

A Study on Evaluation of District Development Projects in Osaka Bay Area

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Abstract

In the bay area of Tokyo and Osaka, many projects for creating future cities as well as for solving the problems of the inner cities are being conceptualized, planned and enforced. The projects are aimed at developing increased economic activity and standards of living, thereby leading to the expansion of profitable opportunities for business enterprises.

Because many of these projects are very large and complicated, business enterprises must take a comprehensive view and make accurate judgements, supported by keen inspirations and superior experiences, in order to make a wise decision regarding participation. The ability to make such judgements will become more important in the future. For this reason, an attempt to measure a project in numbers is indispensable for future business activities. To achieve this purpose, we need a model to reveal the mechanisms of an individual project that would allow a possible participant to evaluate the district development project comprehensively and accurately before making a final decision.

In this research, I have an attempt to evaluate the Osaka Bay district development project using the AHP (Analytic Hierarchy Process) method.

1. Introduction

In the bay area of Tokyo and Osaka, many projects for creating future cities as well as for solving the problems of the inner cities are being conceptualized, planned and enforced. The projects are aimed at developing increased economic activity and standards of living, thereby leading to the expansion of profitable opportunities for business enterprises.

Because many of these projects are very large and complicated, business enterprises must take a comprehensive view and make accurate judgements, supported by keen inspirations and superior experiences, in order to make a wise decision regarding participation. The ability to make such judgements will become more important in the future. For this reason, an attempt to measure a project in numbers is indispensable for future business activities. To achieve this purpose, we need a model to reveal the mechanisms of an individual project that would allow a possible

participant to evaluate the district development project comprehensively and accurately before making a final decision.

However, such assessment is often carried out based on multipurpose evaluation standards. Specially in the modern society where people hold different value systems, multipurpose evaluation standards may conflict with each other calling for trade-off in which the standard of certain purpose goes down when those of other purpose is raised. How to deal with trade-off for making overall balanced decision is an important issue. A multipurpose decision making model provides a systematic, scientific method for such a multipurpose system.

From this perspective, Thomas L. Saaty has presented a decision making method called the AHP¹⁾ (Analytic Hierarchy Process) for uncertain conditions and various evaluation standards. This method is one of problem-solving type decision making methods and combines subjective judgement and system approach adeptly in analyzing problems.

This method, however, requires pair comparison again if an alternative or alternatives are added. Further the frequencies of pair comparison (nC_2) increases at the higher rate as the number of alternatives increases, making it difficult to carry out many pair comparisons at a time. It is also observed that consistency deteriorates. (refer to bibliography 2)

To correct the above defects, Saaty has presented an Absolute Measurement method³⁾. In this method, however, the method of calculation may be differed depending on the nature of data of alternatives when applied to actual social problems. The author presents concrete computation methods for crisp and fuzzy data of alternatives²⁾.

In this research, I have an attempt to evaluate the district development projects in Osaka Bay area using the AHP (Analytic Hierarchy Process) method presented in the bibliography 2).

2. Outline of Overall Osaka Bay Area Plan and Individual Projects

The Osaka Bay area covers districts between Ako city, Hyogo prefecture and Kainan city, Wakayama prefecture.

The area played an important role as one of the primary heavy and chemical industry areas in Japan since the Meiji era. With intensifying industrial structure change, however, stop of population increase, decrease of factories, and also slowing down of increase in harbor demands are observed in the area producing re-developable sites.

On the other hand, reconsideration is given to the Osaka Bay area at the opportunity of constructing the large-scale Kansai International Airport operating 24 hours in conjunction with the

worldwide water front development. Expecting a role of a pilot area for constructing a multifarious function dispersion country to the Osaka Bay area, overall development of the area is being implemented to realize the role.

Broad, composite area development projects unlike conventional ones are being implemented in the Osaka Bay area centering about the construction of the international airport, including construction of access traffic networks, realization of international urban functions, development of existing industries and growing of new industries, full provision of living spaces such as dwellings, and creation of leisure functions.

The total number of projects in the Osaka Bay area is 154 and the funds amount to 15 trillion 6 hundred billion yen (as of January 1993). Of them 25 are big projects funded exceeding a hundred billion yen.

Projects for consumption and leisure functions, culture and recreation functions, and business and service functions are specially noticeable revealing that the projects aim at the creation of urban functions suitable for the change of age.

3. Area Development Projects Assessment Policies

3-1 Policies in Business Strategies

The Osaka Bay area projects are very big in the scale but it can not be denied that some projects are being cut down in the scale or postponed and new projects are being reduced reflecting the recent deterioration of economic environments. Conversely speaking, enterprises should have definite policies for making decision at this time of the age on whether or not they should participate in the projects.

3-2 Selection of Evaluation Criteria

According to the survey on the conditions of renting rooms in office buildings conducted by the Japan Building Association, pointed out mostly are the conditions of location and the room rent except for the interior conditions such as furnishings and equipment. The two factors are seemingly sufficient enough as evaluation criteria, but the conditions of location include various elements and it is difficult to evaluate just on the conditions of location. The room rent is actually determined according to the land rent. After all, traffic convenience, image of the location, land rent, and business concentration were adopted as criteria.

3-3 Selection of Alternatives

In this study, 72 projects are selected and those associated with amusement and social infrastructures are excepted because the

The inner product (e_{2j}^*) of the eigenvector acquired by pair comparison multiplied by the ratio of the image of the region is divided by the maximum value of the inner product, and the quotient (S_{2j}^*) is taken as the judgement value for the image of the region. The value is given to the projects involved in the corresponding region.

The results of computation are shown in Table 5.

