Study on the Consolidation of Residential Environments Using Natural Land System

Bull. Univ. Osaka Pref., Ser. B, Vol. 48,
大阪府立大学紀要, 農学・生命科学, 1996

Study on the Consolidation of Residential Environments Using Natural Land System

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(Received October 31, 1995)

Abstract

This study was designed to identify future issues and courses of action in the consolidation of residential enviroments by comparing residential areas developed using natural land system and those developed not using this system, from the point of view of access to greenery, scenic value, exterior mobility and organizing community.

While the study showed that residential areas consolidated using natural land system exhibited superior abundance of greenery, had a more natural appearance, heightened the perception of seasonal change, possessed more scenic diversity and changeability, offered more pleasant views, had easier to understand layouts, and exhibited better community formation through shared maintenance activities, it also exposed the existence of faults such as a cramped sensation caused by complicated topography, danger of crime produced by blind spots, steep slopes restricting movement, lack of exterior mobility, insect pests such as mosquitoes, and a sense of disorderliness. Regarding future issues and courses of action, the study showed that it is extremely important to provide a network of access roads to counter lack of exterior mobility due to remaining undeveloped greenery, and to establish a system for maintaining undeveloped greenery.

Study Goal

Now that harmony the urban environment and nature has become an important theme, there is demand for a method of developing residential areas that uses natural land system including water features, landforms and vegetation. This study was designed to identify future issues and courses of action in the development of residential environments by comparing residential areas developed using natural land system and those developed not using this system, from the point of view of access to greenery, scenic value, exterior mobility and organizing community.

Method of Investigation and Analysis

The two areas of Makitsukadai 1-chome and Harayamadai 3-chome in the Senboku New Town area of Sakai were selected as the representative residential areas using a natural land system, and the two areas of Kashinodai 5-chome and Karibadai 3-chome in the Seishin New Town area of Kobe were selected as the representative residential areas not using this system.

The location of the areas is shown in Figure 1.

The study consisted of a physical study relating to physical conditions in the residential environment of the representative areas, and a perceptual study relating to residents' evaluation of their residential environment.

