Study on airside planning of kayuadi airport to develop a specific economic region (KEK) at Selayar Regency

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Abstract. To accelerate national economic growth, our government needs to increase capital investment by preparing and set up a specific economic zone/region (KEK), which had advantages in geo-economic and geostrategic. Selayar Regency is one of the regencies in South Sulawesi Province that proposes the development of Tourism KEK by relying on the superiority of the Takabonerate area. The existence of Kayuadi Airport in Takabonerate Subdistrict, Selayar Regency, currently stops operating due to the lack of passengers, even the airport has a runway length of around 600 meters, has not been able to accommodate the landing and takeoff of larger aircraft. This study aims to design an airside development plan using the provisions of ICAO (International Civil Aviation Organization). The results showed the annual number of passengers for stage II and stage III 9.360 Passengers, with plan aircraft CASA C 212-300, runway length 900 meters, length Taxiway 90 meters, Apron length 52.7 meters.

1. Introduction

Economic growth is a process of changing a country's economic conditions on an ongoing basis towards better conditions for a certain period. The existence of economic growth is an indication of the success of economic development in people's lives [1]. The higher the rate of economic growth, the faster the process of increasing regional output so that the prospects for regional development become better. Based on a report from Bank Indonesia on economic growth, the condition of Indonesia's economic growth has decreased compared to last year, where the gross domestic product in 2018 was 5.2 percent to 5 percent in 2019. In the report, Bank Indonesia wrote, although macro-economy Strong Indonesia continues to sustain economic growth, investment has slowed this year. In order to accelerate the achievement of the national economy, the government needs to increase investment through the preparation of areas that have geo-economic and geostrategic advantages. The area is prepared to maximize the industrial activities of exports, imports, and other economic activities that have high economic value [2].

The development of economic zones in Indonesia is no stranger [3]. Because in 1970 Indonesia succeeded in developing the Free Trade Zone and Free Port continued in 1972 also developed the Bonded Zone (Bounded Warehouse) Then in 1989 the Industrial Zone was developed, after that in 1996 developed the Integrated Economic Development Zone (KAPET), and finally, the government made new breakthroughs for economic growth, including industry, tourism, and trade. At the same time, it is prepared to increase new jobs, namely the Special Economic Zones (KEK), based on Law Number 39 of 2009.
Special Economic Zones, hereinafter referred to as KEK, are zones with certain limits within the territory of the Unitary State of the Republic of Indonesia, which are designated to carry out economic functions and obtain certain facilities. KEK consists of one or several zones in the form of export processing, logistics, industry, technology development, tourism, energy, and other economies. Selayar Regency is one of the districts in the province of South Sulawesi that proposes the development of a tourism SEZ for eastern Indonesia. This regency, which has 132 islands, has abundant potential. Not only relying on the Taka Bonerate National Park, which has the third-largest atoll in the world, Selayar also has a number of interesting attractions. Including historical tourism as one of the trade centers in the past.

Another reason for the Selayar Islands to become one of the marina cities in Indonesia is because Takabonerate is located at the midpoint of national and international cruise and sailing crossings, making it suitable for the development of marine tourism, cruise or sailing yachts, plus cultural richness, and the history of the silk path. Nautical world. Even KEK Kepulaun Selayar in the future will be branding as The New Virgin Atoll in the Heart of 17,000 Tropical Islands in Indonesian Archipelago South East Asia. In supporting the Selayar SEZ tourism development plan as a world-class destination, the government is trying to build 3A (Attractions, Accessibility, and Amity). Where the attraction of the Taka Bonerate Sea National Park has been nominated as a world heritage site to UNESCO since 2005, the region is also planned as a hub for yachts and cruises.

The amenities in the form of a guaranteed place to stay is adequate for tourists, ranging from hotels to homestays, as well as accessibility in the form of convenience for tourists to reach the location. But in terms of accessibility, Selayar Islands has a number of records that must be developed to become a world-class destination, namely the need for an international airport. The existence of Kayuadi Airport in Takabonerate Subdistrict, Selayar Regency, currently stops operating due to the lack of passengers. Even before, there had not been a regular flight to the Kayuadi airport; in other words, flights to the airport were only possible via special charter pioneers. In addition, the airport currently has a runway length of only around 600 m that has not been able to accommodate the landing and takeoff of larger aircraft [4–6].

