A Decision-making Criteria in Airport Site Selection: A Systematic Review

Nattaphon Rangsaritvorakarn
Healthcare Logistics Management Research Center, School of Management, Mae Fah Luang University

Received: 2 June 2023
Revised: 11 August 2023
Accepted: 21 August 2023

Abstract

The study aimed to identify factors influencing the selection of a new airport location. A systematic review of 16 relevant articles were identified using the PRISMA Flow diagram. The selection criteria were extracted and analyzed to determine their frequency of occurrence. The results revealed that the most frequent factor influencing airport location selection was distance to main transportation networks, appearing 10 times in the selected articles. On the other hand, distance to other airports was the least frequently mentioned factor, occurring only once. Environmental considerations, such as air and noise pollution, were the most prominent criteria, each occurring 11 times. In terms of topography, the slope of land emerged as the most frequently cited criterion, with 6 occurrences. Social criteria, particularly access to airport facilities, were mentioned 5 times. Regarding safety and risk, conflict with air corridors, distance from faults, and distance from water streams were the most considered factors, each appearing 4 times.

Keywords: Airport, Decision Making, Site selection, Systematic review

1. Introduction

Transportation infrastructure is the backbone of a country's development, which mainly arises from the convenience of transportation, as an efficient transportation system will lead to the development of the economy. For instance, different types of public transportation within a country, such as trains, buses, and airlines, have played a significant role in the economy and global society as they provide convenient, fast, and safe transportation. The aviation industry is an industry that reflects the economic status of the country in many dimensions, such as entering the ASEAN Economic Community (AEC) in 2015.

Thailand's aviation industry has grown rapidly because the country has played a significant role in the Southeast Asian region as a central hub. Thai Airways International Public Company Limited (THAI Airways), as a state-owned enterprise, has responded to the government's policy of entering the AEC under the "Single Market and Production Base" concept to create competitiveness in the changing business structure of the aviation and air transportation industry in the ASEAN region. Therefore, Thailand must realize the importance of improving its transportation infrastructure to enhance its economic development.

Chiang Mai International Airport has been in service for 30 years and last 3 years, there were a total of 71,994 commercial aircraft take-offs and landings. There are 8 domestic airlines operating on 13 routes, and 26 international airlines operating on 23 routes, averaging 221 flights per day, with 10.23 million passengers, an increase of 8.30% from 2016 to 2022. There were approximately 2.3 million international passengers, an increase of 9.72% from 2016 to 2022, including 1.42 million Chinese travelers. The airport has the capacity to handle 8 million passengers per year, but last year, there were more than 10 million users, which was a significant increase. Therefore, the previous estimate of capacity for the year 2025 of 18 million passengers has been adjusted to 2028, and the estimate for the year 2031 is now 20 million passengers, which was previously estimated for the year 2025.

As a result, it has led to the push for consideration of the construction of a second Chiang Mai international airport, based on analysis of two potential areas: 1) San Kamphaeng District, Chiang Mai Province and 2) Ban Thi District, Lamphun Province, both of which are adjacent to each other. However, it was found that the main factors in analyzing the suitability of site selection for the airport were mainly focused on the factors of demand and convenience for foreign passengers and lacked spatial analysis of spatial data. Therefore, attention was given to selecting factors for analyzing the site selection of the airport.

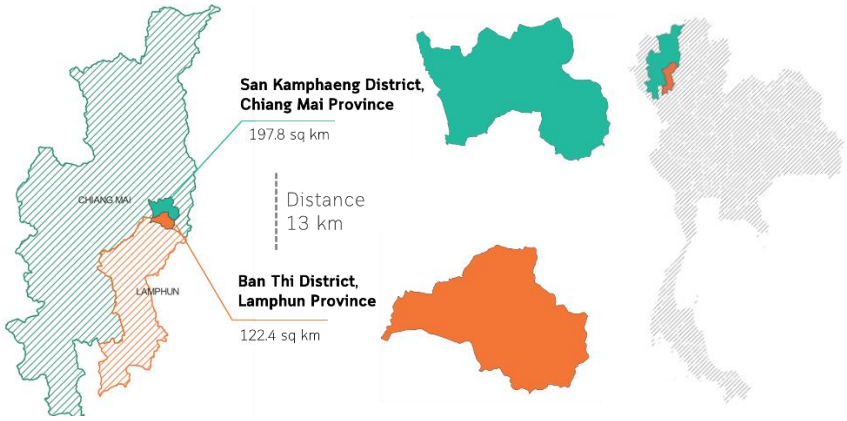

Figure 1 Study area of new airport hub

However, many of these studies lack integration with other relevant fields, such as disaster risk science for unpredictable hazards, air pollution risks from smoke and smog, geographical suitability, or bird hazard management. These aspects should be considered more comprehensively in future research. This lack of research creates a lack of credibility in decision-making for selecting the location of a new airport. Therefore, the main objective of this study is to assess the best possible location for the establishment of a new airport by gathering criteria through literature review to expand knowledge on decision-making criteria for Airport Site Selection. The study emphasizes the use of geographic information system (GIS) as the primary database for airport site selection (ASS).

