

Analyzing Connectivity Level of Cargo Aviation To Eastern Indonesia Sector

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Abstract. Transportation and logistics is two things that are related to each other in the efficiency of the distribution process the goods. The percentage offload at 16 % to eastern Indonesia shows that the efficiency of distribution to the region is still not better than the other parts of Indonesia. This research aims to identify the effects of the availability of the plane, and total volume of the shipment on the connectivity freight a cargo measured by offload goods from Jakarta to eastern Indonesia (Makassar, Ambon, Manado, Sorong, Timika, dan Jayapura) by using the method of panel regression. This research uses daily data from January to March 2019 with a sample of 540. The result showed that is effected, between variables availability of the plane and volume of a shipment on level the connectivity freight a cargo to eastern Indonesia.

Keywords : connectivity, offload cargo, flight availability, volume shipment

1. Introduction

The increasing demand for goods or services around the world and along with the development of the transportation sector is developing especially in air transportation, especially in freight delivery even though air transport is rated as a alternative choice at a higher cost when compared to other modes of transportation such as sea transport, road transport and rail transport (train).

Advanced countries nowadays tends to producing their products in other countries , such as developing countries because labor cost are quite cheap and close to raw materials , and can distribute them in various parts of the world. Plus by the current globalization which rapidly going bigger created a market that does not know the limits. This encourage the goods growing the number including goods for export and incoming goods from import. Its supporting by complex activity level or human activity increased as well level the demand to merit air transport, air transportation industry has been increase in both the quantitative airline and the quality of offering product or services that they provided. This has led domestic stiff competition that offers transportation in the air cargo services.

Figure 1 illustrates that the fact is a result of public awareness or industry arising from the benefits and benefit obtained from the air transportation as an equipment and the needs of goods that cannot be obtained with close proximity. These items are all goods sent through the airplane to be able to save the delivery time. Air cargo is defined as all freight other than baggage belonging to passengers which have a document of airwaybill for international and Surat Muatan Udara (SMU) for domestic shipments [1]