Table 5 Judgement Values of Regions on Images

Region	Osaka City	Port Town	Hokusetsu	Hanshin
Judgement value	0.867	0.655	0.645	0.647
Rinku	Minami-Osaka	Keihan	West of Kobe	Port Island
	0.830	1.000	0.649	0.627

(3) Land Prices (Crisp Data)

Judgement values for land price were obtained by dividing the reciprocals (e_{3j}) of posted land prices of the cities, towns, and villages involved in the projects by the maximum values of the reciprocals. The quotients (S_{3j}) are taken as judgement values. The method was employed so that low land prices should be appraised high.

(4) Business Concentration (Fuzzy Data)

With business concentration, the ranks of evaluation were compared in pair. The results are shown in Table 6.

Table 6 Pair Comparison of Business Concentration

	Absolutely high	Very high	Fairly high	Slightly high	Not high	Eigen-vector
Absolutely high	1	3	4	6	9	0.5129
Very high	1/3	1	2	3	5	0.2218
Fairly high	1/4	1/2	1	2	4	0.1399
Slightly high	1/6	1/3	1/2	1	3	0.0855
Not high	1/9	1/5	1/4	1/3	1	0.0403

The five ranks were determined according to the standards given in Table 7. The quotients (S_{4j}^*) of the eigenvectors (e_{4j}^*)

divided by the maximum eigenvector were taken as the judgement values of the projects.

Table 7 Standards of Business Concentration

Absolutely high	3.000 firms/km ² or over
Very high	1.500 firms/km ² or over
Fairly high	1.000 firms/km ² or over
Slightly high	500 firms/km ² or over
Not high	Less than 500 firms/km ²

Judgement values on each of four criteria and overall judgement values (10 values from the highest) are shown in Table 8.

Table 8 Table of Judgement Values (10 projects of High Judgement Values from the Highest)

Rank	Overall Judgement values	Traffic convenience	Image	Land Price	Business consumption	Region	Function
1	0.874	1.000	0.867	0.253	1.000	1	1
2	0.838	0.726	0.867	0.263	1.000	1	1
3	0.825	0.480	0.867	0.421	1.000	1	7
4	0.514	0.178	0.867	0.550	0.432	1	2
5	0.513	0.375	0.867	0.335	0.432	1	1
6	0.513	0.285	0.867	0.428	0.432	1	2
7	0.466	0.525	0.867	0.440	0.273	1	3
8	0.437	0.118	0.645	0.416	0.432	3	4
9	0.399	0.427	0.867	0.440	0.167	1	2
10	0.382	0.176	0.649	0.550	0.273	8	2

Refer to 5-2 (2) for the region numbers and 3-3 for the function numbers.

The names of the projects are not referred to. It is likely that the projects in the regions of high business concentration and traffic convenience show high overall judgement values. As a result, the closer to the urban regions, the higher the priorities.

The regions in the Osaka Bay area are shown in Fig. 2.

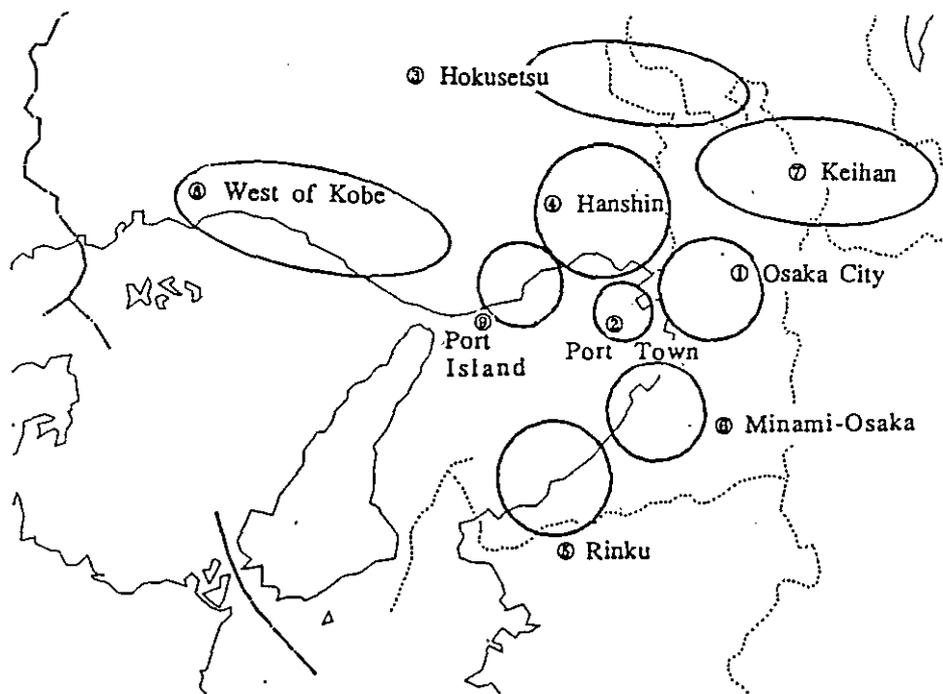


Fig. 2 Project Distribution in Osaka Bay Area

6. Conclusion

In this study, the area development projects in the Osaka Bay area were assessed by the AHP method presented in the bibliography 2). The key points of the study are;

- (1) Many alternatives (72 area development projects) could be assessed by the AHP method. Even if new projects are added, assessment can be made easily.
- (2) Crisp data (traffic and price) and fuzzy data (image and business concentration) could be assessed on each criterion and combined.
- (3) The most dominant evaluation standards in the overall assessment of the projects was business concentration influencing decision approximately 50%, followed by approx. 23% of image and approx. 13% of traffic and price.
- (4) Many of the projects appraised highly are involved in Osaka City. This may be explained by the fact that the most dominant evaluation standards is business concentration.

A subject for a future study will be the analysis of such project assessment in management strategic approach.

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