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## Research on Creating Attractiveness in Waterfront Scape

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### Abstract

In this research into waterfronts as representing the mid-distance landscape of a city, photomontage was used to construct a basic compositional model through manipulation of the configuration of buildings which is the central element of the mid-distance landscape, and their background and foreground. Next, a landscape planting model, consisting of landscape planting introduced to the basic compositional model, was produced. The results of landscape evaluations made using these images demonstrated the importance of the configuration of buildings central to the mid-distance landscape, and their background and foreground, as they present a key outward expression of the city. The evaluation of cluster-type and high-rise wall-type building configurations in the central area was high, while port facilities were an important element of the foreground. A mountainous background was also found to be advantageous. Furthermore, it became clear that a turf embankment in the foreground is a factor in enhancing the evaluation of a city's attractiveness and completeness.

### Research Goal

The mid-distance skyline, which takes in the full view of a city, engenders a variety of feelings about a city: a sense of eagerness and anticipation when visiting it, or a sense of relief when leaving it. Improving this landscape is of great importance in creating the identity of a city.

In this research, the waterfront, which is representative of the mid-distance landscape of a city, was concentrated on. A basic compositional model was constructed using photomontage to manipulate the configuration of buildings central to the mid-distance landscape and their background and foreground. Next, a landscape planting model, consisting of landscape planting introduced to the basic compositional model, was produced. The purpose of this research was to use landscape evaluation of the models to determine which factors contribute to the attractiveness of the mid-distance landscape, and to find ways of promoting these through introduction of landscape planting.

### Research Methods

#### 1) Production of the Simulation Model

The basic compositional model was used to manipulate the configuration of buildings central to the mid-distance landscape and their background and foreground. With respect to the configuration of buildings central to the landscape, building height and position were manipulated to vary the skyline composition and the vertical density. Ten types were determined: 3 single-peak types, 3 two-peak types, 2 three-peak types and 2 multi-peak types.

Next, from the perspective of background composition and amount of greenery, two types of background were determined – one with mountains, and one without. For the foreground, from the perspective of the atmosphere of the waterfront, 3 types were determined : a masonry