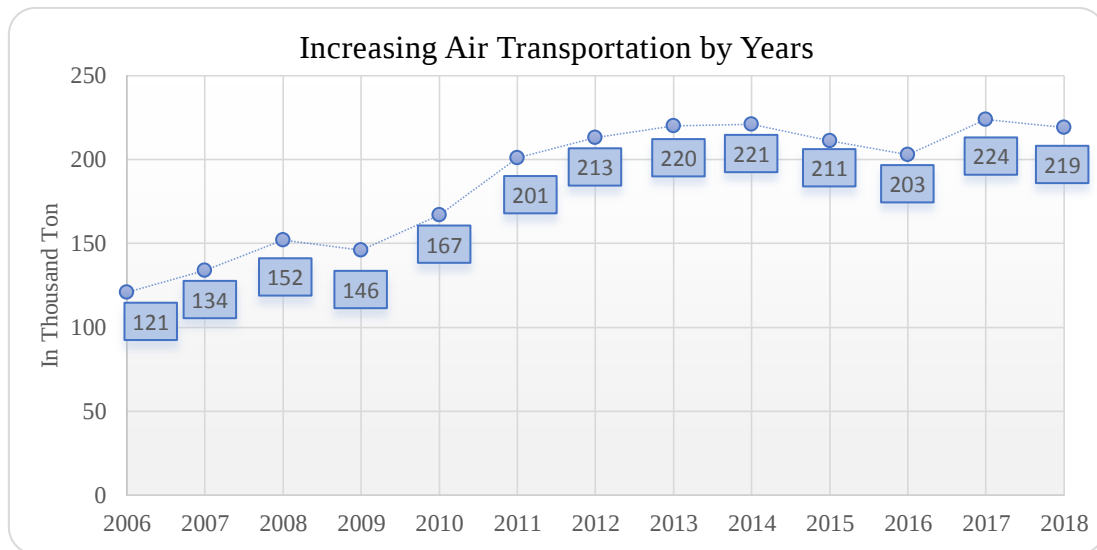


Figure 1. Increasing air transportation by years

Source: Badan Pusat Statistik

Air transport sector is very important for the transfer of goods in a country, because it includes a wide range of activities such as production, distribution, consumption, and service. Air cargo itself provides the distribution process in the form of delivery service from origin to destination through forwarder [2]. As shown, Air cargo has become one of the important sources of income on an airline [3]. Therefore, the higher dependence on an item should be directly proportional to the availability of prime service from the transportation company to avoid the irregularity such as offload cargo which is not the lifting of an item In accordance with the schedule that has been agreed by both parties. It can occur due to the avoidable factor which includes human error and unavoidable factor such as the state of the airplane that is not in accordance with the weight of the airplane balance (weight and balance). Basically, the success of freight delivery is measured from the network availability of all regions including to remote areas (in this case eastern Indonesia) as well as speeds that are shown with short travel time, high security, and Timeliness.

A process of transporting cargo by airplane through a process that is quite long from Booking space until the goods is uplifted to the destination and the demand forecasting is a key element. Good process and according to standard will determine the smooth delivery process of cargo, but not a little miss the process, both caused by human error or factors that cannot be avoided so as to cause offload cargo.

Offload cargo is at least caused by two things which are flight availability that relates to flight routing in the process of cargo delivery [4] and cargo capacity that covers the weight and volume of shipment [5].

Based on the theory presented, the hypothesis in this study is as follows:

- H1** : There is a relationship between flight availability to the level of connectivity (offload cargo) on shipping via airplane to eastern Indonesia destinations.
- H2** : There is a relationship between volume shipments to the level of connectivity (offload cargo) on shipping via airplane to eastern Indonesia destinations.

In the effort on giving cargo service, there has to be some analysis should be done by many methods and properly for good optimization and proper quality services to avoid the offload problems in the process of shipment, especially for the low flight facilities in the east part of Indonesia which will impact on the level connectivity cargo flight sector.

The limited ability of the airlines to fulfill the amount of flights route to the Eastern of Indonesia has given attention to discuss on the connectivity level of PT Garuda Indonesia as one of the cargo transportation with the high market share provider compared with other airlines in Indonesia, it interests the author to take the title “Analyzing Connectivity Level of Cargo Aviation to Eastern Indonesia Sector”.

2. Method

This research data uses a regression panel method, it is necessary to merge data cross section with Data time series [6]. The most suitable approach method in this study estimates the regression model with the data panel using the Random Effect Model (REM) method. Random Effect Model (REM) is a discrepancy that is accommodated by error, and assumed the presence of differences in the interception of each variable. [7].

The variable used is the dependent variable (Y_{it}) which is a variable level of cargo connectivity measured from the offload level, and the independent variable (X_{1it}) is measured from the number of flights on each destination and the variable (X_{2it}) is measured of the volume of cargo at each measured destination.

The sample is used in this method as much as 540, with the data criteria taken as follows:

1. Daily data bases
2. Three months data bases (January-March 2019)
3. Data is taken from performance of offload cargo by Garuda Indonesia

This research uses the regression panel method with the following equations:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_n X_{nit} + e_{it}$$

Keterangan :

Y_{it}	: Offload cargo (dummy)
β_0	: Constanta
β_1 - β_2	: Regression coefficient
X_{1it}	: Availability flight
X_{2it}	: Volume of cargo
e_{it}	: Error

3. Discussion and Result

Transportation and logistics systems have very strong correlation. The efficiency of the freight transport process depends on both of these things [8]. Without any of its good systems then the process on transporting both passengers and cargo shipments will not run smoothly. In this case, the system to be done is a process on the allocation of cargo carried by the shipper airlines which must maximize the space on the airplane. His challenge is a combination of products from cargo airlines offered or traded drifting to generate additional revenue on scheduled passenger airplane [9], therefore according to [10] The allocation of cargo space is highly dependent on the customer as well as the volume of baggage in which the reality is uncertain as to the take-off airplane. Its effects, pre-defined allocation can experience empty/unsold space, cancellation, or even re-booked to next flight which will make a domino effect on the next flight. In this situation, airlines may lose revenue from space on unsold airplane or overbooking where customer cargo can move goods to other airlines [11]. The Offloading and re-loading process is much related to this kind of situation.