2. Objectives

1) Study articles related to airport selection. which is not specified in the Ruler's Manual.
2) Identify the most used criteria from extracted research articles.

3. Literature Review

Due to the nature of the airport business, which requires a high level of investment, there have been few new airport establishments in Thailand. As a result, there is a lack of research on site selection criteria for new airport development in Thailand, especially in terms of necessary geographic information system (GIS) criteria. Most of the research in airport site selection covers various perspectives, such as economic factors, tourism demand, consumer purchasing power, or technical considerations, such as efficient runway placement and area size. The selection of a suitable location for an airport involves evaluating multiple criteria and requires careful analysis. Several studies have proposed different methods for airport location selection. Palczewski and Sałabun (2019) explored the effect of various normalization methods in the PROMETHEE II method for airport location selection. The study concluded that the Topsis method is the most suitable for this type of analysis. Similarly, Sennaroglu and Celebi (2018) used AHP, PROMETHEE, and VIKOR methods to evaluate different criteria and

identify the most suitable location for a military airport in Turkey. The authors found that the selected location is optimal for the military airport based on the criteria. Belbag et al. (2013) compared two fuzzy multi-criteria decision-making (MCDM) methods for airport location selection, namely Fuzzy TOPSIS and Fuzzy AHP. The study concluded that the Fuzzy AHP method is the most suitable for this type of analysis.

Meanwhile, Ramu et al. (2020) proposed a hybrid approach for airport site selection that combines fuzzy AHP, remote sensing (RS), and geographic information systems (GIS). The authors concluded that the proposed hybrid approach is effective for airport site selection and can be applied in other regions. Liao and Bao (2014) proposed a method based on the triangular fuzzy number for airport site selection. The authors concluded that the proposed method is effective for airport site selection and can be used to evaluate multiple criteria. Additionally, Wang et al. (2009) proposed a method based on uncertain multi-attribute decision making (MADM) for airport site selection. The study concluded that the proposed method is effective for airport site selection and can be used to evaluate multiple criteria under uncertain conditions. In conclusion, airport site selection is a complex task that requires careful evaluation of multiple criteria. The reviewed studies proposed various methods, including PROMETHEE II, AHP, VIKOR, Fuzzy TOPSIS, Fuzzy AHP, RS, GIS, and uncertain MADM, for airport location selection. These methods are effective for evaluating multiple criteria under uncertain conditions and can be used in different regions.

Airport site selection is a crucial process that involves various criteria, such as accessibility, environmental impact, risk assessment, and passenger demand. The selection of an appropriate airport site has significant implications for the safety, efficiency, and sustainability of air transport. In recent years, researchers have proposed numerous methods to address this issue. This literature review examines some of the latest methods proposed in the field of airport site selection. Yang et al. (2014) proposed a new method for airport site selection that combines the Weighted Least Square Method (WLSM) and the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS). The authors applied the method to a real-world case in China and found that it was more effective than traditional methods in identifying the most suitable airport site. The WLSM-TOPSIS method can provide a more comprehensive and accurate evaluation of airport site selection by considering multiple criteria simultaneously. Han et al. (2022) proposed a new method for emergency airport site selection based on global subdivision grids. The authors applied the method to a real-world case in China and found that it can effectively identify suitable sites for emergency airports, especially in areas with complex terrain and limited suitable land for airport construction. The method provides a novel approach to emergency airport site selection that can address the unique challenges posed by complex terrain and limited available land. Erkan and Elsharida (2020) proposed a new method for airport site selection that combines Analytical Hierarchy Process (AHP), Receiver Operating Characteristic (ROC), and Geographic Information Systems

(GIS). The authors applied the method to a real-world case in Libya and found that it can effectively identify suitable airport sites based on multiple criteria such as accessibility, land use, and environmental impact. The method provides a more comprehensive and integrated approach to airport site selection by combining multiple decision-making techniques. Zhao et al. (2019) presented a method for airport site selection that considers bird ecological conservation. The authors applied the method to a real-world case in Dalian, China and found that it can effectively identify suitable airport sites while minimizing the impact on bird habitats. The method provides a more environmentally conscious approach to airport site selection that considers the impact on local wildlife.