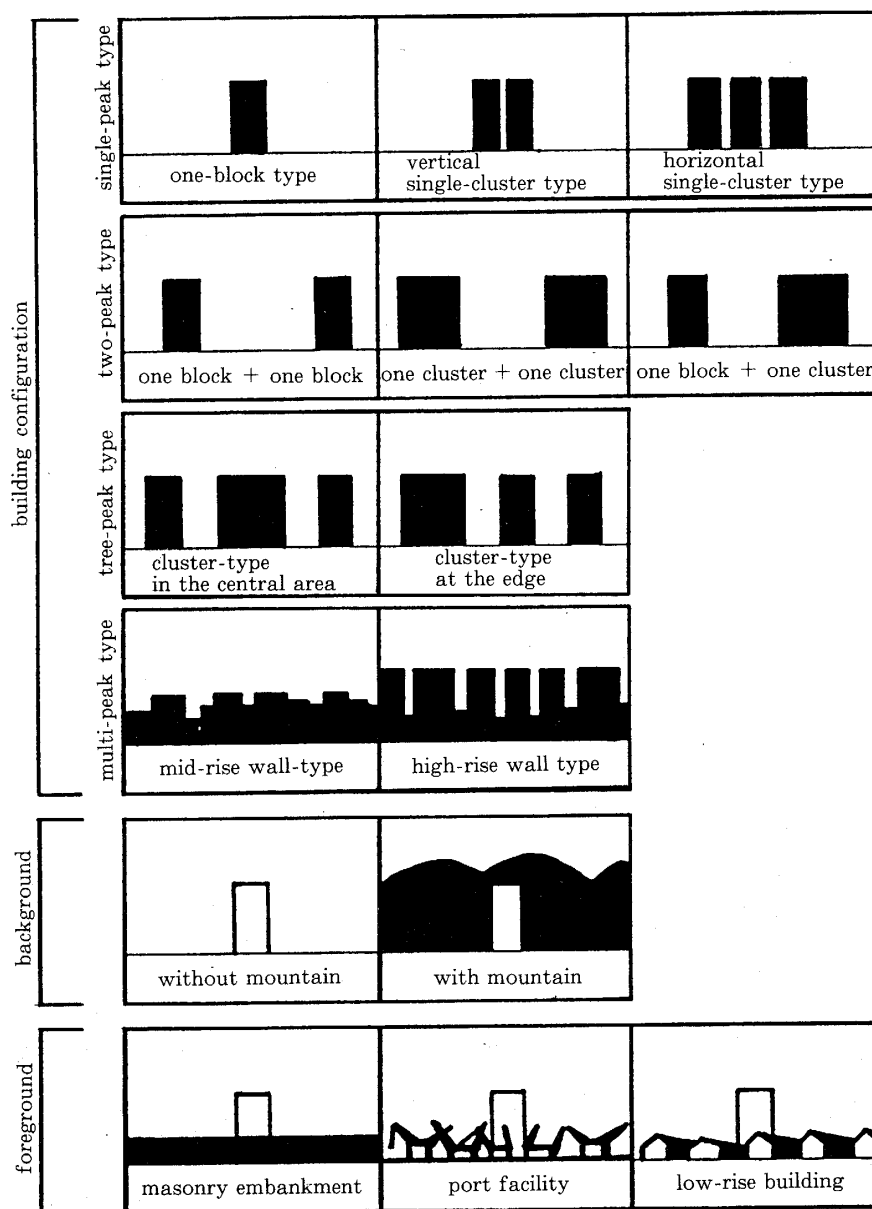


Fig. 1 Basic compositional model patterns

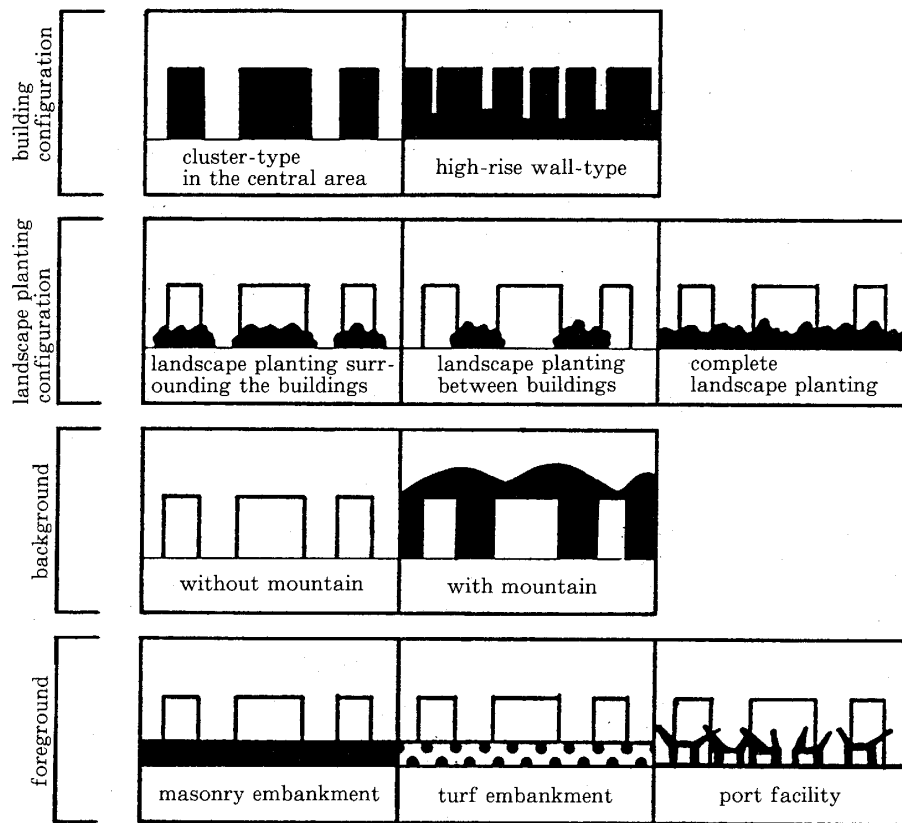


Fig. 2 Landscape planting model patterns

embankment, port facilities and low-rise buildings. Based on 10 types created by manipulating these building configurations, foreground and background were further manipulated to produce 60 models. Figure 1 shows the basic compositional model.

The construction of the landscape planting model was based on the basic compositional models judged to have the building configuration with the highest 'enjoyability' evaluation – i.e. the single central cluster and the high-rise wall-types. 3 types of landscape planting were introduced – landscape planting surrounding the buildings, landscape planting between the buildings and complete landscape planting; two types of background – one with mountains and one without; and three types of foreground – a masonry embankment, port facilities and low-rise buildings. In total, by manipulating each of these factors, 36 models were created. Figure 2 shows the landscape planting model patterns.

## 2) Evaluating survey

To obtain landscape evaluations, printout images of the above simulation models were used as a stimulus medium, and an evaluating survey of 36 subjects was carried out using a 4 level-scale from 'feel strongly' to 'do not feel' with respect to 8 criteria from tastefulness to dramatic impression. Then the results of the principal component analysis were discussed.

## Results and Discussion

### 1) Basic Compositional Models

Table 1 shows the eigenvector, eigenvalue and coefficient of determination. In this research, up to the second principal component, which has an eigenvalue of 1 or over, was used.

In the first principal component, since the eigenvector for the evaluating criteria 'variety', 'activity', 'enjoyability', 'culture' and 'dramatic impression' was high, it was judged that the first principal component indicated "the city's enjoyability". In the second principal component, since the main eigenvector for the evaluating criteria 'tastefulness', 'legibility' and 'harmony' was high, it was judged that the second principal component indicated "the city's completeness."