Cargo form of courier express such as airmail, small goods, household has a high level of difficulty in the planning of allocation as a result of not against the volume of goods that arise or

delivered. This can be a challenge for PT Garuda Indonesia as flight provider that has a large number of customer in the field of Courier Express such as TIKI, JNE, DHL Express, and etc. which has the high volume in domestic goods delivery from Jakarta to all parts of Indonesia especially to the east of the region such as Makassar, Manado, Sorong, Jayapura, Timika, Ambon. These areas destination quite challenging for PT Garuda Indonesia and even other airlines due to several factors such as the low flight facilities or airports, low demand passengers to eastern Indonesia sector.

Table 1. Passenger volume. *Source : Garuda Indonesia*

Dest	Category	Total Passenger
SOQ	Passenger	58
AMQ	Passenger	90
TIM	Passenger	115
MDC	Passenger	123
DJJ	Passenger	258
UPG	Passenger	527

Timika (TIM), Makassar (UPG), Manado (MDC), Jayapura (DJJ), Ambon (AMQ), Sorong (SOQ) did not exceed 1.000 passengers in the period of January to February 2019. The smallest passenger destination is Sorong with 58 passengers in 2 months, following by Ambon 90 passengers, Timika 115 passengers, Manado 123 passengers, Jayapura 258 passengers. Capital of Sulawesi which is Makassar had the most number of passenger compared to other city in East Indonesia with 527 passengers.

These factors can be considered by PT Garuda Indonesia and other airlines in the formulation of routes that have resulted in the procurement of flight availability in eastern Indonesia destinations less than the flight routes from other cities. This formulation automatically related with the revenue consideration of Garuda Indonesia.

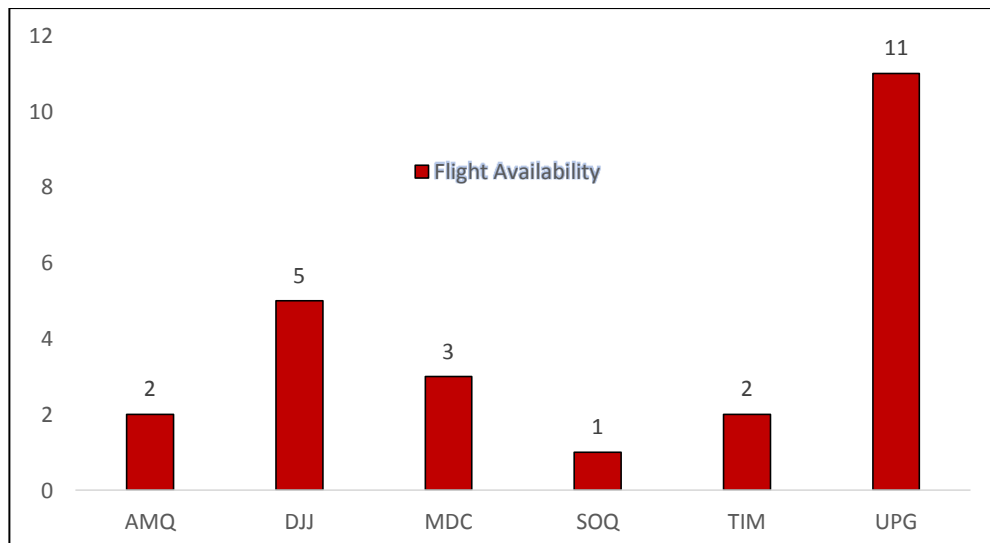


Figure 2. Flight Availability. *Source : Garuda Indonesia*

Based on the table above, the procurement of airplane by Garuda Indonesia airlines to eastern region of Indonesia is still a few compared to other Indonesian region. For example Ambon (AMQ) only had 2 flight, Jayapura (DJJ) 5 flight, Manado (MDC) 3 flight, Sorong (SOQ) 1 flight, Timika (TIM) 2 flight. And Makassar (UPG) which had the most flight availability 11 flight according to the number of passengers compared to 5 other cities in eastern Indonesia.