Fu et al. (2016) proposed a new method for airport site selection that considers the risk of bird strikes. The authors applied the method to a real-world case in Dalian, China and found that it can effectively identify suitable airport sites that minimize the risk of bird strikes. The method provides a more proactive approach to airport site selection that considers the potential risks associated with local wildlife. Carmona-Benítez et al. (2015) presented a new method for airport site selection that focuses on maximizing the sum of expected air passenger demand. The authors applied the method to a real-world case in Mexico City and found that it can effectively identify suitable airport sites that can maximize passenger demand. The method provides a more market-oriented approach to airport site selection that considers the potential demand for air travel in the local area. Huang et al. (2013) proposed a new method for airport site selection that considers complex airspace. The authors applied the method to a real-world case in China and found that it can effectively identify suitable airport sites that can minimize the impact on airspace while Ding et al. (2011) presented a new method for airport site selection that uses comprehensive evaluation based on multiple criteria. The authors applied the method to a real-world case in China and found that the method can effectively identify suitable airport sites based on multiple criteria. In conclusion, airport site selection is a complex process that requires the consideration of multiple criteria. The methods presented in this literature review can effectively identify suitable airport sites based on various criteria, including accessibility, environmental impact, risk assessment, passenger demand, and bird ecological conservation. These methods can be used by airport planners to make informed decisions and ensure that the selected site meets the needs of all stakeholders."

The selection of airport sites is a complex process that requires the consideration of various criteria. Lv (2021) proposed a new method for airport site selection based on a three-dimensional visual system using SuperMap. The author applied the method to a real-world case in China and found that the three-dimensional visual system can effectively assist in the decision-making process for airport site selection. Zhang et al. (2021) investigated the influence of ground-effect wind field of unmanned aerial vehicles (UAVs) on distributed airport site selection. The authors proposed a method to analyze the wind field and applied it to a real-

world case in China. The results showed that the ground-effect wind field of UAVs has a significant impact on airport site selection, and the proposed method can provide a more accurate assessment of the wind field. Sedlin et al. (2020) explored the role of public participation in airport development using the case of the site selection for Berlin Brandenburg Airport in Germany. The authors analyzed the public participation process and found that it played a critical role in the decision-making process.

The study suggests that involving the public in airport site selection can lead to more informed and transparent decisions that are better aligned with the community's needs. Alves et al. (2020) proposed an objective decision-making framework for regional airport site selection based on multi-criteria decision analysis (MCDA) and Geographic Information Systems (GIS). The authors applied the method to a real-world case in Brazil and found that it can effectively identify suitable airport sites based on multiple criteria. The study suggests that the proposed framework can assist airport planners in making more informed and objective decisions. Ruifang and Rui (2020) conducted a brief analysis on the design points of the site selection for the relocation of airports in the branch line, taking the relocation of Nanyang Airport in China as an example. The authors proposed a design concept for the airport site selection process and discussed the importance of considering factors such as economic development, transportation, and environmental protection. The study highlights the importance of taking a comprehensive approach to airport site selection, considering both technical and social factors.

From the entire literature review process, researchers have described and explained the contributions of each study to highlight the advancements in the field. The findings and conclusions of all the studies are summarized in Section 4, as shown in Table 1.

4. Research Methodology

Study design

This study is a descriptive systematic review investigating decision criteria in Airport Site Selection.

Paper collection

In the current study, “airport” refers to an area used for taking off and landing of aircraft, which can be an airport for large aircraft such as an international airport or a small airport such as a local airport. Airports typically have various amenities such as terminals that provide passenger services, hotels, industrial factories, aircraft maintenance facilities, flight schools, accommodations, and other related facilities for aviation (Salter, 2008).

“Site selection” refers to the process of selecting a location or site for a project or activity, such as building a factory, developing real estate projects, or construction. It uses

both quantitative and qualitative data and formalizes a process to interpret and render. Categories of consequence to a decision task (Veitch, 1997).

"Decision criteria" refer to the benchmarks or guidelines utilized to determine the suitable choices to pursue in business decision-making or strategizing. These typically encompass a set of qualities or features necessary for the decision, aiding decision-makers in acquiring sufficient information to make a sound choice and minimizing the chances of an erroneous decision (Jato-Espino et al., 2014).

To gather a comprehensive collection of research papers The search strategy was developed with the help of three experts and two authors, including two professors of aviation business management from the School of Management at Mae Fah Luang University, and one aviation business personnel. Relevant keywords were selected to guide the search. A search text was created by combining the operator 'or' between each two of the following four terms: 'Airport Site Selection', 'Airport Location Selection', 'Airport Site', and 'Airport Location'. The systematic search was conducted using four electronic databases, namely Web of Science, Google Scholar, Scientific.net, SCOPUS, IEE, and Science Direct, and MDPI to identify academic research papers that published before March 2023

Study Eligibility

The criterion for inclusion is articles that have been published in peer-reviewed journals and have undergone a selection process for airport venues only. Sources that can be reviewed include academic conference proceeding papers and theses, but articles from Belle's list and non-English articles will not be included.