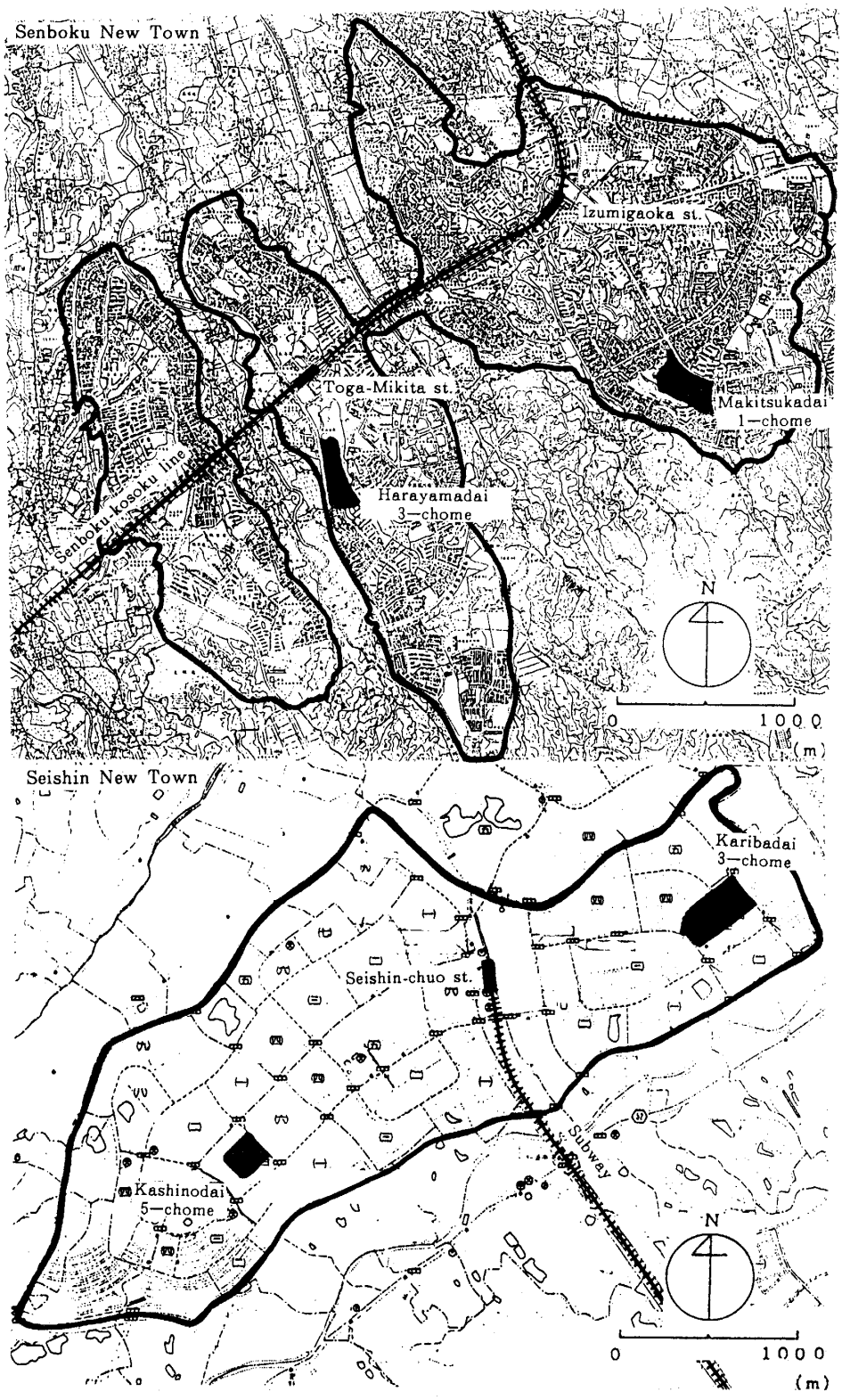

Figure 1 Study Area

Using a field survey and survey of 1:2,500 topographical maps, the physical study provided an understanding of utilization characteristics, topographical characteristics, greenery environment characteristics, and circulation for residents.

The perceptual study was conducted in the form of a questionnaire directly sent and collected by mail in October 1994. The four main aspects mentioned above were subdivided as follows: six items concerning access to greenery, twelve concerning scenic value, six concerning exterior mobility, and six concerning organizing community, giving a total of 30 items (see Figure 6), the presence of absence of which respondents were asked to evaluate in a four-level scale ranging from 'not present' to 'strongly present'. Table 1 shows the number of questionnaires sent, the number of valid responses, the response rate, an analysis of respondents according to certain categories and the percentage of the total represented by each category. There were 336 responses to the survey, suggesting that responses received were primarily from individuals acutely aware of their living environment.

Table 1 The Number of Valid Responses

	Total (persons)			number of floors			the constraction of family	
	the number of questionaires sent	the number of valid responses	the response rate	1~3 floor	4~5 floor	above 6 floor	no child	above one child
Senboku Makitsukadai 1-chome	500	58	11.6%	23 39.5%	15 25.7%	20 34.8%	16 33.3%	42 66.7%
Senboku Harayamadai 3-chome	500	49	9.8%	17 34.7%	20 40.8%	12 24.5%	11 22.9%	37 77.1%
Seishin Kashinodai 5-chome	429	103	24.0%	22 21.6%	20 19.6%	60 58.8%	24 23.3%	79 66.7%
Seishin Karibadai 3-chome	432	125	28.2%	94 75.2%	31 24.8%	0 0.0%	24 19.2%	101 80.8%
Total	1861	336	18.1%	156 46.5%	86 25.7%	92 27.8%	75 22.5%	259 77.5%

In the analysis of the perceptual study, the separate evaluation profiles of each of the four housing complexes were established by awarding evaluation points for each response to the thirty items mentioned above, awarding 0-3 points according to the four-level scale of evaluation, and calculating from this a mean evaluation value and standard deviation. The study also focused on the number of floors in medium- and high-rise apartment buildings occupied by respondents, employing foctor analysis to determine perceptual profile according to number of floors, using data from all respondents regardless of which complex they lived in.

