Research on Location of BJ Airport Based on Analytic Hierarchy Process

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Abstract

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With the rapid growth of economy and the continuous gathering of population, it is difficult for the existing capital BJ airport to carry the increasing passenger flow, so discussing the location of the new airport is an important strategic measure to solve the traffic pressure and promote the regional economic development. This paper provides a scientific decision-making method, which is not only suitable for the location of BJ airport, but also provides a reference framework for similar large-scale infrastructure construction in other cities.

This paper first introduces the research background, significance and methods, and then reviews the research status and future trends in this field at home and abroad. Then, the basic principle, calculation steps, hierarchical structure model and judgment matrix of AHP are introduced in detail. Secondly, the evaluation index system of BJ new airport site selection is constructed and a questionnaire survey is designed, and experts are invited to conduct professional evaluation to get the best scheme layer. Then, SWOT and PESTEL analysis are used to deeply analyze the best scheme layer. Finally, this paper summarizes the research results and puts forward some suggestions. This paper provides scientific decision support for the location of BJ airport, hoping to provide reference for similar large-scale infrastructure projects.

Key words

AHP, airport location, BJ airport,Swot,Pestel

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1 Introduction

In this study, "BJ" refers to Beijing, the capital of China. As the political, cultural and international exchange center of the country, the optimization of BJ's air transport network is very important for promoting regional economic development. Therefore, this paper aims to explore the optimal location strategy of BJ Airport through AHP, so as to promote the efficient operation of aviation logistics and the further development of regional economy. We will evaluate the feasibility of different site selection schemes, and consider many factors such as economic benefits, traffic convenience and environmental impact to determine the airport location that is most suitable for BJ's characteristics.

By analyzing the importance of air traffic in BJ as an international metropolis, this chapter discusses the realistic demand of new airport location and its strategic impact on regional economic development. The significance of the research lies in providing a scientific decision-making method, which is not only applicable to the site selection of BJ new airport, but also provides a reference framework for similar large-scale infrastructure construction in other cities. In addition, the research method part introduces the application of AHP method in complex decision-making. By building a hierarchical structure model and comprehensively considering various factors such as economic benefits, social impact and environmental protection, the best site selection scheme is determined, which provides a scientific basis for the construction of BJ new airport. This comprehensive analysis not only helps relevant decision makers to comprehensively consider multiple factors, but also helps them make more reasonable decisions.

1.1 Research background

In an international metropolis like BJ, the importance of air traffic as an important artery of urban development is self-evident. With the rapid growth of economy and the continuous gathering of population, it is difficult for the existing Capital Airport to carry the increasing passenger flow. Therefore, discussing the location of the new airport is not only a realistic demand to solve the traffic pressure, but also an important strategic measure to promote regional economic development. (Xue,2021)

1.2 Research significance

The significance of this study lies in that it not only provides a scientific decision-making method for the location of BJ new airport, but also provides a referential analysis framework for other cities in similar large-scale infrastructure construction. In addition, the in-depth analysis of this study can provide a more comprehensive perspective for relevant decision makers and help them make more

reasonable decisions after considering multiple factors such as economy, society and environment. (Lu,Liu&Yang,2012)

1.3 Research methods

The location of the new airport not only involves the traffic demand, but also needs to comprehensively consider many factors such as economic benefits, social impact and environmental protection. (Liu,2015) .In this complicated decision-making process, AHP as a decision-making analysis method combining qualitative analysis with quantitative analysis, has strong practicability. It decomposes complex problems into multiple components by building a hierarchical structure model, and makes comparative evaluation and ranking. (Chen,2018)

AHP is chosen as the main decision-making tool in this study, because it can structure complex multi-criteria decision-making problems and provide a clear decision-making framework for decision makers by combining qualitative and quantitative methods. The parameter selection criteria of AHP are based on expert evaluation and related literature, which ensures the comprehensiveness and professionalism of the evaluation. (Zhao&Guo,2019)

2 esearch status and future research trends at home and abroad

This chapter mainly combs and analyzes the present situation and development trend of airport location research at home and abroad, especially analyzes the application of AHP in airport location decision. By comparing the research progress at home and abroad, this chapter aims to show how AHP can help to establish a scientific and reasonable site selection evaluation system and improve the accuracy and efficiency of site selection analysis through GIS and other technologies. At the same time, this chapter also discusses the evolution of research methods, from the initial empirical judgment and qualitative analysis to the current quantitative analysis and model simulation. Future research will pay more attention to the comprehensiveness and practicability of the model, and the importance of environmental protection and public participation in airport site selection. This not only provides a solution to the current traffic pressure problem, but also provides valuable experience and enlightenment for future urban planning and development.

2.1 Domestic research status

The research on airport location in China, especially the application of AHP to airport location, started late, but has made some progress in recent years. Most research focuses on how to build a scientific and reasonable site selection evaluation system. For example, some studies have combined GIS with AHP to construct a multi-factor weighted superposition model of airport location space suitability. (He,Shu&Zheng,2021). This model can sort out and fuse the data of the factors that affect the airport layout, and assign the influence weights of the factors through AHP to form the classification of suitable site selection areas. In addition, some researches put forward a new index system, which is applied to the comparison and selection of site selection to provide intuitive and quantitative analysis conclusions. (Zhou,2016)

2.2 Foreign research status

Internationally, the research on airport location is more mature, especially in theoretical research a nd the establishment of quantitative evaluation system. International researchers usually use interd isciplinary methods to apply theories and technologies in operational research, geography, environ mental science and other fields to the study of airport location. (Li&Shi,2011;CAAC,2019).AHP is widely used in the decision-making process of airport location in the world, and it is favored becaus e it can effectively deal with multi-criteria decision-making problems. International researchers not only pay attention to the construction of site selection model, but also pay attention to the empirical analysis and practical application of the model, such as considering environmental impact assess ment, socio-economic benefit analysis and other factors. (Zhu,Cao&Zhang,2012)

2.3 the evolution of research methods

No matter at home or abroad, the research methods of airport location are constantly evolving and improving. From the initial empirical judgment and simple qualitative analysis, it has developed into quantitative analysis and model simulation. The introduction of AHP provides a new perspective and tool for airport location, which makes the location decision more scientific and reasonable. With the development of computer technology and data processing technology, GIS and remote sensing technology are gradually introduced into the airport location research, which improves the accuracy and efficiency of the research. (Yang,Cai&Zhong,2003)

2.4 Future research trends

Looking forward to the future, the research on airport location will pay more attention to the comprehensiveness and practicability of the model. With the development of big data and artificial intelligence technology, it is expected that more intelligent tools and methods will be applied to the research of airport location. (Li&Shi,2011) In addition, with the social attention to environmental protection and sustainable development, the location of environmentally friendly airports will become the focus of research. At the same time, the improvement of public participation will also promote the airport site selection research to pay more attention to the opinions and needs of the public.