5. Research Finding

This study utilized the PRISMA FLOW approach for literature screening, in which 36 relevant studies on airport site selection were identified. Among these studies, 2 were excluded due to duplication, 1 was excluded due to inadequate content, resulting in a remaining 28 relevant studies. Additionally, 7 supplementary studies were excluded due to lack of credibility, and 2 studies were inaccessible. Thus, a total of 16 relevant studies were included in this review (Figure 2).

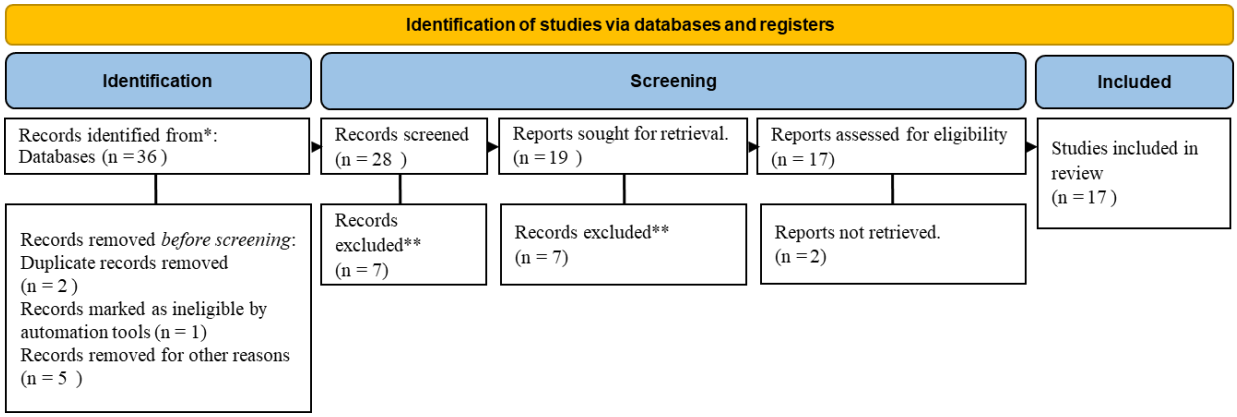

Figure 2 PRISMA Flow diagram for systematic review of airport site selection criteria

This list of Table 1. Displays the frequency of occurrences for each country mentioned in the collection of research papers pertaining to airport site selection and multi-criteria decision-making techniques. The list indicates that China had the highest number of occurrences, with 16 research papers referencing the country. Turkey followed closely behind with three occurrences, while Poland, Germany, Brazil, India, Iran, and Mexico each had one occurrence. The prominence of China in the list may indicate a heightened interest in the application of multi-criteria decision-making techniques to airport site selection within the country, while the presence of multiple countries with only one occurrence suggests a more limited scope of research in those regions.

Table 1 The summarized of the systematic review of airport site selection

No.	Author(s)	Year	Country	Type	Journal/ Conference	Method
1	Palczewski and Sałabun	2019	Poland	Proceeding	23rd International Conference on Knowledge-Based and Intelligent Information & Engineering Systems	Normalization method
2	Sennaroglu and Celebi	2018	Turkey	Article	Transportation Research Part D	AHP, PROMETHEE, VIKOR
3	Yang et al.	2014	China	Article	Applied Mechanics and Materials	WLSM-TOPSIS
4	Belbag et al.	2013	Turkey	Proceeding	2nd International Conference on Operations Research and Enterprise Systems	Fuzzy multi criteria decision methods
5	Zhang et al.	2021	China	Proceeding	2021 2nd International Symposium on Computer Engineering and Intelligent Communications (ISCEIC)	Ground-effect wind field of UAV

No.	Author(s)	Year	Country	Type	Journal/ Conference	Method
6	Sedlin et al.	2020	Germany	Article	Sustainability 2020	Case study, The Theory of Effective Public Participation
7	Alves et al.	2020	Brazil	Article	Journal of Air Transport Management	Objective decision-making framework
8	Erkan and Elsharida	2020	Turkey	Article	International Journal of Geoinformation	AHP, ROC, GIS
9	Ramu et al.	2020	India	Article	International Journal of Advanced Science and Technology	Fuzzy AHP, RS & GIS hybrid approach
10	Zhao et al.	2019	China	Article	Global Ecology and Conservation	Expert-based selection
11	Carmona-Benítez et al.	2015	Mexico	Proceeding	Lecture Notes in Computer Science	Maximization model
12	Liao and Bao	2014	China	Article	Applied Mechanics and Materials	Triangular fuzzy number
13	Jiang and Wang	2014	China	Proceeding	2014 International Conference of Logistics Engineering and Management	Multilayer fuzzy reasoning model
14	Huang et al.	2013	China	Proceeding	Fourth International Conference on Transportation Engineering	GIS-based analysis
15	Zhao and Sun	2013	China	Article	International Journal of Online and Biomedical Engineering	Lattice order decision making method
16	Ding et al.	2011	China	Article	Applied Mechanics and Materials	Comprehensive evaluation