Results of Analysis and Consideration

1) *Findings of Physical Study*

The physical study probed the physical environment of each target area from the point of view of exterior mobility, presence of greenery, and topography.

*Topographical Characteristics

Figure 2 shows a classification of the topographical characteristics of Makitsukadai 1-chome and Harayamadai 3-chome in Senboku New Town on five levels (0-3%, 3-6%, 6-10%, 10-20%, 20 % or above) based on human activity and using the contour-interval method. Also Figure 2 shows the topographical characteristics of Kashinodai 5-chome and Karibadai 3-chome in Seishin New Town classified in the same manner.

This Figure shows much variation in topographical gradient within Makitsukadai 1-chome and Harayamadai 3-chome (Senboku New Town), and reveals that natural topography has been preserved to a significant extent, as seen in the area of fairly steep gradient (twenty percent or more) running through the center and more or less dividing each complex into two parts.

On the other hand, in the large-scale developments at Kashinodai 5-chome and Karibadai 3-chome in Seishin New Town, the topography is level without sloping surfaces, and with gradient kept within zero to three percent.

*Greenery Characteristics

Figure 3 shows the distribution of different types of greenery space and circulation movement for Makitsukadai 1-chome and Harayamadai 3-chome in Senboku New Town. Also this Figure shows the same for Kashinodai 5-chome and Karibadai 3-chome in Seishin New Town.

Figure 3 shows that in both areas of Senboku New Town, remaining undeveloped greenery accounts for about forty percent of total greenery area. Remaining undeveloped spece in Makitsukadai 1-chome meanders in a complicated pattern, twisting among the residential buildings. In Harayamadai 3-chome, the undeveloped space cuts across the center of the complex. On the other hand, the undeveloped space for both areas of Seishin New Town is man-made. In Kashinodai 5-chome, the man-made open space exists as a plaza in the center of the area, with a man-made forest of high trees and shrubs taking up a little over sixty percent. In Karibadai 3-chome, a band of green cuts across the center, again with a man-made forest of high trees and shrubs taking up a little over sixty percent of the greenery area within the complex.

*Circulation Characteristics

Concerning the circulation, Figure 3 shows that footpaths and roads are provided around the residential buildings of Makitsukadai 1-chome, and that there are also many paths through the remaining greenery areas. In Karibadai 3-chome, on the other hand, there are few roads leading across the undeveloped greenery area, which lies centrally between the east and west sides of the development, making considerable detours necessary. In this Figure also showing the circulation in Seishin New Town, it is seen that that because the buildings of Kashinodai 5-chome are gathered around a central plaza, footpaths wind in and out among them. In Karibadai 3-chome, on the other hand, because the wings of the complex are arranged in parallel lines, parking lots and access roads are provided for each block. This means there is little footpath, one of the few examples being the footpath through the band of greenery in the center.