Table 2. Volume shipment. *Source: DHLExpress*

Sector	Total Volume (in KG)
CGK-AMQ	528
CGK-DJJ	821
CGK-MDC	8.814
CGK-SOQ	1.341
CGK-TIM	58.925
CGK-UPG	17.374

The Volume of shipment to eastern Indonesia region is not so high compared to other destinations in Indonesia such as data shown in table 2. This Data was taken from one of the companies courier express service users of Garuda Indonesia, namely DHL Express within the period of January-March 2019 which shows that the objectives of Timika become the highest destination for cargo shipments with a total of 58.925 kg, Furthermore Makassar city with a total volume of 17.374 kg, Manado city with total cargo of 8.814 kg, Sorong city with 1.341 kg, Jayapura with a total of 821kg, and the city with the smallest cargo volume of the Ambon is 528kg.

From the above, the data shows that the East Indonesia sector has a challenge for domestic airlines including PT Garuda Indonesia in the procurement of aviation. This indirectly also impacts the process and flow of cargo shipments from Jakarta to those cities which if not managed properly will lead to offload cargo which affects the level of connectivity in Air freight delivery.

Table 3. Result of regression

Variable	Coefficient	t-Statistic	Prob
C	-0,029094	-0,280955	0,7789
X1	0,054518	2,131840	0,0336
X2	0,000147	2,129331	0,0038
R-squared	0,246641		

Based on the table above, the result of estimation obtained regression equation as follows:

$$Y_{it} = -0,029094 + 0,054518X_{1it} + 0,000147X_{2it} + e_{it}$$

The interpretation of the partial model obtained is flight availability positive and significant impact on the level of connectivity or Offloadcargo of 0.054518, while the volume

of shipment has positive and significant impact on the level of connectivity or Offloadcargo 0.000147.

R-Squared was obtained a figure of 0.246641. This indicates that 24.66% of the connectivity or Offloadcargo levels are affected by the flight availability variable and the shipment volume variable. While 75.34% is influenced by variables not described in this study.

3.1 Flight Availability

Based on table 3, the estimated result by using the Random Effect model indicates that the Flight availability (x1) variable has the result of a < 0.05 p value of 0.0336. The result indicates that the flight availability variable has a positive and significant influence over the level of cargo delivery connectivity measured by many off load cargo. Flight availability is closely related to cargo demand and passenger where according to [12] all of consideration of flight availability procurement is based on the future Scargo market to meet the company's profit. In addition, procurement should consider the airport facilities, where not all types can enter the desired airport [13]. Judging from the data on table 1 and table 2 It appears that there is an imbalance between cargo demands and passenger in flight to eastern Indonesia cities where demands for cargo delivery to East Indonesia is quite large but the number of passenger requests Not so big, this causes insufficient flight availability to cargo demands so that the cargo becomes offload because of the limitation of space on the airplane (overload).

Another challenge in terms of flight procurement to be able to operate to the East Indonesia destination is related to the slot times, where each airport has different slot times depending on the Airport facilities. Airport in East Indonesia majority have airport that has not been international standard, there are only 2 airports between 6 airports that have good facilities namely Makassar City (Sultan Hassanudin Airport) and Manado City (Sam Airport Ratulangi) so that the slots that have been very small to be given to every airline. Flight routing and schedule is not to be realized if the airlines cannot get slot times at the destination airport so that flight availability became a bit as well.