In order to realize the expectations of the availability of airport capacity according to current needs and to anticipate future developments, it is necessary to immediately take steps on a strategic, technical level and lead to the work implementation program in the soonest possible time. For this reason, an air transportation system is needed as a connecting facility for residents to carry out their activities. Therefore, the purpose of this study is to design the airside development plan at Kayuadi Airport in supporting the development of the Special Economic Zone (KEK) of Kab. Selayar.

2. Literature Review

2.1. Airside facilities
This airside facility is closely related to the characteristics of the aircraft and must always be able to support the creation of a guarantee of safety, security, and the smoothness of the flights served. These aspects are the main considerations in preparing the standard technical requirements for the operational side of the airside facilities. So that the operational, technical feasibility standard of this facility is prepared with a standard reference related to the aircraft served. This reference is the result of processing from existing international references adjusted to the conditions and regulations in Indonesia, such as ICAO adjustments regulating it in the form of letter and number code determination. In the preparation of operational, technical standards for these airside facilities, groupings are made based on the classification of aircraft and airport classes in Indonesia. More can be seen in Table 1 below.

| Table 1. Classification of airports and aircraft groups based on the airport reference code. |
|---------------------------------|--|--|--|--|---|
| **Airport Group** | **Number Code** | **ARFL (Aeroplane reference field length)** | **Letter Code** | **Spread Wings** |
|---------------------------------|--|--|--|--|---|
In KM 47 of 2002 concerning the certification of Airport Operations the items listed on the Air Side include:

### 2.1.1. Runway

This facility is a facility in the form of a pavement that is prepared for aircraft to conduct landing and takeoff activities. The basic elements of the runway include pavement that is structurally sufficient to support the load on the aircraft it serves, the shoulder of the runway, the runway strip, the engine heat runway (blast pad), the runway end safety area (RESA) stopway, clearway. Completeness of data that constitutes the evaluation aspect includes Runway designation/number/azimuth, which is a number or number that indicates runway numbering and direction of the runway slope. This data is data that has been determined since the beginning of airport planning and development. The next part is the runway dimension, which includes the length and width of the runway. The runway length is affected by the critical aircraft served, ambient air temperature, altitude, airport humidity, runway slope, and runway surface characteristics.

### 2.1.2. Taxiway

The taxiway is a part of airport side facilities that are built for aircraft in and out of runways and as a means of connecting between several facilities such as aircraft parking position taxi line, apron taxiway, and rapid exit taxiway. Exit taxiways need to be designed to minimize the runway usage time required by landing aircraft. Rapid end taxiways located at the end of runways are designed with a tilt angle of 250 to 450 from the runway angle for use by aircraft, leaving the runway at high speed. Taxiways must be designed so as to minimize the distance between the terminal and the end of the runway.

### 2.1.3. Apron

The Apron is an airside facility provided as a place for aircraft when carrying out and lowering passengers, cargo, and cargo loading from aircraft, refueling, parking, and aircraft maintenance. The Apron is part of the airport that serves the terminal, so it must be designed according to the needs and characteristics of the terminal. Apart from that, the apron design is also related to the terminal system used by the relevant airport, which consists of a single concept terminal, linear concept, dock concept, satellite concept, transporter concept, and mixed concept. The aspects to be considered in the operational feasibility assessment verification activities include dimension (length and width), longitudinal slope, Transverse Slope, pavement type (Surface Type), and strength (strength) and Apron marking, among others Apron edge marking, Apron guidance marking, Parking stand position marking. GSE (Ground Support Equipment).

### 2.1.4. Special Economic Zones

Special Economic Zones in Indonesia (KEKI National Team) with Decree of the Coordinating Minister for the Economy Number: Kep-21 / M / EKON / 03/2006 dated 24 March 2016 whose duties include:

1. Make a framework for the plan to develop special economic zones and determine the conditions for the selection of regions.
2. To evaluate national policies and strategies for the development of economic zones, assessment of the area, and the need for facilities and infrastructure, intensives, and other implementing regulations.
3. In addition, the team will also facilitate the development and management of the area in the area of conducting evaluations and monitoring, and formulating regional development strategies based on national spatial plans [6].
Special Economic Zones are certain areas where special provisions apply in the fields of customs, taxation, licensing, immigration, and employment. The purpose of KEK development is to provide opportunities for increased investment through the preparation of areas that have advantages and are ready to accommodate industrial, export-import activities, and economic activities that have high economic value.