The table provided includes 16 studies related to airport site selection, which were conducted in different countries and published in various types of academic publications, including articles and conference proceedings. The studies utilized a range of decision-making methods and techniques to evaluate various criteria for airport site selection. The methods and techniques used in the studies included normalization method, AHP, PROMETHEE, VIKOR, WLSM-TOPSIS, fuzzy multi-criteria decision methods, ground-effect wind field analysis, case studies, objective decision-making framework, ROC, GIS, fuzzy AHP, RS & GIS hybrid approach, optimization model, expert-based selection, maximization model, triangular fuzzy number,

multilayer fuzzy reasoning model, GIS-based analysis, lattice order decision making method, and comprehensive evaluation. The criteria evaluated in these studies include environmental, geographic accessibility, topography, safety and risk, and social criteria.

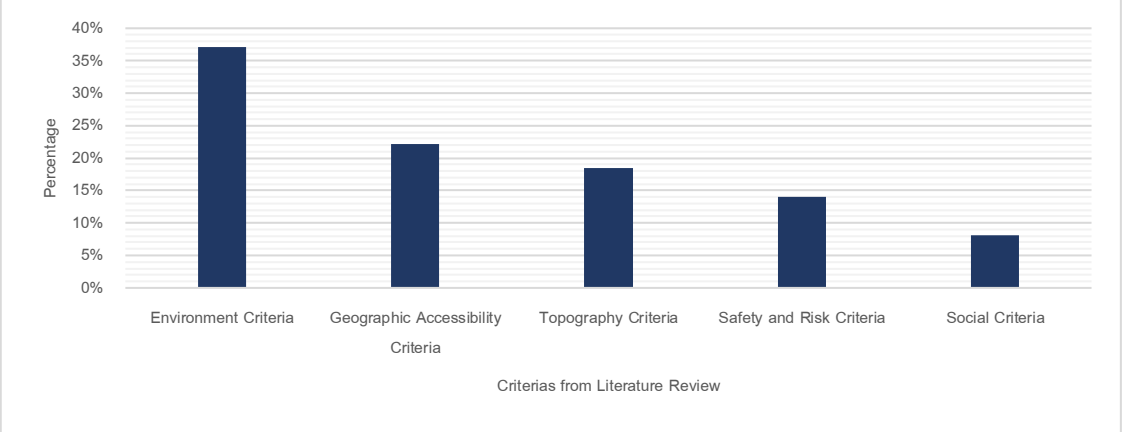

Figure 3 Margins of Criteria from Literature Review

The statistics provided suggest the percentage breakdown of different criteria that were considered in several research studies on airport site selection. Environment Criteria: This category represents the largest proportion at 37%, which means that environmental factors were the most important criteria when selecting an airport site. Environmental criteria could include factors such as air and water quality, noise pollution, and the impact on wildlife habitats. Geographic Accessibility Criteria: This category represents 22% of the criteria, meaning that accessibility was a significant consideration in airport site selection. Geographic accessibility could include proximity to transportation network distance to city, railways, and connectivity, as well as the availability of land and infrastructure. Topography Criteria: This category represents 19% of the criteria, suggesting that topography (the physical features of the land) played a significant role in airport site selection. Topography could include factors such as elevation, slope, and soil stability. Safety and Risk Criteria: This category represents 14% of the criteria, which means that safety and risk were also important factors in airport site selection. Safety and risk criteria could include factors such as proximity to hazards like chemical plants or natural disasters like floods or earthquakes. Social Criteria: This category represents the smallest proportion at 8%, indicating that social considerations (such as airport facility, population density, or health) were less important than other criteria in airport site selection. Most research studies demonstrate that environmental criteria are the most significant and primary focus when selecting an airport site. This is followed by geographic accessibility criteria, which includes convenience in connecting to other modes of transportation. Next in importance is topography, which must be evaluated prior to analyzing safety and risk criteria, which involves assessing natural hazards. Finally, social criteria have the least impact on airport site selection.