Figure 3 shows the results of the evaluations of the city's enjoyability and the city's completeness, the first and second principal components in the basic composition model, in a two-dimensional cluster diagram of the principal component score for 60 models, with examples of representative models. In capturing the city's enjoyability, the first axis of the evaluation, models which earned a high evaluation were those with mountains in the background and port facilities in the foreground, regardless of building configuration, represented by model 50; and those with a building configuration of a single central cluster or a wall of high-rise buildings, regardless of foreground and background, represented by models 28, 50, and 21. On the other hand, regardless of building configuration and background, models featuring a masonry embankment or low-rise buildings in the foreground received an overall low evaluation. Particularly low were those models with one-block or mid-rise wall-type configuration, represented by models 57 and 3. Also, in capturing the second evaluation axis, the city's completeness, models which earned a high evaluation were those with a masonry embankment or low-rise buildings in the foreground, regardless of building configuration or background, represented by models 28 and 39. Models receiving a low evaluation were those with no mountains in the background and port facilities in the foreground, regardless of building

Table 1 Landscape evaluation of basic compositional models (eigenvector)

	1st principal component (city's enjoyability)	2nd principal component (city's completeness)
tastefulness	0.189	0.417
legibility	-0.160	0.532
variety	0.450	-0.171
activity	0.398	-0.359
enjoyability	0.458	0.151
culture	0.444	0.055
harmony	0.069	0.552
dramatic	0.406	0.233
eigenvalue	3.764	2.424
coefficient of determination	0.470	0.773