It is hoped that this study can not only solve the current traffic pressure problem, but also provide valuable experience for future urban planning and development.

3 Analytic Hierarchy Process (AHP)

This chapter mainly introduces the basic principle and calculation steps of AHP and how to apply it to complex decision analysis. This chapter will elaborate in detail how to establish a hierarchical structure model, create a judgment matrix, conduct hierarchical sorting and consistency testing, and integrate these steps to determine the overall priority ranking. These contents not only help to understand the theoretical basis of AHP, but also provide clear guidance for practical application, so that decision makers can adopt a systematic and logical method to make decisions when considering various goals and standards. Through the study of this chapter, readers can master the application process and method of AHP in practical problems, and provide theoretical support and calculation tools for the AHP of new airport location in subsequent chapters.

3.1 Overview of Analytic Hierarchy Process

The Analytic Hierarchy Process, developed by Thomas L. Saaty in the 1970s, is a structured technique for organizing and analyzing complex decisions. It involves breaking down a problem into a hierarchy of sub-problems, which can be assessed independently before aggregating the results to determine an overall outcome. This approach is particularly beneficial for addressing issues that are not easily quantifiable and involve various objectives and criteria. (He & Liang, 2010)

3.2 Calculation steps

The AHP involves several key steps: establishing a hierarchical model, creating comparison matrices, conducting order rankings and consistency tests, and synthesizing these to determine an overall priority ranking. Decision-makers apply their judgment, expertise, and knowledge throughout this process to ensure a methodical and logical approach to decision-making. (Wang, 2022)

3.3 Basic Principles of Analytic Hierarchy Process

3.3.1 Hierarchical Structure Model Construction

The hierarchical model construction starts with defining the main objective, identifying influencing factors, and listing all potential alternatives. These components are structured into a hierarchy with multiple levels, where each level serves as a foundation for the next. Typically, this includes the objective at the top, followed by criteria, and then the alternatives at the bottom.

3.3.2 Construction of Judgment Matrix

The judgment matrix is a pivotal element of AHP. It is formed by comparing elements at a given level to assess their relative significance concerning an element at the preceding level. The comparisons yield a matrix where the value aij represents the weight of element i in relation to element j, on a scale from 1 to 9.

3.3.3 Hierarchical Order and Consistency Test

Ranking within the hierarchy involves calculating the eigenvectors of the comparison matrices to determine local priorities. A consistency check is performed to ensure the matrix's reliability. A consistency ratio (CR) below 0.1 indicates acceptable consistency, necessitating no further adjustments. (Jiang, Yan & Feng, 2022)

3.3.4 Hierarchical Total Sorting

Finally, the overall priority ranking is derived by integrating the rankings from all levels to establish a comprehensive priority weight that aligns with the overarching goal. This ensures a holistic consideration of all elements from the top-tier objective down to the specific alternatives.

4 Construction of BJ airport site selection evaluation index system

This chapter establishes the basic principles of the construction of evaluation index system, and introduces how to use this system to evaluate different airport site selection schemes. By establishing the hierarchical structure of target layer, criterion layer and scheme layer, we can select specific evaluation indicators from multiple dimensions such as geographical location, transportation convenience, economic benefits, environmental impact and policy support. Through empirical analysis and comprehensive evaluation system, the advantages of Pinggu District as the location of BJ new airport are highlighted. By constructing judgment matrix and calculating weight vector, it is found that geographical location and policy support are the two most important factors affecting the final decision. Pinggu District got the highest comprehensive score under the five criteria of geographical location, convenient transportation, economic benefit, environmental impact and policy support, which showed its potential as an airport location.

4.1 Construction principles of evaluation index system

First of all, we need to establish the basic principles for the construction of evaluation index system. These principles include scientific, systematic, operational, comparative and dynamic. The scientific principle requires that the index system can scientifically reflect the actual needs of airport site selection; The systematic principle emphasizes the interrelation and hierarchy between indicators; The principle of operability requires that indicators should be quantifiable and accessible; The principle of comparison means that the index can be used to compare different site selection schemes; The dynamic principle takes into account that airport location is a long-term dynamic process, and the index system should reflect this feature.

4.2 Hierarchy of evaluation index system

Evaluation index system usually includes target layer, criterion layer and scheme layer. In the case of BJ airport location, the main goal of the target layer is to choose the most suitable location to build a new airport. The criterion layer may include many criteria such as geographical location, economic benefit, environmental impact, social benefit and technical feasibility. The scheme layer is the specific site selection scheme. (Li,Yang,Shao&Jiang,2022)

4.3 Selection of evaluation indicators

In the criterion layer, we need to select specific evaluation indicators. These indicators can be considered from the following aspects:

1. Geographical location: Geographical location determines the relative distance between the airport and the city center, business district and other transportation hubs, and directly affects the convenience of passengers' travel and the operational efficiency of the airport. Choosing a superior geographical location can improve the attractiveness of the airport, facilitate the rapid circulation of passengers and goods, and contribute to the international competitiveness of the airport.

2. Transportation convenience: Transportation convenience involves the connection between the airport and major roads and public transportation systems, which is very important to ensure that passengers and employees can reach the airport quickly and conveniently. Good traffic connection can not only improve the passenger experience, but also reduce the operating cost and improve the overall efficiency and service quality of the airport.

3. Economic benefits: Economic benefits take into account the cost-benefit analysis of airport construction and operation, including the return on investment, job creation and the driving effect on the surrounding economy. Ensuring economic benefits can make the airport project sustainable in the long run and contribute to local economic growth and social employment.

4. Environmental impact: Environmental impact focuses on the impact of airport construction and operation on the local ecosystem, including noise pollution, air quality and utilization of natural resources. By evaluating the environmental impact and taking corresponding measures, we can reduce the negative impact on the environment and enhance the social responsibility and public image of the airport.

5. Policy support: Policy support involves the government's attitude towards the airport project and various preferential policies provided, such as tax relief and land use rights. Strong policy support can speed up the airport construction process, reduce operational risks, and may attract more investors and airlines to cooperate. (He&Liang,2010)

4.4 Application of evaluation index system

After the evaluation index system is determined, we can use this system to evaluate different site selection schemes. The total evaluation score of each scheme can be obtained by calculating the score of each scheme on each index and combining the weighted sum of the weights. In the end, the scheme with the highest score will be considered as the optimal site selection scheme.