Table 2 The summarized of the criteria of airport site selection review

Criteria	Sub-Criteria	Palczewski and Satabun (2019)	Sennaroglu and Celebi, (2018)	Yang et al., (2014)	Belbag et al., (2013)	Zhang et al., (2021)	Sedlin et al., (2020)	Alves et al., (2020)	Erkan and Elsharida,	Ramu et al., (2020)	Zhao et al., (2019)	Carmona-Benitez et al., (2015)	Liao and Bao, (2014)	Jiang and Wang, (2014)	Huang et al., (2013)	Zhao and Sun, (2013)	Ding et al., (2011)	Total
Geographic Accessibility	Distance to main transportation networks	✓	✓	✓	✓			✓	✓	✓			✓	✓		✓		10
	Distance to urban centers	✓							✓	✓		✓	✓			✓	✓	7
	Public transportation							✓				✓					✓	3
	Rail network									✓					✓	✓		3
	Distance to potential customers	✓															✓	2
	Distance to fuel suppliers	✓	✓															2
	Closest distance from regional airports											✓				✓		2
	Distance to other airports	✓																1
Environment Criteria	Air pollution	✓	✓	✓	✓	✓	✓		✓		✓		✓	✓	✓			11
	Noise pollution	✓	✓	✓	✓	✓	✓		✓		✓		✓	✓	✓			11
	Temperature	✓	✓	✓	✓	✓	✓											6
	Clearness index	✓	✓	✓	✓	✓	✓											6
	Wind speed					✓			✓				✓				✓	4
	Bird							✓			✓						✓	3
	Rain			✓									✓				✓	3
	Smoke							✓					✓				✓	3
	Cloud			✓													✓	2
	Fog																✓	1
Topography Criteria	Slope of land and Elevation			✓	✓			✓	✓	✓			✓					6
	Protected areas			✓	✓			✓							✓	✓		5
	Land use							✓		✓	✓		✓				✓	5
	Soil conditions			✓					✓	✓								3
	Elevation above sea level							✓	✓				✓					3
	Relative humidity								✓									1

Criteria	Sub-Criteria	Palczewski and Satabun (2019)	Sennaroglu and Celebi, (2018)	Yang et al., (2014)	Belbag et al., (2013)	Zhang et al., (2021)	Sedlin et al., (2020)	Alves et al., (2020)	Erkan and Elsharida,	Ramu et al., (2020)	Zhao et al., (2019)	Carmona-Benitez et al., (2015)	Liao and Bao, (2014)	Jiang and Wang, (2014)	Huang et al., (2013)	Zhao and Sun, (2013)	Ding et al., (2011)	Total
	Drainage									✓								1
	Hydrological											✓						1
Social Criteria	Access to airport facilities	✓	✓		✓	✓											✓	5
	Population Density									✓		✓				✓		3
	Public health						✓											1
	Migrants																✓	1
	Crime rate																✓	1
Safety and Risk Criteria	Conflict with air corridoes (no-fly zone)		✓			✓									✓	✓		4
	Distance from faults					✓			✓						✓		✓	4
	Distance from water streams								✓	✓					✓		✓	4
	proximity to hazardous materials					✓		✓						✓				3
	Obstacle outside									✓							✓	2
	Visibility							✓							✓			2

Table 2 displays the frequency of various criteria pertaining to Geographic Accessibility, Environment, Topography, Social, Safety, and Risk in the dataset. The criteria for Geographic Accessibility include distance to main transportation networks (10 occurrences), distance to urban centers (7 occurrences), public transportation (3 occurrences), rail network (3 occurrences), distance to potential customers (2 occurrences), distance to fuel suppliers (2 occurrences), closest distance from regional airports (2 occurrences), and distance to other airports (1 occurrence). The frequency data provides valuable insights into the significance and distribution of these factors. Distance to main transportation networks is the most frequently occurring factor, appearing 10 times, whereas distance to other airports is the least frequent, occurring only once.

In the Environment category, the prominent criteria are air pollution (11 occurrences), noise pollution (11 occurrences), soil pollution (6 occurrences), water pollution (6 occurrences), wind speed (4 occurrences), bird (3 occurrences), rain (3 occurrences), smoke (3 occurrences), cloud (2 occurrences), and fog (1 occurrence). Air and noise pollution stand out as the most significant factors with 11 occurrences each, followed by soil and water pollution with 6 occurrences each.

Topography criteria related to land and geography characteristics encompass the slope of land (6 occurrences), protected areas (5 occurrences), land use (5 occurrences), soil conditions (3 occurrences), elevation above sea level (3 occurrences), relative humidity (1 occurrence), drainage (1 occurrence), and hydrological (1 occurrence). The frequency data reveals that the slope of land is the most frequently occurring factor with 6 occurrences. Protected areas and land use both occur 5 times, while soil conditions and elevation above sea level each occur 3 times. The remaining factors occur only once each.

Social criteria pertaining to socio-economic and public services in a specific context include access to airport facilities (5 occurrences), population density (3 occurrences), public health (1 occurrence), migrants (1 occurrence), and crime rate (1 occurrence). Access to airport facilities stands out as the most frequently occurring factor with 5 occurrences. Population density occurs 3 times, whereas the other factors each occur only once.