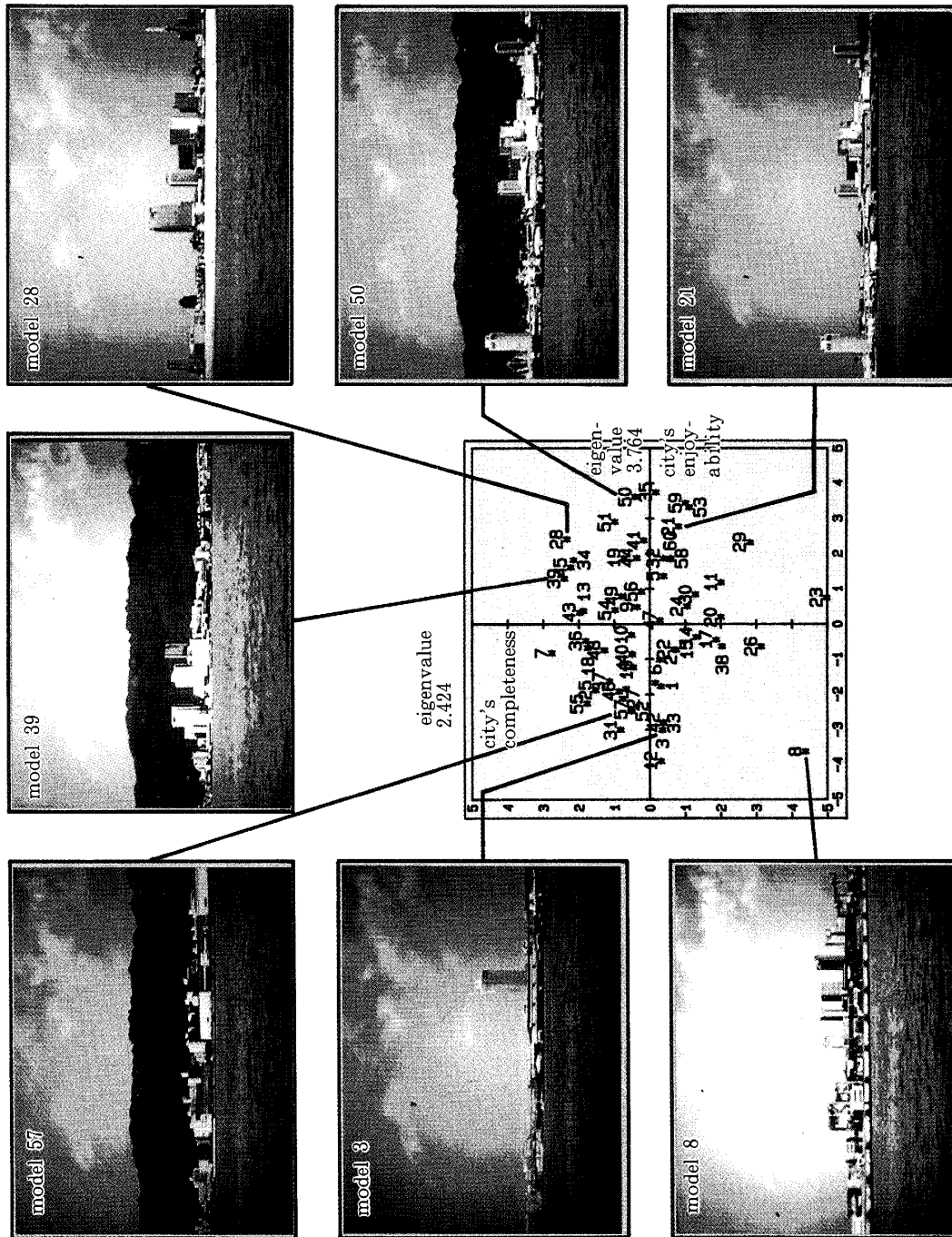


Fig. 3 Result of landscape evaluation of basic compositional models

configuration.

The above analytical results indicate that evaluation of the enjoyability of a city can be judged according to the building configuration, with those having a high vertical density, such as a single central cluster or high-rise wall, earning a high evaluation. The evaluation of a city's completeness can be said to be judged according to its foreground. The evaluation of models with a masonry embankment or low-rise buildings in the foreground was high, whereas a foreground consisting of port facilities was a negative factor in city's completeness evaluation.