4.5 Empirical analysis

In our comprehensive evaluation system, there are four main criteria and twelve specific indicators. These indicators play different roles in the evaluation process, so they are given different weights.

For those indicators that occupy an important position in the evaluation, we will give higher weight; For those relatively less important indicators, lower weights are assigned. Next, we will use AHP to calculate the weight vectors of these evaluation indicators.

First, we need to build a judgment matrix. This matrix is established by comparing the relative importance of each element in the target layer, that is, every two elements in the comprehensive evaluation layer are compared to form a pairwise comparison judgment matrix. We will grade according to the scale from 1 to 9, and the specific meaning and explanation of each number are as follows:

1-means that A and B are equally important.

3-A is slightly more important than B.

5-A is obviously more important than B.

7-A is really more important than B.

9-A is absolutely more important than B.

2, 4, 6, 8-refers to the intermediate importance between appeal judgments.

On the other hand-the importance of B over A.(As shown in Table 4.1)

Table 4.1 Comparison and Evaluation Table of Importance

a_{ij}	Definition	a_{ij}	Definition
1	a_i and a_j are equally important	2	Between equally and slightly important
3	a_i is slightly more important than a_j	4	Between slightly and pretty important
5	a_i is pretty more important than a_j	6	Between pretty and really important
7	a_i is really more important than a_j	8	Between really and absolutely important
9	a_i is absolutely more important than a_j	On the contrary	a_{ij} is the comparison result of the importance of indicators I and J, $a_{ij}=1/a_{ji}$.

When calculating the weight, we also need to consider the consistency test to ensure the consistency of the judgment matrix. If the consistency ratio (CR) is less than 0.1, then the consistency of the judgment matrix is acceptable. In this way, we can use the judgment matrix to calculate the weight vector, and then make a comprehensive evaluation.

According to the data collection results of the attached questionnaire, we can get the judgment matrix of the target layer (Table 4.2).

Table 4.2 Judgement matrix between criterion layers

Evaluating indicator	Geographical position	Traffic convenience	Economic benefits	Environmental effect	Policy support	Wi
Geographical position	1	1.4167	1.4000	1.1500	1.1167	0.2395
Traffic convenience	0.7059	1	0.9833	0.8833	0.9500	0.1783
Economic benefits	0.7143	1.0169	1	0.8333	0.8500	0.1739
Environmental effect	0.8696	1.1321	1.2000	1	0.8833	0.2004
Policy support	0.8955	1.0526	1.1765	1.1321	1	0.2079

According to the data in Table 4.2, λmax=5.0055, CI=0.0014, RI=1.12,CR=0.0012, and CR<0.1, which shows that our judgment matrix has good consistency. Next, the detailed steps for calculating the weight of the judgment matrix are as follows:

First, we calculate the product of each row of elements in the judgment matrix, and the vector obtained is:

$$m_i = \prod_{j=1} a_{ij} = [2.5469, 0.5825, 0.5145, 1.0435, 1.2555]$$

Then, we calculate the n-th root of the above product, and the vector obtained is:

$$w_i^* = \sqrt[n]{m_i} = [1.2056, 0.8975, 0.8756, 1.0085, 1.0466]$$

We normalize the above vectors and get the weight vector as follows:

$$w_i = w_i^* / \sum_{i=1}^{n} w_i^*$$ = [0.2395, 0.1783, 0.1739, 0.2004, 0.2079]

When calculating the maximum eigenvalue λmax, the following formula is used:

$$\lambda_{\max} = \frac{1}{n} \sum_{i=1}^{n} \frac{(Aw)i}{w_i}$$ =1/5×25.0274=5.0055

Among Awi=[1.1982,0.8929,0.8700,1.0028,1.0415]

The consistency index CI is obtained as follows:

$$CI = \frac{\lambda_{\max} - n}{n-1}$$ =(5.0055-5)/(5-1)=0.0014

According to the RI table, when the judgment matrix is of order 5, RI =1.12.

Therefore, we get the average consistency ratio:

CR=CI/RI=0.0014/1.12=0.0012<0.1

which passed the consistency test.

Consistency ratio (CR) less than 0.1 is an acceptable criterion for judging the matrix, which ensures that our weight calculation is based on a reasonable evaluation criterion. Such consistency check is a very important step in AHP, which ensures the reliability and effectiveness of the evaluation results.

Table 4.3 Judgment Matrix under the Geographical Location of the First Indicator

Evaluating indicator	Fangshan district	Mentougou district	Pinggu district	Wi
Fangshan district	1	1.1333	0.8167	0.3205
Mentougou district	0.8824	1	0.6500	0.2733
Pinggu district	1.2245	1.5385	1	0.4062

According to the data in Table 4.3, λmax=3.0012, CI=0.0006, RI=0.52,CR=0.0011, and CR<0.1, which shows that our judgment matrix has good consistency. Next, the detailed steps for calculating the weight of the judgment matrix are as follows:

First, we calculate the product of each row of elements in the judgment matrix, and the vector obtained is:

$$m_i = \prod_{j=1} a_{ij} = [0.9256, 0.5735, 1.8838]$$

Then, we calculate the n-th root of the above product, and the vector obtained is:

$$w_i^* = \sqrt[n]{m_i} = [0.9745, 0.8308, 1.2350]$$

We normalize the above vectors and get the weight vector as follows:

$$w_i = w_i^* / \sum_{i=1}^{n} w_i^* = [0.3205, 0.2733, 0.4062]$$

When calculating the maximum eigenvalue λmax, the following formula is used:

$$\lambda_{\max} = \frac{1}{n} \sum_{i=1}^{n} \frac{(Aw)i}{w_i} = 1/3 \times 9.0035 = 3.0012$$

Among Aw_i=[0.9620,0.8201,1.2191]

The consistency index CI is obtained as follows:

$$CI = \frac{\lambda_{\max} - n}{n-1} = (3.0012-3)/(3-1) = 0.0006$$

According to the RI table, when the judgment matrix is of order 3, RI is 0.52.

Therefore, we get the average consistency ratio:

$$CR = CI/RI = 0.0006/0.52 = 0.0011 < 0.1$$

which passed the consistency test.

