern watched generally

5. Considerations And Conclusions

Here are the components of parks.

1) Hydrophile, 2) Rest space, 3) Public transport and conditions of location, 4) Recreation, 5) Scenery and outlook, 6) Maintenance, 7) Monument, and 8) Openness.

As for the age on from one's twenties, it is understood to think importantly comparatively while the meaning of the access to the park in the park component by public transport and conditions of location, and not attaching importance to one's teens according to Fig. 11 too much. It is thought that it is because of the change into the standpoint where the child is taken it goes for himself/herself while this was a standpoint taken to waterfront parks for one's teens.

As for one's twenties, the rest space is thought that the valuing level low attaches importance to "Act" for the act of going to parks compared with other components from Fig. 12.

From Fig. 13 and Fig. 14, the degrees of concern for the components of parks are comparatively high in the whole 30 generations and 40 generations. This reason is because it is thought that the people of 30 generations and 40 generations regard that they spend time in a park as important.

It is understood from Fig.15 that the person of 50 generations regards hydrophile, public transport and conditions of location, and scenery and outlook as important. It is thought that this images "sightseeing". Degrees of concern in components of the parks are high in 60's generally (Fig.16). It is understood that the person of 60 generations has it to spare for of time and mind.

Male and female think that scenery and outlook, and hydrophile are important (Fig.17 and Fig.18).

The following main results have been obtained from the research.

- Male and female think that scenery and outlook, and hydrophile are important.
- Rest space is less important than other components for the twenties, but important for the thirties, forties and sixties.
- Public transport and location is not much important for teenager, but important for the others.
- The fifties make a point 1) Hydrophile, 3) Public transport and condition of location, and 5) Scenery and outlook.

The results for 17 people were not used in spite of a valuable questionnaire results from 82 people having been provided by an omission of the few mention. By the analysis that is more flexible than in evaluating it with the standard that we use a fuzzy set for the answer of the questionnaire and expressed, we are going to examine the utilization of these data in future.

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References

- (1) Bureau of Port and Harbor, Tokyo Metropolitan Government, *Approach on "New sea park"--Policy of sea park in the future--*, (2003) (in Japanese).
<http://www.kouwan.metro.tokyo.jp/kanko/park/torikumi/0zenbun.pdf>
- (2) E. Kinoshita and E. Ono, *AHP and Conjoint analysis*, Gendai-sugakusha, (2004) (in Japanese).