2) *Results of Perceptual Study and Consideration*

*Evaluation Profile of Residential Environment

Figure 4 shows the residential environment evaluation profile of each area studied. The pur-

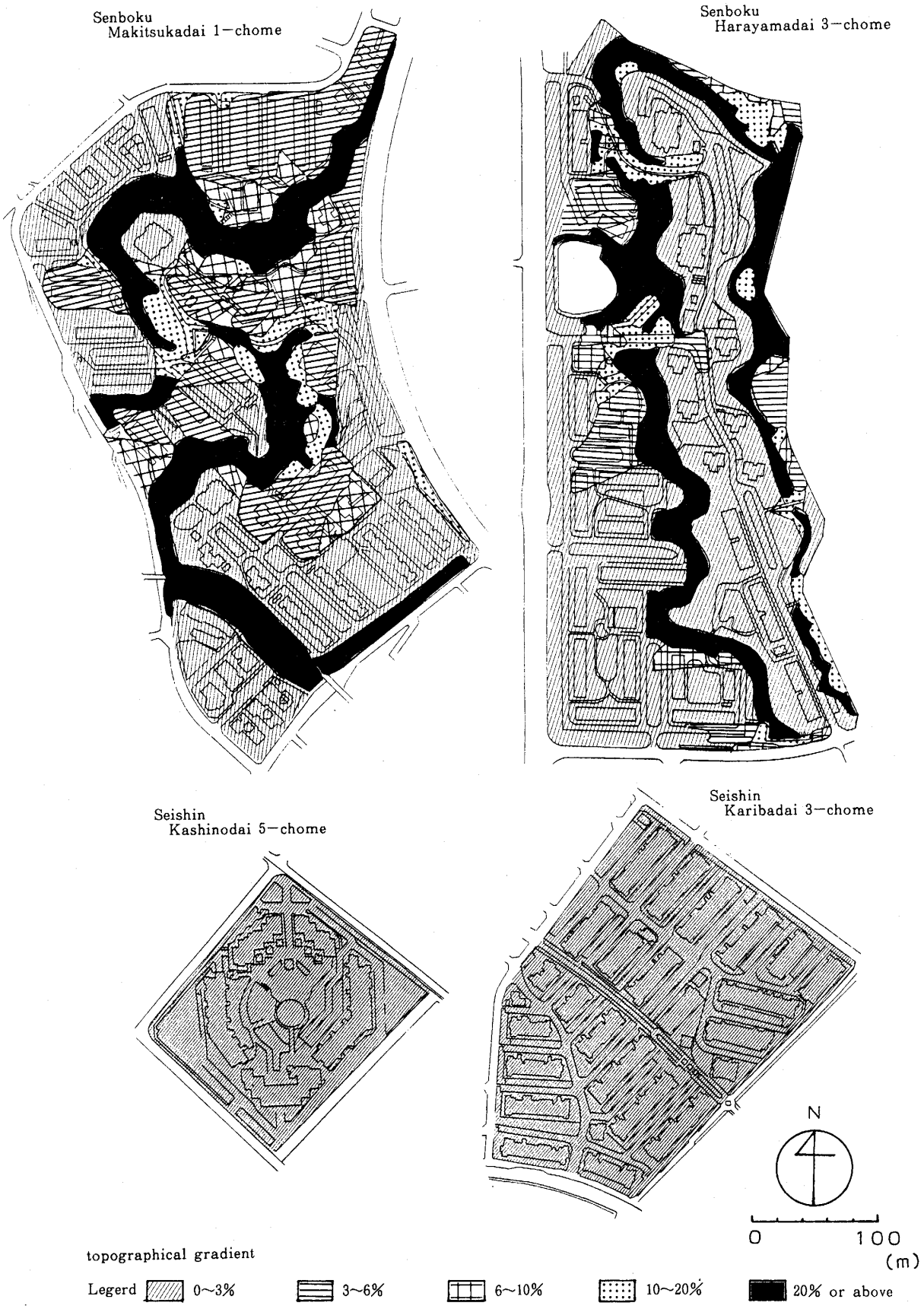

