

Study on the Development of Pioneering Routes at Bua Airport Based on Multi-Criteria Analysis

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Abstract--This study aims to analyze the characteristics of the pioneering route from Bua Airport to other airports in South Sulawesi Province and to analyze the selection of priority pioneer routes from Bua Airport based on multi-criteria analysis. This research is non-experimental and much more based on descriptive qualitative and quantitative. Collecting data process is by using observation, documentation, and questionnaires. The respondents of this study were 100 respondents consisting of the public/passengers, employees and leaders of Bua airport. In this study, the AHP method is needed to make a decision whether to develop pioneer routes at Bua airport by opening several pioneer routes to other areas. The results of pairwise comparisons look at the characteristics of the selection criteria for pioneering route development criteria for distance 24.0%, travel time criteria 24.9%, cost criteria 25.8%, transportation mode criteria 13.6% and road network criteria 11.6%, therefore, the priority criterion in developing the pioneer route for Bua Airport is the cost criterion with a weight of 25.8%. The selection of priority pioneer routes for Bua Airport in comparison of alternatives with alternatives based on the criteria for the main area distance is Toraja 32.3%, the criteria for travel time to the main area of Toraja 38.6%, the criteria for the cost of the main area of Seko 32.8%, the criteria for the main mode of transportation Toraja 32, 5% and the main regional road network criteria are Toraja 31.9%, the priority pioneer route development for Bua Airport is Toraja 33.2%, the second area is Seko 29.2%, the third area is Rampi 19.2%, the fourth area is Masamba 9.8%, and the fifth area is Kendari 8.5%.

Keyword: Airport; Pioneer Routes; Multi-criteria Analysis

I. Introduction

An airport is a stopover place for aircraft (air transportation) to land and carry out activities such as lowering and transporting passengers or goods. In addition, airport is a place to carry out all routine maintenance repairs and other activities. The airport hierarchy is determined based on the criteria for evaluating activities in cities which are economic centers; air traffic density level; and the distribution function. Based on the airport hierarchy, it consists of a

hub and a feeder airport (spoke). The airport has a wide range of services from various airports that serve passengers and/or cargo in large numbers and affect the development of the national economy or various provinces, as one of the service infrastructures of the National Activity Center (PKN). Meanwhile, the speaking airport includes services and influences the development of the local economy, as a means of supporting local activities. According to Suharno [1], in accordance with the government's mission in domestic air transport policy, the purpose and objective of making the airport a hub and talk is to connect and reach all regions of the Republic of Indonesia in order to create stronger routes and flight networks for roles. increased by applying the principles of daylight subsidies (route balance) for the aspect of equal distribution of services throughout the region, namely, apart from serving congested routes, they also fly less congested routes, as well as to open isolation of remote areas and remote areas that are not yet connected to pioneering air transport [1]. Pioneering air transport facilitates not only the movement of passengers, but also the movement of goods. In addition, air transportation will provide benefits for maintaining the security of goods prices, increasing the economic value of a region, and determining regional development.

Pioneer air transportation plays a very vital role in Indonesia, in addition to being a means of fast transportation and the ability to roam to very remote areas of Indonesia, pioneering air transportation also plays a role as one of the unifying tools of the nation and state. Therefore, a solid, strong and resilient aviation environment is needed, so as to be able to connect thousands of islands and every region in Indonesia fairly and equitably.

Bua Airport, also known as Palopo Lagaligo Airport, is a domestic standard airport located in the Bua sub-district, 10 km from Palopo city, South Sulawesi, Indonesia, the airport was inaugurated by President Susilo Bambang Yudhoyono in Makassar on October 19, 2010, Bua Airport has a runway of 1,650 x 30 meters and a total area of 49,500 m², while the runway for taxiways is 191m x 18m and a total area of 3,438 m², while the Parking/Apron runway has a size of 120m x 90m, and a total area of 10,800m², the capacity of Bua airport is able to accommodate 2 ATR-72 type aircraft.

Budi Karya Sumadi said that the development of Uadara Bua Airport in Luwu Regency is expected to accommodate 1 million passengers. Seeing the development of travel access at this time there are still many who have not been able to reach remote areas so that they have the potential to open routes or access for these remote areas. The number of areas that are very difficult to reach by 2-wheeled vehicles, it is possible for Bua airport to serve and open pioneer routes to other areas. The current flight path is the domestic route, namely the Bua to Makassar route and vice versa from Makassar to Bua. Therefore, it is necessary to open and develop pioneering routes from Bua to other areas, Bua to Toraja, Seko, Rampi, Masamba, and Kendari. These five areas have the potential for rapid economic development as evidenced by natural products that have been successfully managed by the surrounding community, such as growth of cloves, cocoa, pepper, coffee, vanilla, rice, vegetables and other agricultural products. Not only from the agricultural sector, has the development of the area also had an influence on the mining sector where one of the opening locations is the largest mining location in Southeast Asia. This is one of the considerations to facilitate and pave the way for the community in the process of selling plant and other natural products. In addition, the opening of access to these pioneering routes makes it easier for the community and the government to manage these areas and their natural products.