Table 4.4 Judgement matrix under the second index of traffic convenience

Evaluating indicator	Fangshan district	Mentougou district	Pinggu district	Wi
Fangshan district	1	1.1000	0.7167	0.3045
Mentougou district	0.9091	1	0.7500	0.2901
Pinggu district	1.3953	1.3333	1	0.4054

According to the data in Table 4.4, λmax=3.0022，CI=0.0011，RI=0.52,CR=0.0021，and CR<0.1,which shows that our judgment matrix has good consistency. Next, the detailed steps for calculating the weight of the judgment matrix are as follows:

First, we calculate the product of each row of elements in the judgment matrix, and the vector obtained is:

$$m_{\mathrm{i}}=\prod_{j=1} a_{ij} \text{=[0.7883,0.6818,1.8605]}$$

Then, we calculate the n-th root of the above product, and the vector obtained is:

$$w_i^* = \sqrt[n]{m_i} = \text{[0.9238, 0.8801, 1.2299]}$$

We normalize the above vectors and get the weight vector as follows:

$$w_{\ i}=w_i^*/\sum_{i=1}^{n} w_i^* \text{ = [0.3045, 0.2901, 0.4054]}$$

When calculating the maximum eigenvalue λmax, the following formula is used:

$$\lambda_{\max}=\frac{1}{n}\sum_{i=1}^{n}\frac{(Aw)i}{w_i} \text{=1/3}\times \text{9.0066=3.0022}$$

Among Aw_i=[0.9141,0.8710,1.2171]

The consistency index CI is obtained as follows:

$$CI=\frac{\lambda_{\max}-n}{n-1} \text{=(3.0022-3)/(3-1)=0.0011}$$

According to the RI table, when the judgment matrix is of order 3, RI is 0.52.

Therefore, we get the average consistency ratio:

CR=CI/RI=0.0011/0.52=0.0021<0.1

which passed the consistency test.

Table 4.5 Judgement matrix under the third index economic benefit

Evaluating indicator	Fangshan district	Mentougou district	Pinggu district	Wi

Fangshan district	1	1.0333	0.7667	0.3074
Mentougou district	0.9677	1	0.9333	0.3211
Pinggu district	1.3043	1.0714	1	0.3714

According to the data in Table 4.5,λmax=3.0059，CI=0.0029，RI=0.52,CR=0.0056，and CR<0.1,which shows that our judgment matrix has good consistency. Next, the detailed steps for calculating the weight of the judgment matrix are as follows:

First, we calculate the product of each row of elements in the judgment matrix, and the vector obtained is:

$$m_{\mathrm{i}}=\prod_{j=1} a_{ij} \text{=[0.7922,0.9032,1.3975]}$$

Then, we calculate the n-th root of the above product, and the vector obtained is:

$$w_i^* = \sqrt[n]{m_i} = \text{[0.9253, 0.9666, 1.1180]}$$

We normalize the above vectors and get the weight vector as follows:

$$w_{\ i} = w_i^* / \sum_{i=1}^{n} w_i^* \text{ = [0.3074, 0.3211, 0.3714]}$$

When calculating the maximum eigenvalue λmax, the following formula is used:

$$\lambda_{\max} = \frac{1}{n}\sum_{i=1}^{n} \frac{(Aw)i}{w_i} \text{=1/3}\times \text{9.0176=3.0059}$$

Among Awi=[0.9240,0.9653,1.1165]

The consistency index CI is obtained as follows:

$$CI = \frac{\lambda_{\max} - n}{n-1} \text{=(3.0059-3)/(3-1)=0.0029}$$

According to the RI table, when the judgment matrix is of order 3, RI is 0.52.

Therefore, we get the average consistency ratio:

CR=CI/RI=0.0029/0.52=0.0056<0.1

which passed the consistency test.

Table 4.6 The judgment matrix under the influence of the fourth indicator environment

Evaluating indicator	Fangshan district	Mentougou district	Pinggu district	Wi
Fangshan district	1	1.0167	0.9167	0.3254
Mentougou district	0.9836	1	1.1833	0.3504
Pinggu district	1.0909	0.8451	1	0.3242

According to the data in Table 4.6,λmax=3.0082, CI=0.0041, RI=0.52, CR=0.0079, and CR<0.1, which shows that our judgment matrix has good consistency. Next, the detailed steps for calculating the weight of the judgment matrix are as follows:

First, we calculate the product of each row of elements in the judgment matrix, and the vector obtained is:

$$m_{\mathrm{i}}=\prod_{j=1} a_{ij} \text{=[0.9319,1.1639,0.9219]}$$

Then, we calculate the n-th root of the above product, and the vector obtained is:

$$w_i^* = \sqrt[n]{m_i} = \text{[0.9768, 1.0519, 0.9733]}$$

We normalize the above vectors and get the weight vector as follows:

$$w_{\ i}=w_i^*/\sum_{i=1}^{n} w_i^* \text{ = [0.3254, 0.3504, 0.3242]}$$

When calculating the maximum eigenvalue λmax, the following formula is used:

$$\lambda_{\max}=\frac{1}{n}\sum_{i=1}^{n}\frac{(Aw)i}{w_i} \text{=1/3}\times\text{9.0247=3.0082}$$

Among Awi=[0.9788,1.0541,0.9753]

The consistency index CI is obtained as follows:

$$CI=\frac{\lambda_{\max}-n}{n-1} \text{=(3.0082-3)/(3-1)=0.0041}$$

According to the RI table, when the judgment matrix is of order 3, RI is 0.52.

Therefore, we get the average consistency ratio:

CR=CI/RI=0.0041/0.52=0.0079<0.1

which passed the consistency test.

Table 4.7 The judgment matrix supported by the fifth indicator policy

Evaluating indicator	Fangshan district	Mentougou district	Pinggu district	Wi
Fangshan district	1	0.8333	0.8667	0.2974
Mentougou district	1.2000	1	0.7500	0.3200
Pinggu district	1.1538	1.3333	1	0.3826

According to the data in Table 4.7, λmax=3.0119, CI=0.0059, RI=0.52,CR=0.0114, and

CR<0.1, which shows that our judgment matrix has good consistency. Next, the detailed steps for calculating the weight of the judgment matrix are as follows:

First, we calculate the product of each row of elements in the judgment matrix, and the vector obtained is:

$$m_{\mathrm{i}}=\prod_{j=1} a_{ij} \text{=[0.7222,0.9000,1.5385]}$$

Then, we calculate the n-th root of the above product, and the vector obtained is:

$$w_i^* = \sqrt[n]{m_i} = \text{[0.8972, 0.9655, 1.1544]}$$

We normalize the above vectors and get the weight vector as follows:

$$w_{\ i} = w_i^* / \sum_{i=1}^{n} w_i^* \text{ = [0.2974, 0.3200, 0.3826]}$$

When calculating the maximum eigenvalue λmax, the following formula is used:

$$\lambda_{\max} = \frac{1}{n}\sum_{i=1}^{n} \frac{(Aw)i}{w_i} \text{=1/3}\times 9.0357=3.0119$$

Among Awi=[0.8956,0.9638,1.1524]

The consistency index CI is obtained as follows:

$$CI = \frac{\lambda_{\max} - n}{n-1} = (3.0119-3)/(3-1)=0.0059$$

According to the RI table, when the judgment matrix is of order 3, RI is 0.52.