Figure 2 Topographical Characteristics

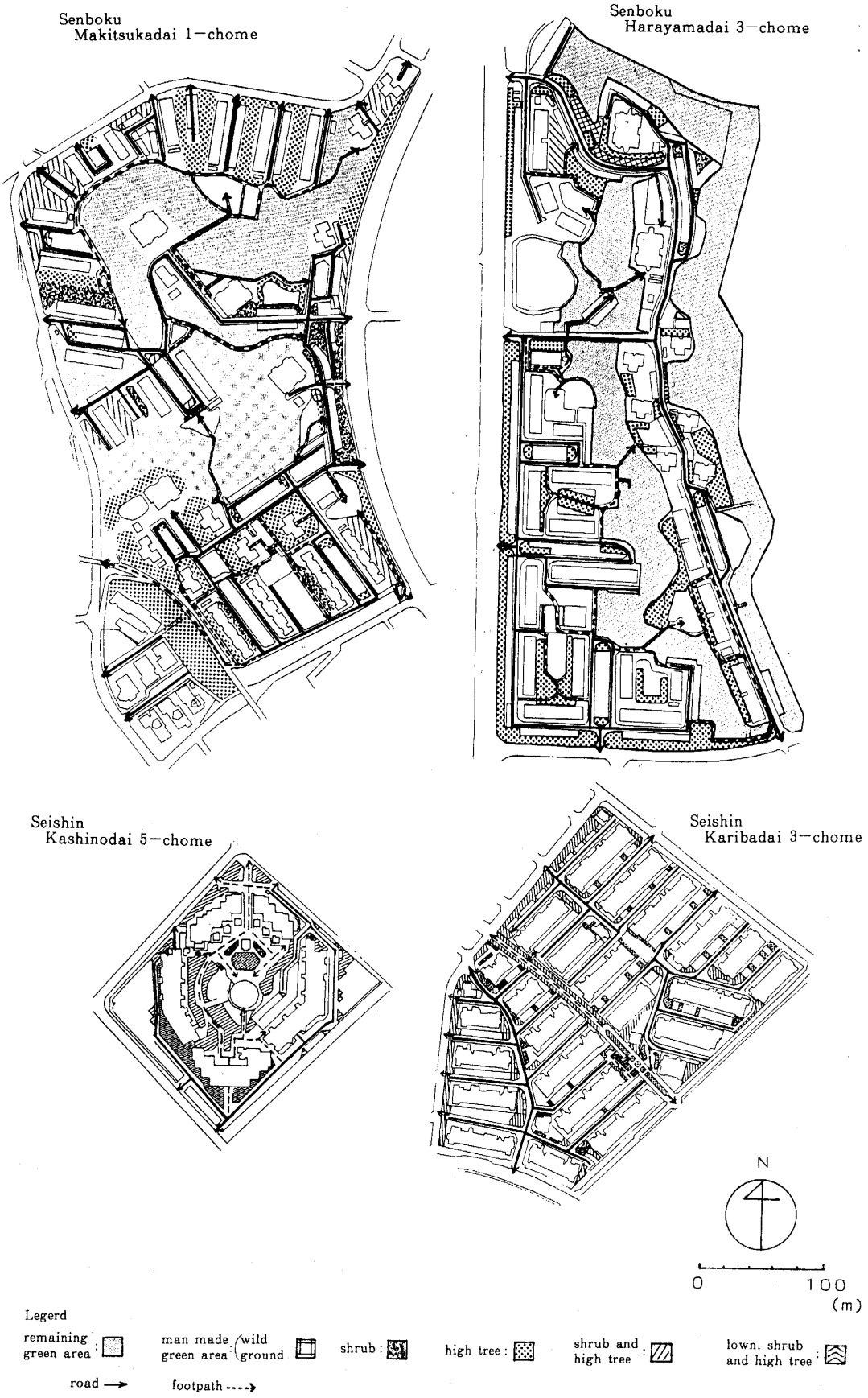

Figure 3 Greenery Characteristics and Circulation

pose of this portion of the study is to determine the ralationship between evaluation profile and physical characteristics.