According to Utomo [2], transportation is: 1 the transfer of goods and people from the place of origin to the place of destination, 2 one type of activity that involves increasing human needs by changing the geographical location of goods and people so that transactions will occur, and the types of transportation are divided into three namely, Land Transportation.

According to the Regulation of the Minister of Transportation of the Republic of Indonesia Number PM 39 of 2019, concerning the National Airport Order, an

airport is an area on land and or waters with certain boundaries that is used as a place for airplanes to land and take off, boarding passengers, loading and unloading goods, and places for intra and intermodal transportation, which are equipped with aviation safety and security facilities, as well as basic facilities and other supporting facilities [3].

According to the Government Regulation of the Republic of Indonesia Number 70 of 2001 concerning Airports Article 1, airports are airports used for landing and taking off aircraft, and boarding and dropping passengers or loading and unloading cargo or post, which is equipped with flight safety facilities and as a place of movement. between modes of transportation [4], Airports are classified into 2, namely according to ICAO (International Civil Aviation Organization) and FAA (Federal Aviation Administration).

According to Aditya Dewantari, pioneering air transportation consists of pioneering passenger air transportation and pioneering cargo air transportation [5], As stated by Sartono, the development of pioneer routes is also very necessary to open isolated areas so that development and development can be carried out in these areas, making it easier for the government to succeed in economic equality, opening access in and out that is able to facilitate trade flows and cooperation which will later be able to boost the economy of these remote areas [6], Yuliana et al. stated that the most important objective of pioneering air freight operations is to emphasize the commodity price gap due to high logistics costs. In line with that [7], Yarlina and Lindasari also stated that the important goal of implementing pioneering air transportation is also to ensure the accessibility of the community [8], Miro describes the relationship scheme between the transportation system and the community's social, economic and cultural life activity system, where the demand for transportation arises as a result of the activities of people's lives to travel [9], The function as a driving element of this pioneering route is very important in realizing connectivity in Indonesia. Air transportation has the characteristics of high speed and

can penetrate to all areas that cannot be reached by other modes of transportation (KM 49/05, 2005).

The development of this pioneering route is based on the government's policy on regulating flight routes on a macro basis, which aims to open regional isolation and develop the potential of each region. as stated in the Regulation of the Minister of Transportation Number PM. 88 of 2013 concerning Networks and Routes [10].

The implementation of pioneering transportation is a manifestation of the state's presence to the community in accordance with the first Nawa Cita, and is part of the work focus of the Ministry of Transportation in order to improve safety, capacity of facilities and quality of transportation services in Indonesia as stated in the regulations that have been enacted starting January 27, 2016 which Then, it was an update from the Decree of the Director General of Civil Aviation Year 2010 Number SKEP/21/I/2010 which regulates several things including types of pioneering air transport activities, criteria for pioneering routes, implementation of pioneering air transportation, implementation of pioneering air transportation, evaluation of pioneer routes, and obligations of pioneering transport operators. The background for pioneering flights is the geographical condition of Indonesia in the form of islands and the economy as well as the welfare of the people in the area, Dina Yuliana et al, in Tangkilisan.

The Analytic Hierarchy Process (AHP) was introduced by Thomas L. Saaty in the 1970s, to solve complex multi-criteria problems into a hierarchy. There are three principles that must be understood to solve a problem using the AHP method, namely: decomposition, comparative judgment, and logical consistency

II. Research Methodology

Based on the objectives and problems studied, this research is non-experimental and descriptive qualitative and quantitative, which is a type of case study with surveys and direct observations in the field that provides an overview of the object under study and its development in the future.

The plan for the pioneer route to Bua to Toraja, Bua to Seko, Bua to Rampi, Bua to Masamba and Bua to Kendari, can be seen in the following figure.

