

A Comparative Site Evaluation Study for Relocating Government Agencies out of Tokyo

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1. Introduction

This paper composes a study on an ongoing decision-making project in Japan, called "Relocation of the Diet and other Government Organizations out of Tokyo." Tokyo, with a population of more than 10 million, is one of the largest megalopolises in the world. It has been suffering from many urban problems, e.g. residence, transportation, pollution, health care and natural disaster preparedness. In an effort to solve such urban problems, the Diet of Japan has decided to relocate several government agencies out of Tokyo, and a bill to transfer the Diet, Governmental Agencies and the Supreme Court to a new capital was approved by the Diet in 1992. The aim of this separation is to create a 'Washington D.C.' in Japan, and to allow Tokyo to maintain itself in a manner similar to New York. This is a huge project with total budget of more than 12 trillion yen (about 10 billion U.S. dollars). A council consisting of 19 "wise men" has been appointed by the Prime Minister to decide on the best site. The Council (chaired by Professor Emeritus Wataru Mori of the University of Tokyo) selected 10 candidate sites by August, 1999. They are Miyagi (A), Fukushima (B), Tochigi (C), Tochigi/Fukushima (D), Ibaraki (E), Shizuoka/Aichi (F), Gifu/Aichi (G), Mie (H), Mie/Kio (I), and Kio (J).

By the end of December 1999, the Council chose two sites, one from the North-East part and the other from the Central part of Japan as candidates for the best relocation site. We could not discriminate between the two sites with respect to the multiple criteria chosen for evaluating sites. The Council recommended the two sites to the Prime Minister. The Prime Minister reported this conclusion to the Diet. This topic is currently the focus of political discussions at the Diet.

2. Main Criteria and Hierarchy Structure

The Council selected the following three categories of criteria as crucial for evaluating the sites for the location of the new capital:

1. Influence on the future of the country

- (B1) Direction for reorganizing the na-

tional structure

This criterion is further divided into:

- (C1) Direction of reform of national land structure
- (C2) Rectification of the excessive concentration of activities in Tokyo
- (C3) Direction of culture formation
- (C4) Ease of correspondence with a new information network
- (C5) Speedy response in the large-scale disaster

2. Conditions for establishing the capital city functions

- (C6) Ease of access to foreign countries
- (C7) Ease of access to Tokyo
- (C8) Ease of access to the whole country
- (C9) Appeal of the landscape
- (C10) Safety in the event of an earthquake disaster
- (C11) Safety in the event of a volcanic eruption

3. Conditions for suitability of the new location

- (C12) Feasibility of the smooth acquisition of land
- (C13) Suitability of topographical features
- (C14) Safety against flood and sediment disasters
- (C15) Stability of water supply
- (C16) Suitability on relation to the existing cities
- (B2) Environmental issues

This criterion is divided into:

- (C17) Harmony with the natural environment
- (C18) Possibility of lessening the environmental load

3. Summary of Group Decision

We describe the processes of group decision-making among the Council members and summarize the results.

3.2 Scores of 10 Sites vs. 18 Criteria

These values were obtained from expert teams consisting of 5 specialists on average. The scores were measured by an absolute value ranging from 5 (the best) to 1 (the worst).

3.3 Weights of 18 Criteria by Council

We employed a multi-stage use of an AHP-like method for 18 of the 19 Council members. Actually, this process converged at the third stage. Each member has 100 points allotted for this evaluation and the 100 points are divided and assigned to the 18 criteria according to his/her individual judgement. It is observed that criteria C5 (Speedy response in the large-scale disaster), C10 (Safety in the event of an earthquake disaster), C12 (Feasibility of the smooth acquisition of land) and C4 (Ease of correspondence with a new information network) have high scores on average. However, a large diversity in evaluations exists reflecting significant disagreement among the Council members.

3.4 Decision Analyses using AHP Results

By using the average and the median of the group AHP results, we obtained the corresponding scores of each site, as exhibited in Table 1. This table suggests the sites C (Tochigi), D (Tochigi/Fukushima) and G (Gifu/Aichi) as promising candidates.

Table 1: Average and Median of Scores of 10 Sites

	A	B	C	D	E
Average	321	325	344	351	333
Median	308	310	328	334	317
	F	G	H	I	J
Average	316	340	310	299	298
Median	302	328	297	287	287

3.5 Decision Analyses using AR Model

We now turn to the evaluation of candidate sites by means of the assurance region (AR) model of Data Envelopment Analysis. We have a shortfall in the number of degree of freedom for discriminating efficiency among 10 candidates even if we employ the AR model.

First, we estimated the lower/upper bounds L_{ij} and U_{ij} on the ratio of criteria i and j in (1) by

$$L_{ij} = \min_{k=1, \dots, 18} \frac{W_{ki}}{W_{kj}}, \quad U_{ij} = \max_{k=1, \dots, 18} \frac{W_{ki}}{W_{kj}}. \quad (1)$$

We employ these bounds for the AR model. If enough discrimination among candidates both in "Positives" and "Negatives" cannot be observed, we apply the following deletion processes. We delete the ks giving the min and max ratio in

(1) and estimate the min and max again using (1). Thus, we remove 2 extreme ratios at each trial. Our experiments showed that after 6 deletions, thus using the remaining 6 (=18-12) ratios, we reached a sufficient and stationary evaluation of sites, as depicted in Figure 1. From this figure, we can observe that two sites D (positive=1, negative=0.894) and G (positive=1, negative=0.898) are excellent in "positives" as well as in "negatives." The site C is a little behind D and G.

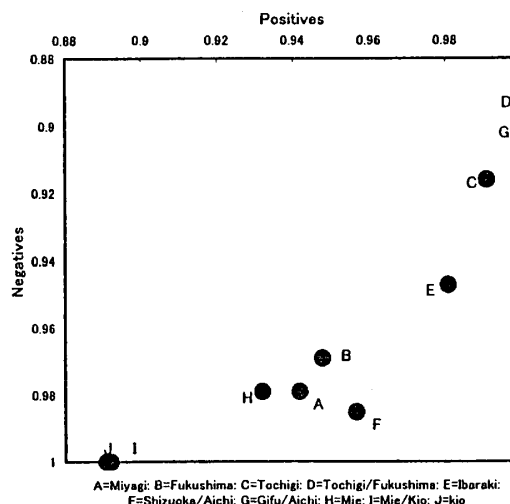


Figure 1: Positives and Negatives of 10 Sites

3.6 Decision by the Council

From the above analyses, the Council acknowledged the sites C, D and G as the most promising candidates for this site selection problem. However, since site C (Tochigi district) is a part of site D (Tochigi/Fukushima district), the Council has decided to recommend the two sites D and G as final. It is very hard to discriminate between D and G from their scores, since they have different characteristics in the criteria chosen.

Note: The views in this paper are those of the author and are not necessarily indicative of those of the National Land Agency, Japan.

References

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