In access to greenery, the mean evaluation for natural appearance and seasonal change is in the range of 1.5 to 2.0 for the two areas of Senboku New Town, which employ natural land system. The evaluation of both areas is higher than for the two mass-developed areas of Seishin New Town. This is probably accounted for by the existence of remaining undeveloped space within the complexes. There was a significant difference in the evaluation of the presence of insects pests such as mosquitoes; whereas the mean evaluation was about 1.0 for the two areas of mass-developed Seishin New Town, it was about 2.0 for Senboku New Town. This is probably accounted for by insufficient maintenance of remaining undeveloped greenery.

Concerning scenic value, the scenic diversity and changeability of the two areas of Senboku New Town was evaluated more highly. On the other hand, the figures show that the residents of Harayamadai in particular in Senboku felt a sense of being hemmed in, with an evaluation of 0.8. This is probably due to the existence of remaining undeveloped space in a variety of forms which excludes long perspectives. There was also a significant difference in mean evaluation of disorderliness between Senboku New Town(1.0) and Seishin New Town(0.2). This is also probably accounted for by lack of maintenance of undeveloped space in Senboku New Town.

Regarding exterior mobility, there was a significant difference in the mean evaluation for understandability of layout, which was about 1.2 for the two areas of Senboku New Town and about 0.8 for those of Seishin New Town. This is probably due to the topographical features and variety of trees of undeveloped greenery. Complicated topography, on the other hand, results in steep slopes which restrict movement, and increases the danger of crime by producing blind spots.