All of the study also presents the frequency of Safety and Risk criteria related to aviation, including Conflict with air corridors (no-fly zone) with 4 occurrences, Distance from faults (4 occurrences), Distance from water streams (4 occurrences), Proximity to hazardous materials (3 occurrences), Obstacle outside (2 occurrences), and Visibility (2 occurrences). These factors play a crucial role in understanding the risks associated with specific locations, be it urban or natural environments. The dataset can be utilized in various fields such as urban planning, disaster management, and environmental risk assessment. Additionally, it serves as a valuable resource for research and analysis in the fields of geography, environmental science, and risk assessment.

6. Conclusion and Discussion

The findings consistently demonstrate that environmental criteria hold the highest significance and are the primary focus in airport site selection. This is followed by geographic accessibility criteria, indicating the importance of convenient transportation connections. Topography is also considered before evaluating safety and risk criteria, which involve assessing natural hazards. Social criteria have the least impact on airport site selection.

The frequency data provided in the result offers valuable insights into the significance and distribution of these criteria within the dataset. It can be utilized for various analysis and decision-making purposes, including land use planning, environmental management, urban planning, public policy development, disaster management, and environmental risk assessment. Moreover, this dataset serves as a valuable resource for research and analysis in the fields of geography, environmental science, and risk assessment.

7. Research Suggestions

From the list of studies on airport site selection, several gaps in the research can be identified. The lack of consistency in the criteria used in airport site selection studies limits the ability to compare and synthesize results across different studies. While environmental, geographic accessibility, topography, safety and risk, and social criteria are commonly used, the weight given to each criterion varies widely among different studies. This inconsistency creates difficulties in making meaningful comparisons and drawing valid conclusions across studies.

Another significant gap in the research is the limited attention given to the social and environmental impacts of airport development. Despite the significant impact airport development can have on local communities, social criteria are given the least weight in many studies. This limited focus on the social and environmental impacts of airport development undermines the overall sustainability of airport projects and can contribute to negative consequences for local communities and ecosystems.

The geographical bias in the studies, with most of the research conducted in China and Turkey, limits the generalizability of the findings to other contexts. The lack of studies from other regions of the world limits our understanding of how site selection criteria and decision-making methods may vary across different cultural and political contexts.

Finally, addressing these gaps in airport site selection research will require greater attention to consistency in criteria and decision-making methods, as well as a focus on the social and environmental impacts of airport development. Furthermore, future studies should include a broader range of geographical contexts to increase the generalizability of findings and avoid a potential regional bias. Such efforts will help to ensure that airport development is sustainable, equitable, and environmentally responsible, and will support the long-term well-being of local communities and ecosystems.

REFERENCES

Alves, C. J. P., da Silva, E. J., Müller, C., Borille, G. M. R., Guterres, M. X., Arraut, E. M., Peres, M. S., and dos Santos, R. J. (2020). Towards an objective decision-making framework for regional airport site selection. *Journal of Air Transport Management, 89*, 101888. https://doi.org/10.1016/j.jairtraman.2020.101888

Belbag, S., Deveci, M., and Uludag, A. S. (2013). Comparison of two fuzzy multi-criterial decision methods for potential airport location selection. In *ICORES 2013 – Proceedings of the 2nd International Conference on Operations Research and Enterprise Systems,* 270-276.

Carmona-Benítez, R. B., Fernandez, O., and Segura, E. (2015). Site Selection of the New Mexico City Airport from the Perspective of Maximizing the Sum of Expected Air Pax Demand. In *6th International Conference on Computational Logistics* 2015*, Delft, The Netherlands, September 23-25, Proceedings,* 586-601. https://doi.org/10.1007/978-3-319-24264-4_40

Ding, D. L., Cai, L. C., Wang, X. L., Shao, B., and Zheng, Y. (2011). Application of Comprehensive Evaluation of the Airport Site Selection. *Applied Mechanics and Materials, 97–98*, 311–315. Trans Tech Publications, Ltd. https://doi.org/10.4028/www.scientific.net/amm.97-98.311

Erkan, T. E., and Elsharida, W. M. (2020). Combining AHP and ROC with GIS for airport site selection: a case study in Libya. *ISPRS International Journal of Geo-Information, 9*(5), 312. https://doi.org/10.3390/ijgi9050312

Fu, Q., Wang, N., Shen, M., Song, N., and Yan, H. (2016). A study of the site selection of a civil airport based on the risk of bird strikes: The case of Dalian, China. *Journal of Air Transport Management, 54*, 17-30.