3.2 Volume Shipment

According to Figure 3, the estimated result by using the Random Effect model indicates that the shipment volume variable (x2) has a result of the < 0.05 p value of 0.0038. The results indicate that the shipment volume variable has a positive and significant influence on the level of cargo delivery connectivity measured from the number of off load cargo. The cargo chamber is associated with 2 aspects, the actual weight measured from the total weight of goods and the calculated volume of the total dimensions or size of goods [14]. The capacity of freight can be transported depending on the type of airplane in operation.

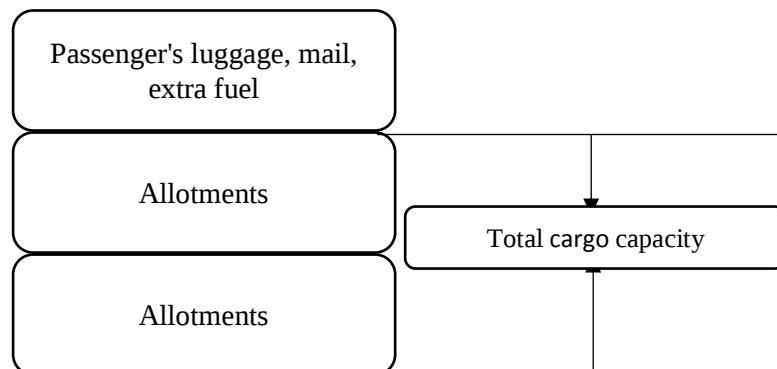


Figure 4. Combination cargo-passenger capacity. Source : [14]

The composition of the airspace includes 2 aspects, namely the sales side between passenger sector and cargo sector as well as operational side such as fuel (including extra fuel) which must be regulated effectively to be able to become a maximum revenue. Operational side such as fuel airplane is an aspect that must be prioritized for smooth flight to the destination city so that the capacity. The airplane will be reduced to the sales aspect. After that passenger sector is a preferred aspect in the sale of space on the airplane, therefore the priority on the airplane that have been schedule will follow the level of demand passenger. PT Garuda Indonesia has difficulty in the division of option between the two aspects because the condition of cargo sector in domestic flight has a volatile demand condition and cannot be predicted absolutely. As a result of the halter call, there will be a potential volume of shipment overload from the capacity of the airplane available when demand from the cargo sector is experiencing an unpredicted increase so that PT Garuda Indonesia as the operator or airlines must do Offload on the cargo so it will affect the level of air cargo connectivity to the airport in eastern Indonesia.

The overload volume shipment will have a bad impact for PT Garuda Indonesia considering that the flight availability for the destinations in Eastern Indonesia cities such as Manado, Makassar, Sorong, Jayapura, Timika, Ambon are very limited due to the market or passenger demand which is less good so that the overload cargo will be held in Jakarta waiting for available space on the next plane.

4. Conclusion

The development of cargo world increased in the last 10 years which was caused by the benefit received by the air cargo delivery service users. In 2018, the total cargo shipments reached 219.000 tons in a year. Based on the result of data panel regression analysis process, therefore it can be concluded that:

- Flight availability on flights to 6 cities in Eastern Indonesia is not much more than other cities in Indonesia. Makassar city has the most flight availability of 11 flights in a day and Sorong city has the least flight availability that is 1 flight per a day.
- The shipment volume of 6 destination cities in Eastern Indonesia has a pretty enormous number through the delivery service of DHL Express Indonesia in the period of January – March in the highest destination that is Timika (TIM) for 58.925 and the lowest destination is Ambon (AMQ) 528 kg.
- Flight availability is influenced by the level of demand on passengers. Where the demand for eastern Indonesia is still relatively small, so flight availability becomes a bit. Regression results indicate that the level of flight availability affects cargo offload due to the limited availability of the aircraft to transport cargo with a high level.
- Cargo space is divided by 2, which is actual weight and volume measured from the dimensions of the shipment. the regression results show that the total shipment volume and actual affect the cargo offload rate because large volumes of goods result in reduced space on aircraft that are already on schedule.

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