The model of a city with a superior balance between enjoyability and completeness was model 28, while the one with superior enjoyability was model 50.

## 2) Landscape Planting Models

Table 2 shows the eigenvector, eigenvalue and coefficient of determination. Here as well, in the same way as the basic composition model mentioned above, up to the second principal component, which has an eigenvalue of 1 or over, was used.

In the first principal component, since the main eigenvector for the evaluating criteria 'tastefulness', 'enjoyability', 'culture' and 'dramatic impression' was high, it was judged that the first principal component indicated "the city's attractiveness". In the second principal component, since the main eigenvector for the evaluating criteria 'legibility' and 'harmony' was high, it was judged that the second principal component indicated "the city's completeness."

Figure 4 shows the results of the evaluations of the city's attractiveness and the city's completeness, the first and second principal components in the landscape planting model, in a two-dimensional cluster diagram of the principal component score for 36 models with examples of representative models. In capturing the city's attractiveness, the first axis of the evaluation, models which earned a high evaluation were those with a turf embankment, regardless of building configuration, background or landscape planting configuration, represented by models 6 and 31; and models with building configuration of a single central cluster, mountains in the

Table 2 Landscape evaluation of landscape planting models (eigenvector)

	1st principal component (city's attractiveness)	2nd principal component (city's completeness)
tastefulness	0.394	0.251
legibility	0.089	0.529
variety	0.249	-0.462
activity	0.236	-0.482
enjoyability	0.485	0.076
culture	0.407	-0.188
harmony	0.308	0.414
dramatic	0.473	-0.011
eigenvalue	3.787	3.133
coefficient of determination	0.473	0.865