Han, B., Qu, T., Huang, Z., Wang, Q., and Pan, X. (2022). Emergency airport site selection using global subdivision grids. *Big Earth Data, 6*(3), 276-293. https://doi.org/10.1080/20964471.2021.1996866

Huang, B., Lin, J., Zheng, X., and Fang, X. (2013). Airport site selection under complex airspace based on GIS. In *ICTE 2013: Safety, Speediness, Intelligence, Low-Carbon, Innovation,* 2188-2194. https://doi.org/10.1061/9780784413159.319

Jato-Espino, D., Castillo-Lopez, E., Rodriguez-Hernandez, J., and Canteras-Jordana, J. C. (2014). A review of application of multi-criteria decision making methods in construction. *Automation in construction, 45*, 151-162. https://doi.org/10.1016/j.autcon.2014.05.013

Jiang, B., and Wang, Y. (2014). Evaluation of airport site selection based on the multilayer fuzzy reasoning model. In *ICLEM 2014: System Planning, Supply Chain Management, and Safety,* 836-841. https://doi.org/10.1061/9780784413753.126

Liao, Y., and Bao, F. (2014). Research on Airport Site Selection Based on Triangular Fuzzy Number. *Applied Mechanics and Materials, 505–506*, 507–511. https://doi.org/10.4028/www.scientific.net/amm.505-506.507

Lv, J. (2021). Three-dimensional visual system of airport site selection based on SuperMap. In *IOP Conference Series: Earth and Environmental Science, 643*(1), 012146. https://doi.org/10.1088/1755-1315/643/1/012146

Palczewski, K., and Sałabun, W. (2019). Influence of various normalization methods in PROMETHEE II: an empirical study on the selection of the airport location. *Procedia computer science, 159*, 2051-2060. https://doi.org/10.1016/j.procs.2019.09.378

Ramu, P., Srinivasarao, T., Lalith Nandan, K., and Keshav, M. (2020). Fuzzy AHP, RS & GIS based hybrid approach for airport site selection-Kothagudem district. *International Journal of Advanced Science and Technology, 29*(1), 1645-1653. http://sersc.org/journals/index.php/IJAST/article/view/3731

Ruifang, S., and Rui, S. (2020). Brief Analysis on the Design Points of the Site Selection for the Relocation of Airports in the Branch Line—Taking the Relocation of Nanyang Airport as an Example. In *IOP Conference Series: Materials Science and Engineering, 780*(6), 062037.

Salter, M. B. (Ed.). (2008). *Politics at the Airport.* NED-New edition. University of Minnesota Press. http://www.jstor.org/stable/10.5749/j.ctttsqsx.

Sedlin, T., Beckmann, V., and Tan, R. (2020). Public participation and airport development: The case of the site selection for berlin Brandenburg airport (BER) in Germany. *Sustainability, 12*(24), 10535. https://doi.org/10.3390/su122410535

Sennaroglu, B., and Celebi, G. V. (2018). A military airport location selection by AHP integrated PROMETHEE and VIKOR methods. *Transportation Research Part D: Transport and Environment, 59*, 160-173. https://doi.org/10.1016/j.trd.2017.12.022

Veitch, S. M. (1997). Land use decisions and site selection: a GIS-based method. *Environmental Software Systems, 2*, 259-262. https://doi.org/10.1007/978-1-5041-2869-8_33

Wang, Z., Cai, L., Chong, X., and Zhang, L. (2009). Airport site selection based on uncertain multi-attribute decision making. In *Logistics: The Emerging Frontiers of Transportation and Development in China,* 647-654. https://doi.org/10.1061/40996(330)93

Yang, C. Q., Wu, T., and Liao, Y. (2014). Evaluation for the Location Selection of Airport based on WLSM-TOPSIS Method. *Applied Mechanics and Materials, 548*, 1823-1827. https://doi.org/10.4028/www.scientific.net/AMM.548-549.1823

Zhang, W., Zhong, Y., Wang, Z., Luo, Z., and Wang, B. (2021). Influence on distributed airport site selection from ground-effect wind field of UAV. In *2021 2nd International Symposium on Computer Engineering and Intelligent Communications (ISCEIC),* 322-329.

Zhao, B., Wang, N., Fu, Q., Yan, H. K., and Wu, N. (2019). Searching a site for a civil airport based on bird ecological conservation: An expert-based selection (Dalian, China). *Global Ecology and Conservation, 20*, e00729. https://doi.org/10.1016/j.gecco.2019.e00729

Zhao, S., and Sun, P. (2013). Scheme comparison of new airport site selection based on lattice order decision making method in the integrated transportation system. *International Journal of Online Engineering (iJOE), 9*(S4), 95-99.

Contact Information

Nattaphon Rangsaritvorakarn
E-mail: Nattaphon.mfu@gmail.com
Healthcare Logistics Management Research Center, School of Management,
Mae Fah Luang University