Based on the above understanding, it can be seen that the objectives of developing Special Economic Zones include: helping or supporting the local economy, creating jobs, improving the industrial structure at the location, increasing exports, and increasing foreign exchange reserves. For this reason, the regional approach to investment development must be characterized by 1) "Reasonable": Economically, socially and politically feasible, 2) "Sustainable": Long-term oriented, and 3) "Measurable": Clear in instruments and targets.

The main criteria for selecting KEK locations determined by the KEK National Team are 1) Commitment of Local Governments, 2) Spatial Planning, 3) Accessibility, 4) Infrastructure, 5) Land, 6) Labor, 7) Supporting Industries, 8) Geopositioning, 9) Environmental Impact, 10) Boundaries [3].

![Figure 1. Location distribution of SEZ tourism district development location.](image-url)

3. Research Methods

3.1. Research location and time

The location of this study was carried out at Kayuadi Airport in Kab. Selayar Province of South Sulawesi. The time of the study was conducted in June 2019 until November 2019.
3.2. Research instruments
Data needed for research analysis is obtained directly and indirectly. Data obtained directly in the field in the form of interviews and discussions with relevant stakeholders or airport wood management in the district. Selayar about the airside condition of Kayuadi Airport in Kab. Selayar. The data obtained indirectly is secondary data obtained from related institutions in the form of geometric air sides.

This research was conducted in 2 stages. The first phase is forecasting the movement of passengers in the future; the second phase is planning the development of the airport airside to support the KEK Regency. Selayar with ICAO provisions. Compilation and tabulation of this data are done using Microsoft Excel applications.

3.3. Data analysis method
The data that has been obtained from the survey results are collected and then processed so that it can be used as input data in the analysis process in the analysis of the airside of the airport using Provisions ICAO (International Civil Aviation Organization).

![Diagram of airport airside analysis with ICAO]

Figure 2. Airport airside analysis with ICAO.

4. Results

4.1. Airside planning

4.1.1. Forecasting number of passengers. The estimated number of passengers is used to determine what type of aircraft will be operated at this airport. The estimated number of passengers can be seen in table 2.

| Description                  | Stage II and III |
|------------------------------|------------------|
| Number of Annual Passengers  | 9,360            |
| Number of Monthly Passengers | 780              |
| Number of Weekly Passengers  | 182              |
| Number of Daily Passengers   | 26               |

4.1.2. Plan plane. With the number of passengers in table 2, we can determine the planned aircraft that will operate later. The planned plane can be seen in table 3.
Table 3. Plan plane.

| Description       | Plane type plans |
|-------------------|------------------|
| Stage II & III    | CASA C 212-300   |

4.1.3. Runway. In planning a geometric runway, one must first know the environmental conditions of the existing airport, which include temperature, elevation, and slope, because these parameters will affect the geometrical runway planning.

Table 4. Runway planning.

| Description          | Stage II and III |
|----------------------|------------------|
| Runway Length (m)    | 900              |
| Runway Width (m)     | 23               |
| Stopway (m²)         | 60 x 23          |
| Runway Strip (m²)    | 960 x 150        |
| Runway End Safety Area (m²) | 90 x 46      |

4.1.4. Taxiway. The length of the taxiway needed will depend on the runway strip used and also on the transition surface length, which is affected by the height of the tail of the parked aircraft (nose in or nose out) at the Apron. Taxiway length can be seen in the table below:

Table 5. Taxiway planning.

| Description          | Stage II & III |
|----------------------|----------------|
| Taxiway Length (m)   | 90             |
| Taxiway Width (m)    | 10.5           |

4.1.5. Apron. Apron length calculation by taking into account the type of aircraft used, the following apron dimensions:

Table 6. Apron planning.

| Description | Stage II and III |
|-------------|------------------|
| Width (m)   | 41.4             |
| Length (m)  | 52.7             |

5. Conclusion

The results showed the annual number of passengers for stage II and stage III 9,360 Passengers, with plan aircraft CASA C 212-300, runway length 900 meters, length Taxiway 90 meters, Apron length 52.7 meters.

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