Therefore, we get the average consistency ratio:

CR=CI/RI=0.0059/0.52=0.0114<0.1

which passed the consistency test.

The weight summary calculation result is:

The absolute weight of each lowest index is equal to the product of the corresponding relative weight.

Table 4.8 Hierarchical total sorting

Criterion layer	Relative weight	Index layer	Relative weight	Absolute weight	sort
Geographical position	0.2395	Fangshan district	0.3205	0.0768	3
		Mentougou district	0.2733	0.0654	7
		Pinggu district	0.4062	0.0973	1
Traffic convenience	0.1783	Fangshan district	0.3045	0.0543	13
		Mentougou district	0.2901	0.0517	15
		Pinggu district	0.4054	0.0723	4
Economic benefits	0.1739	Fangshan district	0.3074	0.0535	14
		Mentougou district	0.3211	0.0559	12
		Pinggu district	0.3714	0.0646	10
Environmental effect	0.2004	Fangshan district	0.3254	0.0652	8
		Mentougou district	0.3504	0.0702	5
		Pinggu district	0.3242	0.0650	9

Policy support	0.2079	Fangshan district	0.2974	0.0618	11
		Mentougou district	0.3200	0.0665	6
		Pinggu district	0.3826	0.0795	2

According to the data results in Table 4.8, add the absolute weights corresponding to each scheme, and get the score of each scheme as follows:

Fangshan District: 0.3115

Mentougou District: 0.3098

Pinggu District: 0.3787

It can be seen from the score that the best scheme is the third scheme: Pinggu District.

4.6 Summary

In the comprehensive evaluation system, by constructing the judgment matrix and calculating the weight vector, we find that among the five criteria, geographical location has the highest weight, followed by policy support, which shows that these two criteria have the most significant influence on the final decision in the study of BJ airport location. Among the 15 specific indicators, Pinggu District has the highest comprehensive score under the five criteria of geographical location, convenient transportation, economic benefits, environmental impact and policy support, which shows its advantages as an airport location.

Specifically, Pinggu District has the highest geographical score, which may be due to its relatively large undeveloped land area and its relative position with the center of BJ and other regions. In terms of transportation convenience, although the current transportation infrastructure in Pinggu District may not be as developed as that in the downtown area, its potential development space and planning may be more conducive to the future airport construction and operation. In terms of economic benefits, Pinggu District may promote the rapid development of local economy, provide employment opportunities and promote the formation of related industrial chains because of the construction of the new airport. In terms of environmental impact, Pinggu District also scored relatively high, which indicates that the negative impact on the environment in this area may be small when airport construction is carried out. Finally, in terms of policy support, the high score of Pinggu District may reflect the government's willingness to invest and develop in the region.

To sum up, Pinggu District, as the location of BJ's new airport, not only has geographical advantages, but also shows its potential as the best location in transportation, economy, environment and policy. Therefore, we suggest that relevant decision-makers should focus on Pinggu District when considering the location of BJ new airport, and conduct more in-depth feasibility study and planning for this area.

5 Swot and Pestel Analysis of Pinggu District's Site Selection in BJ Airport

The data results show that Pinggu District is the best scheme, and this chapter will further use Swot and Pestel analysis to discuss the internal strengths, weaknesses, external opportunities and threats of this area. This dual analysis method makes the research more comprehensive and ensures the scientific and reasonable location decision. Swot analysis is helpful to comprehensively evaluate the potential of Pinggu District as an airport location, and identify possible challenges and risks. This analysis method can provide a structured framework for decision makers so that they can make more informed decisions after considering all relevant factors. Pestel analysis is a tool for macro-environmental analysis of Pinggu District, which takes into account political, economic, social, technological, environmental and legal factors, all of which are external factors affecting airport site selection and future operation. Through Pestel analysis, we can fully understand the macro-environmental conditions that affect the location decision of the new airport, thus laying the foundation for the long-term success of the project.

5.1Swot analysis

1. Strengths:

(1) Strategic advantage of geographical location: Pinggu District is located on the key development axis of BJ, which means that it can not only serve the core area of the capital, but also radiate to the surrounding economic belt. Such a geographical location can bring huge traffic and business opportunities to the airport and become an important hub connecting domestic and foreign countries.

(2) Blueprint for economic growth: Pinggu District, as a dynamic development area, has a series of planning projects and development plans, which all indicate the future economic take-off. The construction of the new airport may become a bright spot in this blueprint and inject new vitality into the regional economy.

(3) Strong support of government policies: The support of local governments is often the key to the success of the project. In Pinggu District, the government may provide a series of incentive measures, including tax reduction and exemption, financial subsidies, and optimizing the approval process, which will provide a solid policy foundation for the construction of the new airport.

2. Weaknesses:

(1) The double-edged sword of infrastructure: Although the existing infrastructure provides the foundation for the construction of the airport, the possible shortcomings, such as traffic congestion

and lack of public service facilities, may also become the bottleneck restricting the development of the new airport.

(2) The challenge of environmental protection: While pursuing economic development, environmental protection has always been a topic that cannot be ignored. The construction of the new airport may have an impact on the local natural ecology, which requires careful balance and adjustment in planning and construction.

(3) The arduous task of raising funds: Airport construction is a capital-intensive project. Under the background of complex and changeable economic situation, how to effectively raise and manage huge funds to ensure the smooth progress of the project will be a problem that needs careful consideration.

3. Opportunities:

(1) Tourism development: The construction of the new airport will bring unprecedented opportunities for tourism development in Pinggu District. With the opening of the airport, more domestic and foreign tourists will be attracted here to promote the prosperity of local tourism.

(2) Technology update: In the construction of the new airport, the most advanced aviation technology and intelligent management system can be adopted, which can not only improve the operational efficiency of the airport, but also provide passengers with a more convenient and comfortable travel experience.

(3) Promoting regional development: The construction of the new airport will open a new chapter in regional cooperation, and promote regional integration development by improving logistics efficiency and strengthening economic ties with neighboring cities and countries.

4. Threats:

(1) The test of economic fluctuation: The uncertainty of global economy may bring risks to airport construction and operation. Economic fluctuation may affect passenger flow and airport revenue, which needs to be fully considered in project planning.

(2) The pressure of fierce competition: With the expansion and upgrading of other airports in the surrounding areas, the new airport will face fierce market competition. How to stand out from the competition and become an important aviation hub in the region and even in the world is a problem that needs strategic thinking.