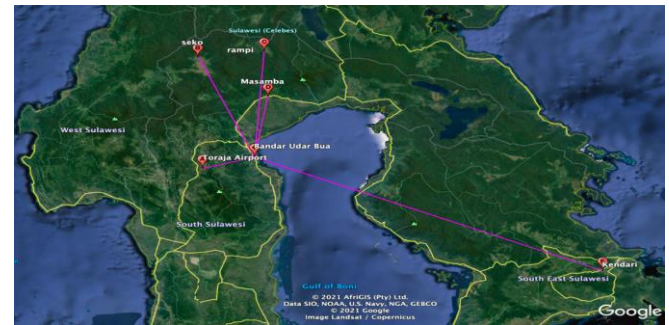


Figure 1. Alternative Planned Locations for Pioneer Route Development

In this study, the researchers conducted direct observations at the location and also conducted interviews with resource persons, namely the community/airport users, officers and related officials from the transportation service or other related agencies. To strengthen the interview data, the researcher also used a questionnaire to obtain the data. As for the process of getting the data, the researcher will distribute a questionnaire containing statements regarding expectations, conditions and also customer satisfaction in enjoying the facilities at the airport. For interviews, the researchers themselves will be the research instruments as interviewers or journalists who will later interview 100 people/respondents, including airport users/passengers, airport officials and also related officials, that the number of respondents with an unlimited number of populations is four or five the number of sub-variables studied Maholtra (2009) [11]. In sampling, this study also uses accidental sampling, which is a technique of making samples based on chance, which means that anyone by chance meets the sample, if the person who happened to be met is the source of the data, Sugiono (2013) [12].

In this study, the AHP method is needed to make a decision whether the development of pioneer routes at Bua airport by opening several pioneer routes to other areas is appropriate or there is still need for adjustments using criteria in terms of distance, travel time, cost, and mode of transportation.

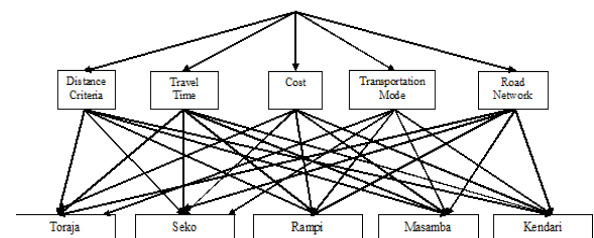


Figure 2. Hierarchical Structure

III. Results and Discussion

In accordance with KM No. 20 of 2014 the Minister of Transportation concerning the procedures and procedures for determining the location of airports in this case the development of pilot routes in remote areas with the following criteria: a. Distance Criteria, b. Travel Time Criteria, c. Cost Criteria, d. Transportation Mode Criteria, e. Road Network Criteria. As for alternative locations to open a pioneer route at Lagaligo BUA Airport, Luwu Regency, there are 5 locations. Among them: a. Toraja, b. Seko, c. Rampi, d. Masamba, e. Kendari.

From the five alternative locations, pairwise comparisons will be carried out on each of the criteria for distance, travel time, cost, and mode of transportation, and road network, pairwise comparison stages on each criterion in order to obtain criteria and variables that affect alternative locations. The first stage was determining the criteria for pairwise comparisons on the criteria for distance, travel time, costs, transportation modes and road networks.

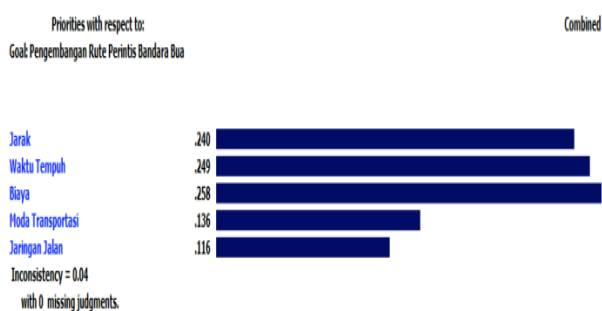


Figure 3. Bar Chart Comparison with Criteria Paired Criteria

Based on the determination of the pairwise comparison of the criteria with the above criteria for the development of the peritis route, the distance criterion is 24.0%, for the travel time criterion it is 24.9%, for the cost criterion is 25.8%, for the transportation mode criterion is 13.6 % and for the road network criteria of 11.6 seeing the resulting inconsistency below 0.10%, the distribution of the questionnaire does not require repetition. For the next stage, namely determining the value of alternative pairwise comparisons with alternatives based on each criterion

a. Comparison of alternatives with alternatives based on distance criteria

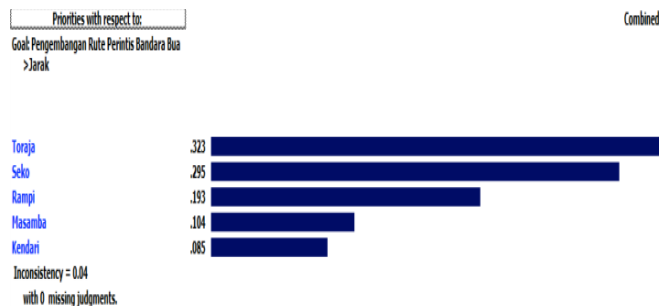


Figure 4. Comparison Bar Chart Alternative with Alternative Based on Distance Criteria