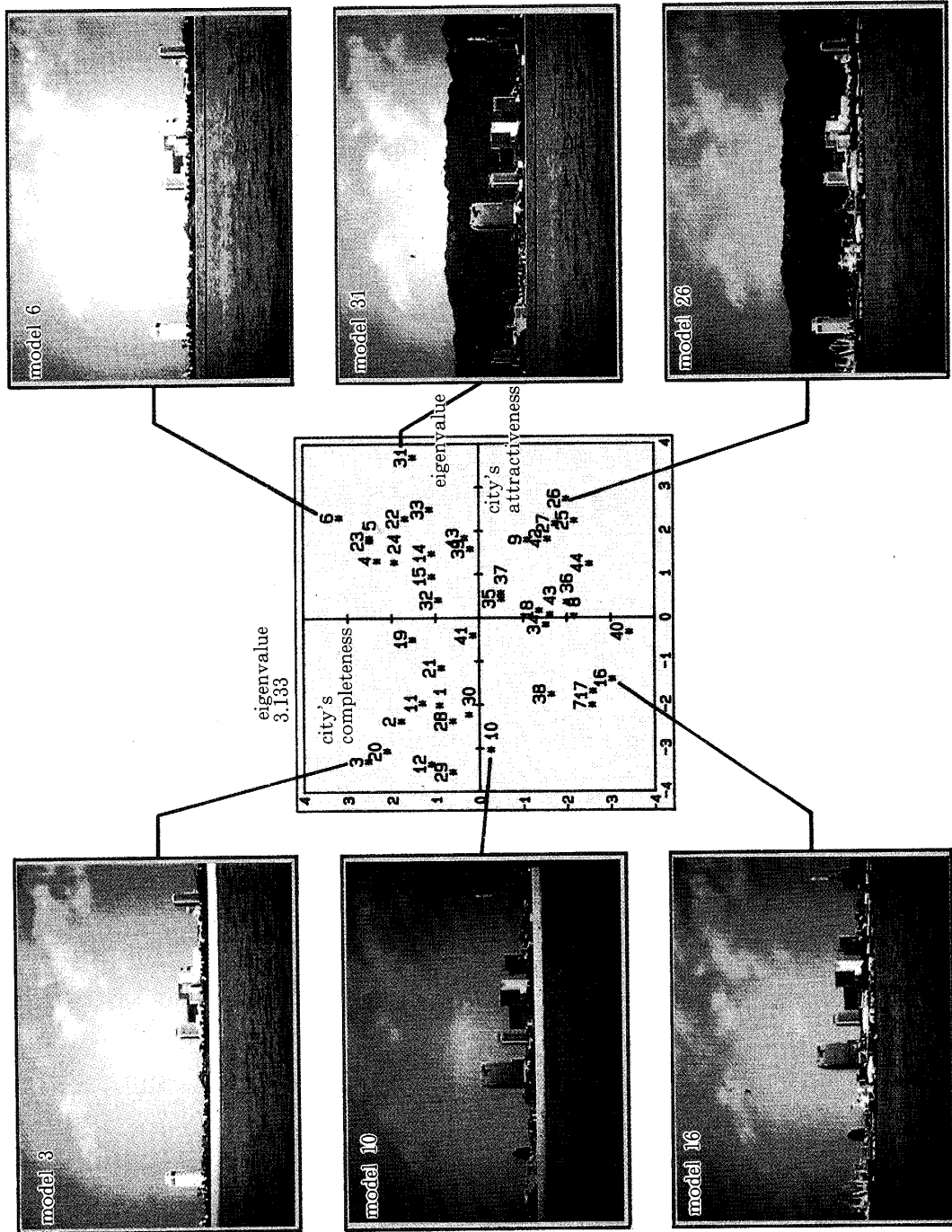


Fig. 4 Result of landscape evaluation of landscape planting models



background and port facilities in the foreground, represented by model 26. At the same time, models with a masonry embankment or port facilities in the foreground, regardless of building configuration, background and landscape planting, were overall low. Of these, models with no mountains in the background, represented by models 3, 10 and 16, and models with a masonry embankment in the foreground, represented by models 3 and 10, scored particularly poorly. Also, in capturing the second evaluation axis, the city's completeness, models which earned a high evaluation were those with a building configuration of a single central cluster, regardless of background or landscape planting, represented by model 6, and models with a masonry embankment in the foreground or with a turf embankment, represented by models 6 and 3. Models receiving a low evaluation were those with port facilities in the foreground, regardless of building configuration, background or landscape planting configuration, represented by models 26 and 16. Furthermore, no great differences with respect to landscape planting were apparent, but models introducing complete landscape planting gained an overall higher evaluation of the city's completeness, as seen in models 6 and 3.

The above analytical results indicate that cities whose building configuration is a single central cluster earned a high evaluation. Cities with a turf embankment in the foreground were awarded high evaluations for the city's attractiveness and completeness. Port facilities improved the city's evaluation for attractiveness, while a masonry embankment raised its completeness evaluation regardless of background or landscape planting. Also, while differences in the landscape planting configuration had a powerful effect on evaluating, the introduction of landscape planting increased the city's completeness evaluation regardless of the landscape planting configuration. The model of a city with superior city's completeness was model 6, while the one with superior city's attractiveness can be given as model 31.

### Conclusion

The results of the above analysis indicate that in the building configuration central to mid-distance landscape, single-cluster and high-rise wall-type configurations, whose vertical density is high, receive a high evaluation. The presence of mountains in the background was considered an effective factor in awarding a city a high attractiveness evaluation. Furthermore, effective foreground factors included port facilities, which enhanced the city's attractiveness evaluation; a masonry embankment, which added to its completeness evaluation, and a turf embankment, which raised the city's evaluation on both city's attractiveness and city's completeness. Therefore, in the waterfront scape, through which the city's mid-distance landscape is represented, the buildings which form the landscape's core and the foreground are important for the outward expression of the city they present. Moreover, landscape planting is a subordinate element in the presentation of that expression, which may be considered necessary to present the city in a way that suits its personality.

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