(3) The double-edged sword of technological progress: Although the rapid technological progress of aviation industry brings opportunities, it also brings challenges. The new airport needs to constantly update its technical equipment and management mode to adapt to the development trend of the industry.

5.2 Pestel Analysis

1. Political:

(1) Positive promotion of government policies: On the political level, the new airport project in Pinggu District will become one of the key projects for the government to promote regional development. The government actively promotes the development of the project through a series of policies and measures, such as providing financial subsidies, tax incentives and land use rights concessions. These policies can not only provide solid support for airport construction, but also attract more social capital to participate and jointly promote the success of the project.

(2) Promotion of international relations: As the political center of China, BJ has good international relations and foreign policies, which provides favorable conditions for the international cooperation of Pinggu New Airport. Because of the friendly relations and cooperation agreements between governments, international airlines choose to set up routes at Pinggu New Airport, thus increasing the number of international flights and passenger flow at the airport.

2. Economic:

(1) Great attraction of market potential: In terms of economic factors, BJ's strong economic strength provides a broad market prospect for the construction and operation of the new airport in Pinggu District. With the sustained growth of BJ's economy, Pinggu New Airport is expected to become an important hub connecting domestic and foreign markets, providing convenient services for airlines and passengers.

(2) Diversification of financing channels: As a part of BJ, Pinggu District can make use of BJ's rich financial resources and diversified financing channels to provide sufficient financial support for the construction of the new airport. Whether through government financing, private investment or public-private partnership, Pinggu New Airport is expected to get the necessary financial guarantee.

3. Social:

(1) Opportunities brought by population growth: In terms of social factors, BJ's sustained population growth and social development demand provide a stable foundation for the passenger flow of Pinggu New Airport. With the increase of population and the development of society, more

and more people will choose to travel by air traffic, which will directly promote the growth of airport passenger flow.

(2) Rich experience of cultural diversity: BJ's cultural diversity and internationalization level provide rich inspiration for the service design of Pinggu New Airport. The airport can provide diversified services and experiences according to the needs of passengers with different cultural backgrounds, thus attracting more domestic and foreign tourists.

4. Technical:

(1) Driving force of technological innovation: In terms of technical factors, the continuous innovation and progress of technology provided a strong driving force for the construction and operation of the new airport in Pinggu District. From architectural design to operation management, advanced technology can help airports improve efficiency, reduce costs, and improve safety and passenger experience.

(2) Construction prospect of smart airport: Taking advantage of BJ's advantages in scientific research and development, Pinggu New Airport can be built into a smart airport by adopting intelligent management system and automated service facilities. This can not only improve the operational efficiency of the airport, but also provide passengers with a more convenient and comfortable travel experience.

5. Environmental:

(1) Demonstration effect of green building: In terms of environmental factors, the new airport in Pinggu District can adopt green building and sustainable design to reduce the environmental impact and enhance the international image of the airport. By using energy-saving materials and adopting renewable energy such as solar energy and wind energy, the airport can become a model of green building.

(2) The guiding role of environmental protection policies: Following environmental protection policies and standards, Pinggu New Airport can reduce the negative impact on the environment during its construction and operation. This will not only help protect the local natural environment, but also increase public support and recognition of the airport project.

6. Legal:

(1) Normative guidance of legal framework: In terms of legal factors, clear legal framework and norms provide normative guidance for the construction and operation of Pinggu New Airport.

These laws and regulations cover land use, building standards, safety regulations and other aspects, which provide legal protection for the construction and operation of the airport.

(2) Compliance with international regulations: As an international aviation hub, Pinggu New Airport needs to comply with international aviation regulations and standards. This is not only the basis of international cooperation, but also the key to ensure airport safety and service quality.

5.3 Summary

Through SWOT and PESTEL analysis of Pinggu District, we can see that Pinggu District has obvious advantages in government policy support, economic growth potential, technological innovation and application despite some infrastructure challenges and environmental restrictions, which have provided a solid foundation for the construction of the new airport. At the same time, BJ's stable political environment, strong economic strength and social and cultural diversity, as well as its emphasis on environmental protection and legal compliance, have further enhanced the attractiveness of Pinggu District as a new airport site. Although external threats such as economic fluctuations and market competition need to be overcome, the new airport project is expected to be successfully realized in Pinggu District through effective management strategies and measures. These analyses provide a comprehensive perspective and in-depth insight for future project planning and decision-making.

6 Discussion

The main purpose of this chapter is to summarize the conclusions of the research on the location of BJ New Airport based on AHP, and put forward suggestions for future research and policy formulation. These conclusions and suggestions will help to ensure the successful implementation of the new airport project and promote the sustainable development of the region.

6.1 Conclusion

In the process of building a comprehensive evaluation system, we deeply analyzed the criteria such as geographical location, transportation convenience, economic benefits, environmental impact and policy support. Through expert scoring and weight calculation, we get the relative importance of each index. Empirical analysis shows that policy support and geographical location are the most critical decision-making factors. After several rounds of weight calculation and consistency test, Pinggu District ranks first in the comprehensive score. This result reveals the comprehensive advantages of Pinggu District under multiple criteria, especially in policy support and geographical location.

The combination of theoretical analysis and practical application of this study not only provides a scientific basis for the location of BJ new airport, but also provides strong support for the decision-making of urban planning and infrastructure construction.

6.2 Suggestions

1. Follow-up research direction:

It is suggested that future researchers can further consider more dynamic factors and long-term effects, such as regional development planning and aviation market changes, on the basis of this study, so as to optimize the location decision.

2. Policy formulation:

It is suggested that the government and decision makers should fully consider the importance of policy support in airport site selection when formulating relevant policies, so as to provide strong policy guarantee for the construction and operation of the new airport.

3. Public participation:

In view of the fact that public acceptance is crucial to the success of infrastructure projects, it is suggested to strengthen communication and consultation with the public in the subsequent site selection process to ensure that the project can be widely supported by all sectors of society.

4. Environmental protection:

Considering the importance of environmental impact in site selection, it is suggested that effective measures should be taken during airport construction and operation to minimize the negative impact on the environment.

5. Comprehensive transportation planning:

In view of the importance of transportation convenience, it is suggested that the construction of comprehensive transportation network, including the effective connection of roads, railways and urban public transportation, should be considered simultaneously in airport planning. (Ardeshir A, Mohseni N, Behzadian K, & et al,2014)

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Appendices

Appendix 1. Questionnaire on BJ airport site selection

Dear Ms./Mr.,

Hello!

Hello! I come from Chongqing University of Science and Technology. I hope you can spare some time to complete the following questionnaire, which is very important to me. Please rate the importance of each indicator. If you choose to fill in 2, it proves that A is three times as important as B. If you choose to fill in 1/2, it proves that B is twice as important as A. .