Based on the comparison results Comparison of alternatives with alternatives based on the distance criteria above for the opening of pioneer routes by looking at the distance criteria, the results obtained are 32.3% for the Toraja area, 29.5% for the Seko area, 19.3% for the Rampi area, 10, 4% for the Masamba area and 8.5% for the Kendari area. From the results of the comparison of alternatives with alternatives based on the distance criterion, it is concluded that if you look at the distance for opening pioneer routes, the Toraja area becomes a priority according to the results obtained. And seeing the resulting inconsistency below 0.10%, the distribution of the questionnaire does not require repetition. For the second weight, namely Travel Time as follows:

b. Comparison of alternatives with alternatives based on travel time criteria

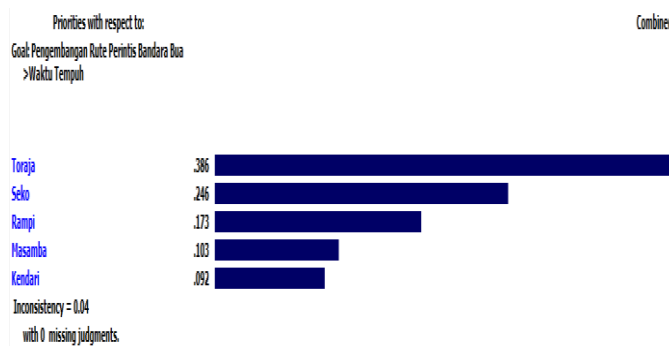


Figure 5. Bar Chart Comparison of Alternatives with Alternatives Based on Travel Time Criteria

Based on the results of the comparison of alternatives with alternatives based on the Travel Time criteria for opening pioneer routes by looking at the weight of the travel time, the results obtained are 38.6% for the Toraja area, 24.6% for the Seko area, 17.3% for the Rampi area, 10.3% for the Masamba area and 9.2% for the Kendari area. From the results of this pairwise comparison, it is concluded that looking at the travel time for opening the pioneer route, the Toraja area becomes a priority according to the results obtained. And seeing the resulting inconsistency below 0.10%, the distribution of the questionnaire does not require repetition. For the third weight, the costs are as follows:

c. Comparison of alternatives with alternatives based on Cost criteria:

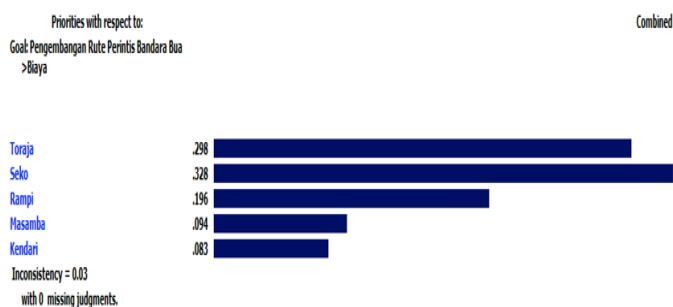


Figure 6. Bar Chart Comparison of Alternatives with Alternatives Based on Cost Criteria

Based on the results, comparison of alternatives with alternatives based on the cost criteria for opening pioneer routes by looking at the weights on the cost criteria, the results obtained are 29.8% for the Toraja area, 32.8% for the Seko area, 19.6% for the Rampi area, 9.4% for the Masamba area and 8.3% for Kendari area. From these results it is concluded that looking at the cost criteria for opening pioneer routes, the Seko area becomes a priority according to the results obtained. And seeing the resulting inconsistency below 0.10%, namely 0.03%, the distribution of the questionnaire does not require repetition. For the fourth weight, namely the Mode of Transportation as follows:

d. Comparison of alternatives with alternatives based on the criteria of Mode of Transport

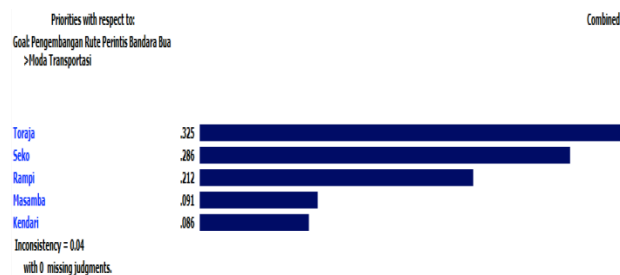


Figure 7. Bar Chart Comparison of Alternatives with Alternatives Based on the Criteria for Mode of Transportation