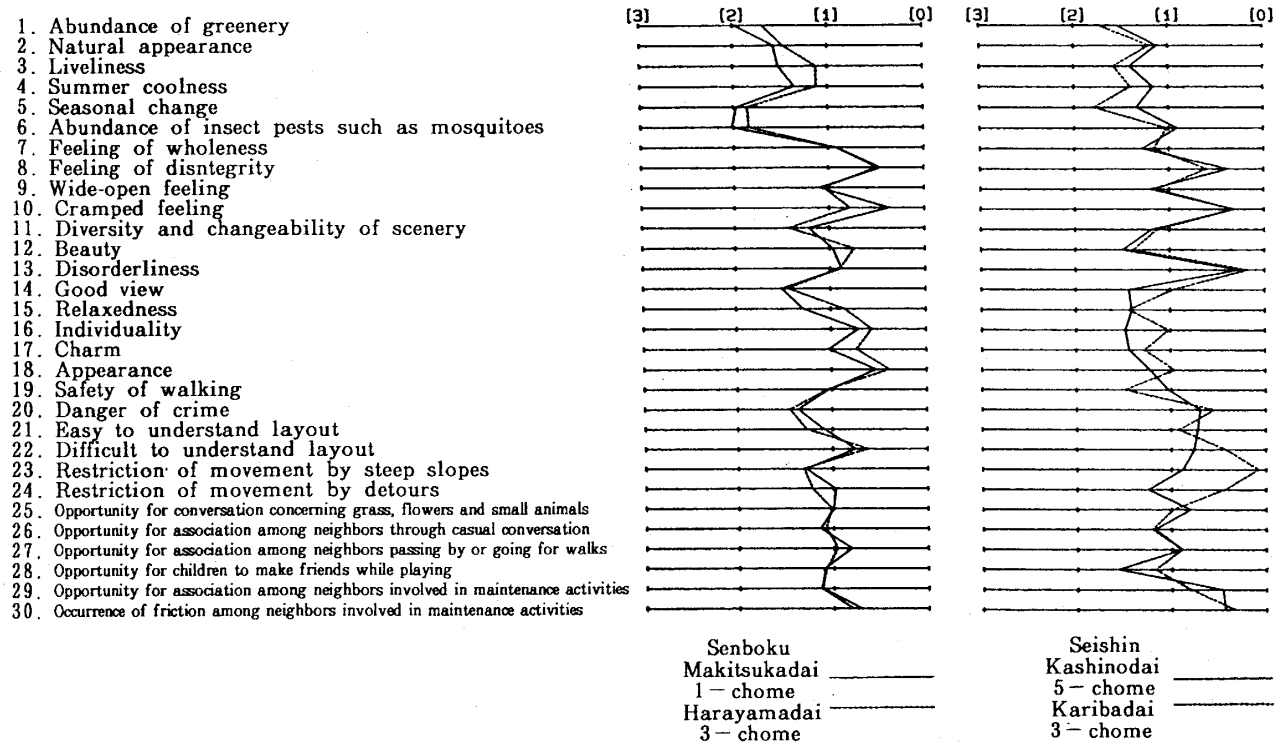

Figure 4 Evaluation Profile of Residential Environment

In the area of community formation, opportunity for association among neighbors passing by or relaxing in nearby open space received the same evaluation of about 1.0 regardless of whether the space was remaining undeveloped space or man-made leisure space. There was however additional opportunity for association in Senboku New Town through involvement in the maintenance of undeveloped greenery.

*Perception Profile According to Number of Floors

Table 2 shows the perception profile according to number of floors, obtained by factor analysis. There was found to be a difference in perceptions according to the number of floors in the residence. The residents of all floors indicated a common concern for the appearance, charm and individuality of the complex in which they live. As for difference according to number of floors, those dwelling on the first (ground level) to third floors indicated an interest in conversations concerning grass, flowers and small animals, whereas those dwelling on the fourth floor or above were strongly concerned with diversity and changeability of scenery. This is probably because there is more contact with the ground on the first to third floors, and a better view from the fourth floor up.

Table 2 Result of Factor Analysis According to Number of Floors

	1 ~ 3 floor	4 ~ 5 floor	above 6 floor
the first factor	18. Appearance 17. Charm 15. Relaxedness 16. Individuality	16. Individuality 17. Charm 18. Appearance	23. Restriction of movement by steep slopes
the second factor	25. Opportunity for conversation concerning grass, flowers and small animals	1. Abundance of greenery 2. Natural appearance	11. Diversity and changeability of scenery 14. Good view
the third factor	23. Restriction of movement by steep slopes 24. Restriction of movement by detours	11. Diversity and changeability of scenery	18. Appearance 17. Charm

Conclusion

Regarding future issues and courses of action for consolidation of residential environments using natural land system, the following can be said:

Table 3 shows the strong and weak points of residential areas using natural land features, with regard to access to greenery, scenic value, exterior mobility and organaizing community. As indicated by Table 3, the study showed that residential areas developed using natural land system exhibited superior abundance of greenery, had a more natural appearance, heightened the perception of seasonal change, possessed more scenic diversity and changeability, offered more pleasant views, had easier to understand layouts, and exhibited better community formation through shared maintenance activities, but it also exposed the existence of faults such as a cram-

ped sensation caused by complicated topography, danger of crime produced by blind spots, steep slopes that restrict movement, lack of exterior mobility, insect pests such as mosquitoes, and disorderliness.

As for future issues and courses of action for development of residential environments using natural land system, in order to maximize the merits of this method and minimize its weaknessses, it is important to provide a network of access roads to remedy lack of interior mobility caused by remaining undeveloped space, and to establish a system for maintaining remaining undeveloped greenery.

Table 3 Result of Evaluation of Residential Environment using Natural Land System

goodness	badness
<access to greenery>	
1. Abundance of greenery 2. Natural appearance 4. Summer coolness	6. Abundance of insect pests such as mosquitoes
<scenic value>	
11. Diversity and changeability of scenery 14. Good view	10. Cramped feeling 13. Disorderliness
<exterior mobility>	
21. Easy to understand layout	23. Restriction of movement by steep slopes 20. Danger of crime
<community>	
29. Opportunity for association among neighbors involved in maintenance activities	30. Occurrence of friction among neighbors involved in maintenance activities

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