The weight ratios and their meanings are as follows:

1-means that A and B are equally important.

3-A is slightly more important than B.

5-A is obviously more important than B.

7-A is really more important than B.

9-A is absolutely more important than B.

2, 4, 6, 8-refers to the intermediate importance between appeal judgments.

On the other hand-the importance of B over A.

1. The importance relationship between the criteria layers is:

Evaluation score	Index	Importance comparison	Index
	Geographical position	1/9 --9	Traffic convenience
	Geographical position	1/9 --9	Economic benefits
	Geographical position	1/9 --9	Environmental effect
	Geographical position	1/9 --9	Policy support
	Traffic convenience	1/9 --9	Economic benefits

	Traffic convenience	1/9 --9	Environmental effect
	Traffic convenience	1/9 --9	Policy support
	Economic benefits	1/9 --9	Environmental effect
	Economic benefits	1/9 --9	Policy support
	Environmental effect	1/9 --9	Policy support

2 The importance relationship between the schemes under the first indicator geographical location is as follows:

Evaluation score	Index	Importance comparison	Index
	Fangshan district	1/9 --9	Mentougou district
	Fangshan district	1/9 --9	Pinggu district
	Mentougou district	1/9 --9	Pinggu district

3 The second indicator, the importance relationship between the schemes under traffic convenience, is as follows:

Evaluation score	Index	Importance comparison	Index
	Fangshan district	1/9 --9	Mentougou district
	Fangshan district	1/9 --9	Pinggu district
	Mentougou district	1/9 --9	Pinggu district

4 The importance relationship between the schemes under the third index economic benefit is as follows:

Evaluation	Index	Importance comparison	Index

score			
	Fangshan district	1/9 --9	Mentougou district
	Fangshan district	1/9 --9	Pinggu district
	Mentougou district	1/9 --9	Pinggu district

5 The fourth indicator, the importance relationship between schemes under environmental impact is as follows:

Evaluation score	Index	Importance comparison	Index
	Fangshan district	1/9 --9	Mentougou district
	Fangshan district	1/9 --9	Pinggu district
	Mentougou district	1/9 --9	Pinggu district

6 The relationship of importance among the schemes supported by the fifth indicator policy is as follows:

Evaluation score	Index	Importance comparison	Index
	Fangshan district	1/9 --9	Mentougou district
	Fangshan district	1/9 --9	Pinggu district
	Mentougou district	1/9 --9	Pinggu district

- Interview questions

1. What do you think of the impact of the new airport on local economic development?

2. In airport construction, what do you think is the trade-off between safety and cost?

3. What suggestions do you have for the environmental protection measures of the airport?

4. How do you evaluate the demand and impact of the new airport on the surrounding transportation infrastructure?

5. When considering the location of the airport, how much influence do you think the opinions of local residents should have?

Appendix 2.Survey results of BJ airport site selection questionnaire

A total of 13 people answered this questionnaire, including 3 invalid questionnaires and 10 valid questionnaires.

1 The importance relationship between the criteria layers is:

Title \ Options	1/3	1/2	1	2	3
Geographical location/transportation convenience	2(20%)	1(10%)	2(20%)	4(40%)	1(10%)
Geographical location/economic benefits	0(0%)	4(40%)	1(10%)	4(40%)	1(10%)
Geographical location/environmental impact	0(0%)	3(30%)	4(40%)	3(30%)	0(0%)
Geographical location/policy support	2(20%)	3(30%)	1(10%)	4(40%)	0(0%)
Traffic convenience/economic benefits	1(10%)	5(50%)	1(10%)	3(30%)	0(0%)
Traffic convenience/environmental impact	1(10%)	3(30%)	5(50%)	1(10%)	0(0%)
Transportation convenience/policy support	3(30%)	3(30%)	1(10%)	3(30%)	0(0%)
Economic benefit/environmental impact	1(10%)	4(40%)	4(40%)	1(10%)	0(0%)
Economic benefits/policy support	0(0%)	7(70%)	1(10%)	2(20%)	0(0%)
Environmental impact/policy support	1(10%)	5(50%)	2(20%)	2(20%)	0(0%)

2 The importance relationship between the schemes under the first indicator geographical location is:

Title \ Options	1/3	1/2	1	2	3
Fangshan District/Mentougou District	1(10%)	4(40%)	1(10%)	4(40%)	0(0%)
Fangshan District/Pinggu District	2(20%)	3(30%)	4(40%)	1(10%)	0(0%)
Mentougou District/Pinggu District	3(30%)	5(50%)	1(10%)	1(10%)	0(0%)

3 The importance relationship between the schemes under the second indicator of traffic convenience is:

Title \ Options	1/3	1/2	1	2	3

Fangshan District/Mentougou District	3(30%)	2(20%)	1(10%)	4(40%)	0(0%)
Fangshan District/Pinggu District	2(20%)	5(50%)	2(20%)	1(10%)	0(0%)
Mentougou District/Pinggu District	3(30%)	3(30%)	3(30%)	1(10%)	0(0%)

4 The importance relationship between the schemes under the third indicator economic benefit is:

Title \ Options	1/3	1/2	1	2	3
Fangshan District/Mentougou District	1(10%)	6(60%)	0(0%)	2(20%)	1(10%)
Fangshan District/Pinggu District	5(50%)	2(20%)	2(20%)	0(0%)	1(10%)
Mentougou District/Pinggu District	4(40%)	2(20%)	2(20%)	1(10%)	1(10%)

5 The fourth indicator, the importance relationship between the schemes under environmental impact is:

Title \ Options	1/3	1/2	1	2	3
Fangshan District/Mentougou District	2(20%)	3(30%)	3(30%)	1(10%)	1(10%)
Fangshan District/Pinggu District	2(20%)	5(50%)	1(10%)	1(10%)	1(10%)
Mentougou District/Pinggu District	4(40%)	1(10%)	2(20%)	1(10%)	2(20%)

6 The importance relationship between the schemes supported by the fifth indicator policy is:

Title \ Options	1/3	1/2	1	2	3
Fangshan District/Mentougou District	4(40%)	2(20%)	2(20%)	2(20%)	0(0%)
Fangshan District/Pinggu District	2(20%)	4(40%)	3(30%)	0(0%)	1(10%)
Mentougou District/Pinggu District	6(60%)	1(10%)	2(20%)	0(0%)	1(10%)

- Interviewer Information

Interviewers A, B, C, D, E, F, G and H are all employees in the aviation industry, and interviewers I and J are teachers of aviation major.