Based on the results comparison of alternatives with alternatives based on the criteria of Mode of Transportation for opening pioneer routes by looking at the weights on the criteria of transportation modes, the results obtained are 32.5% for the Toraja area, 28.6% for the Seko area, 21.2% for the Rampi area, 9.1% for the Masamba area and 8.6% for the Kendari area. From these results it is concluded that looking at the criteria for the mode of transportation for the opening of pioneer routes, the alternative area of Toraja becomes a priority according to the results obtained. And seeing the resulting inconsistency below 0.10%, i.e. 0.04%, the distribution of the questionnaire does not require repetition. For the fifth weight, the road network is as follows:

e. Comparison of alternatives with alternatives based on Road Network criteria:

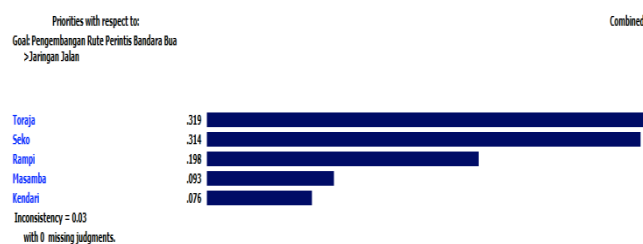


Figure 8. Bar Chart Comparison of Alternatives with Alternatives Based on Road Network Criteria

Results Based on Comparison of alternatives with alternatives based on Road Network criteria to open pioneer routes by looking at the weights on the road network criteria, the results obtained were 31.9% for the Toraja area, 31.4% for the Seko area, 19.8% for the Rampi area, 9.3% for the Masamba area and 7.6% for the Kendari area. From these results, the key is that

looking at the road network to open pioneer routes, the Toraja area becomes a priority according to the results obtained. And the resulting inconsistency is below 0.10%, namely 0.03%, so the distribution of the questionnaire does not require direct contact. Meanwhile, the priority areas for opening pioneer routes are as follows:

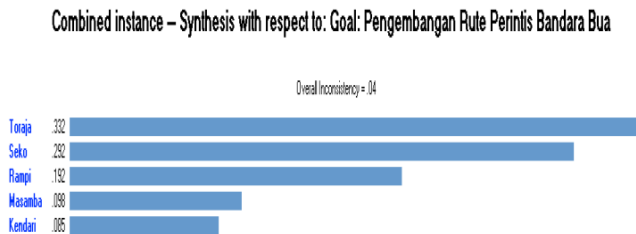


Figure 9. Bar Chart of Priority Areas for Pioneer Path Opening

The alternative location which is the priority for opening the pioneer route in accordance with the results of interviews and questionnaires obtained and data processing using the expert choice 11 application with a percentage value of 3.32% is Toraja, the second alternative location is Seko with a percentage weight of 29.2%, Rampi with a percentage weight of 19.2%, and the fourth alternative location is Masamba with a percentage weight of 9.8%, while the last alternative location for opening the pioneer route is Kendari with weight of 8.5%, for the criteria of each alternative area that is the hope of the community the first is the cost criterion with a percentage of 25.8%, the second criterion is travel time with a percentage of 24.9%, the third criterion is Distance with a percentage of 24.0%, then the fourth criterion is Mode of Transportation with a percentage value of e is 13.6%, and the last criterion is the Road Network with a percentage of 11.6%,

IV. Conclusion

Characteristics The criteria for pioneering routes from Bua Airport to other airports in South Sulawesi Province, based on a comparison of the most important pairs of criteria in the selection of pioneer routes are the criteria of 25.8%, the second criterion of travel time is 24.9%, the third criterion is the distance of 24.0%, the fourth criterion of transportation modes is 13.6% and the last criterion is the road network of 11.6%, the priority

pioneer route for Bua Airport is based on multi-criteria analysis. on the comparison of alternatives with alternatives based on the Distance Criteria, the Toraja location is a priority location with a weight of 32.3%, based on the Travel Time criteria for the Toraja location with a proportion of 38.6%, based on the location cost criteria with a weight of 32.8%, while based on the criteria for Mode of Transportation the Toraja location with a weight of 32.5%, and based on the road network criteria, the Toraja location is a priority location with a weight of 31.9%, so that the main alternative location for the development of priority pioneer routes at Bua Airport is the Toraja location with a weight of 33.2%, the second alternative location is the Seko area with a percentage of 29.2%, the third location is the Rampi area with a percentage of 19.2%. the fourth location is the Masamba area with a proportion of 9.8% and the fifth location is the Kendari area with a weight of 8.5%.

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