Interviewers 1：A

1. The new airport will promote local economic development and provide employment opportunities.

Safety is the primary consideration, even if the cost will increase accordingly.

3. The airport should adopt green building materials to reduce energy consumption.

4. The new airport should promote the construction of surrounding traffic infrastructure and improve the overall traffic efficiency.

5. The opinions of local residents are very important and should be used as an important reference for decision-making.

Interviewers 2：B

1. The new airport may lead to uneven distribution of local resources and aggravate social conflicts.

2. We should find a balance between safety and cost to ensure the economic feasibility of the project.

3. The airport should set up a special area to protect local wildlife.

4. The new airport may increase the existing traffic burden, which needs careful evaluation and planning.

5. Although the opinions of local residents should be listened to, the final decision should be based on comprehensive professional evaluation.

Interviewers 3：C

1. The impact of the new airport on the local economy is usually positive. It can improve the local industrial productivity and GDP level, promote the development of high-tech industries and financial industry, and enhance the productivity of the whole society.

2. In airport construction, the balance between safety and cost should be based on safety. It is suggested that strict standards should be adhered to in terms of route increase and capacity introduction.

3. For the environmental protection measures of the airport, it is suggested to strengthen the prevention and control measures of noise pollution from the aspects of source control, transmission route blocking and terminal treatment.

4. The demand and influence of the new airport on the surrounding traffic infrastructure is remarkable. It is suggested that when building or rebuilding a hub airport, the land for introducing high-speed rail into the airport should be reserved, and interchange of various modes of transportation should be considered to build a comprehensive transportation hub compatible with various transportation facilities.

5. When considering the location of the airport, the opinions of local residents should have certain influence. The opinions of local residents can help determine the location of the airport, so as to reduce the impact on residents' lives and ensure the sustainable development of the airport.

Interviewers 4：D

1. The impact of the new airport on local economic development is usually positive. It can promote tourism, improve regional international connectivity, attract foreign investment, create employment opportunities, and promote the development of related industrial chains.

2. In airport construction, the balance between safety and cost should take safety as the primary consideration. Advanced technology and materials should be adopted in the construction process to ensure the engineering quality and control the cost reasonably.

3. For the environmental protection measures of the airport, it is suggested to adopt effective noise and pollution control technology, carry out ecological landscape design, and implement green energy and waste management strategies.

4. The new airport has a great demand and influence on the surrounding transportation infrastructure, so the corresponding transportation network should be planned, including roads, railways and public transportation, so as to facilitate the transportation of passengers and goods.

5. When considering the airport location, the opinions of local residents are very important, and their feedback should be collected through public hearings and community meetings, and given due consideration in the decision-making process.

Interviewers 5：E

1. The new airport will promote the local economy and increase employment and tourism.

I think airport construction should give priority to safety and then control the cost reasonably.

3. Airport environmental protection should be reflected in green design, renewable energy and noise control.

4. The new airport needs good transportation network support, and the corresponding transportation network should be planned reasonably.

5. The residents' opinions have a great influence on the site selection, so many residents' opinions should be considered.

Interviewers 6： F

1. The construction and operation of the new airport will usually attract more business activities, thus creating employment opportunities and improving the living standards of local residents.

2. Safety is the primary consideration in airport construction, but cost-effectiveness should also be considered.

3. It is suggested that the airport should adopt sustainable architectural design, such as using solar panels and wind energy to reduce carbon emissions and implementing strict wastewater and waste treatment standards.

4. The construction of the new airport often needs the improvement of supporting transportation infrastructure, such as road expansion, new public transportation lines and parking facilities, all of which are to meet the increased traffic flow and improve the accessibility of the airport.

5. In the process of airport site selection, the opinions and needs of local residents should be fully considered, because their lives will be directly affected by airport operation.

Interviewers 7： G

1. The new airport can attract international enterprises and professionals for high-tech industries, thus promoting the development of innovation and knowledge economy.

2. We can explore new construction methods and materials, such as using lighter but stronger materials, or adopting modular construction to improve efficiency and reduce costs without lowering safety standards.

3. In addition to immediate environmental protection measures, long-term ecological impacts should also be considered, and long-term environmental monitoring and management plans can be implemented.

4. The construction of the new airport should consider the integration with intelligent transportation system, such as real-time traffic information update and access of self-driving vehicles to improve efficiency and passenger experience.

5. When considering the location of the airport, we should pay attention to the opinions of local residents and explore how to make the airport a part of the community, such as providing public space, cultural activities and educational facilities, so as to promote the overall development of the community.

Interviewers 8： H

1. The construction of the new airport can be regarded as a part of the regional development strategy, which will help to achieve balanced regional development.11

2. In the balance between safety and cost, airport builders should assume social responsibilities, ensure that safety standards are not affected by cost pressure, and share costs through public investment and partnership.

3. Airport environmental protection measures should be combined with global sustainable development goals, such as reducing greenhouse gas emissions, protecting biodiversity, and promoting environmental education and community participation.

4. The construction of the new airport should be coordinated with the urban planning and development strategy to ensure that the development of transportation infrastructure can support the long-term urban growth and regional development needs.

5. In the process of airport site selection, social justice and equality should be considered to ensure that the opinions of local residents are not only heard, but also treated fairly in the decision-making process, especially the impact on vulnerable groups.

Interviewers 9：I

1. The construction of the new airport can be used as a tool for local governments to promote regional economic development, attract foreign investment and upgrade local industries by providing better logistics and transportation support.

2. In the balance between safety and cost, innovative architectural design and construction technology can be considered to improve construction efficiency, so as to control costs while ensuring safety.

3. The environmental protection measures of the airport should take into account the harmonious coexistence with the surrounding ecosystem.

4. The construction of the new airport should consider how to integrate with the existing regional traffic network and how to improve the traffic efficiency of the whole region through new traffic projects.

5. When selecting the airport, we should consider how to combine the airport with the long-term development plan of the community to ensure that the construction and operation of the airport can bring sustainable benefits to the community.

Interviewers 10：J

1. The new airport can be a platform to promote the revitalization of local culture, and enhance the international popularity of local culture by attracting international tourists and cultural exchanges.

2. In airport construction, the balance between safety and cost can be achieved by adopting new technologies, which not only improves safety standards, but also reduces long-term operating costs.

3. The environmental protection measures of the airport should consider the coordination with the surrounding community environment.

4. The construction of the new airport should consider its role in promoting regional economic integration, such as strengthening economic ties within the region by improving logistics efficiency.

5. In the process of airport site selection, we should encourage extensive participation from all walks of life to ensure that the decision-making process is transparent and fair, and reflect the voices of multiple stakeholders.