The Impact of Airport Performance towards Construction and Infrastructure Expansion in Indonesia

T D Laksono\textsuperscript{1,*}, N Kurniasih\textsuperscript{2}, C Hasyim\textsuperscript{3}, M I Setiawan\textsuperscript{4}, A S Ahmar\textsuperscript{5,6}

\textsuperscript{1}Department of Civil Engineering, Universitas Wijayakusuma, Purwokerto, Indonesia
\textsuperscript{2}Faculty of Communication Science, Library & Information Science Program, Universitas Padjadjaran, Bandung, Indonesia
\textsuperscript{3}Darul Ulum University, Jombang, Indonesia
\textsuperscript{4}Department of Civil Engineering, Narotama University, Surabaya, Indonesia
\textsuperscript{5}AHMAR Institute, Makassar, Indonesia
\textsuperscript{6}Department of Statistics, Universiats Negeri Makassar, Indonesia

*taufikdwilaksono@yahoo.com

Abstract. Development that is generated from airport areas includes construction and infrastructure development. This research reviews about how the implementation of material management in certain construction project and the relationship between development especially construction and infrastructure development with Airport Performance. The method that is used in this research is mixed method. The population in this research is 297 airports that are existed in Indonesia. From those 297 airports then it is chosen airports that have the most completed data about construction project and it is obtained 148 airports. Based on the coefficient correlation (R) test it is known that construction and infrastructure development has relatively strong relation with airport performance variable, but there are still other factors that influence construction and infrastructure development become bigger effect.

1. Introduction
Development is the amount of value added goods and services that are generated from all regional activities in certain area [1]. That is generated from airport areas includes construction and infrastructure development. Construction project is the activity that consists of series of works that is interdependent with each other. The construction project activity starts from the planning stage to project implementation is really influenced by the ability to set or manage project resources. There are several resources that are necessary in the construction project, such as material, workforce, cost or even equipment. The incapability to manage resources that is required in the project can cause various problems, such as inflated cost, project time finishing that is not according to plan, inaccuracy of work quality that is generated and others, which eventually can harm the project implementation as a whole.

Material is one of the important components that influence the sustainable of the construction project without any material management that can cause problem towards on-going construction project. Barne and Paulson mentioned that the lateness of certain small instrument arrival can stop a big job [2]. This statement shows that the lateness of required materials in the construction project can cause the implementation of construction project activity becomes stopped. However, the arrival of materials in the huge amount at the same time can cause problem too, such as project location that is narrow, material can be damaged when it is stored and it needs a huge amount of cost.
According to Patel and Vyas, one of the major problems in delaying construction projects is poor materials and equipment management [3]. The research that they have done shows that the construction materials and equipment may constitute more than 70% of the total cost for a typical construction project. The same thing is stated by Donyavi and Flanagan, cost for civil engineering projects showed the materials and plant component can be up to 70% of the project cost dependent upon the type of project and the extent of mechanization and plant used, whilst on commercial building and housing projects the proportion is around 45 – 50% [4]. As for Messah, Widodo and Adoe mentioned that the causing factor of construction project implementation according to contractor is the availability of workforce, while according to the owner and supervisor consultant, it is about material mobilization factor [5].

Table 1. Quarterly Construction index and Growth (percent), Quarter II/2016 - II/2017

| Description                        | 2016 Q2 | 2016 Q3 | 2016 Q4 | 2017 Q1 | 2017 Q2 |
|------------------------------------|---------|---------|---------|---------|---------|
| Permanent Workers                  | 116.22  | 117.35  | 118.12  | 117.19  | 118.21  |
| Permanent Workers Growth           | 0.37    | 0.97    | 0.65    | -0.78   | 0.87    |
| Mandays                            | 191.46  | 196.46  | 205.09  | 200.70  | 209.57  |
| Mandays Growth                     | 2.10    | 2.61    | 4.40    | -2.14   | 4.42    |
| Compensation and Wages             | 197.75  | 203.34  | 213.22  | 208.83  | 219.07  |
| Compensation and Wages Growth      | 2.47    | 2.83    | 4.86    | -2.06   | 4.90    |
| Value of Construction              | 203.91  | 209.50  | 219.56  | 214.44  | 224.50  |
| Value of Construction Growth       | 2.37    | 2.74    | 4.80    | -2.33   | 4.69    |
| Value of Building Construction     | 210.63  | 216.42  | 210.81  | 222.94  |
| Value of Building Construction Growth | 2.18  | 2.10    | 2.59    | -2.59   | 5.75    |
| Value of Civil Construction        | 252.15  | 259.73  | 274.30  | 268.29  | 281.62  |
| Value of Civil Construction Growth | 2.56    | 3.01    | 5.61    | -2.19   | 4.97    |
| Value of Especially Construction   | 205.43  | 208.91  | 213.28  | 206.35  | 214.81  |
| Value of Especially Construction Growth | 1.24 | 1.69    | 2.09    | -3.25   | 4.10    |
| Business Prospect                  | 53.74   | 53.59   | 52.49   | 58.10   | 56.26   |
| Business Condition                 | 52.46   | 56.64   | 51.37   | 51.28   | 54.61   |
| Business Problems                  | 27.64   | 27.25   | 29.06   | 27.62   | 27.43   |

Table 1 shows the growth data and construction index in the second quarter of 2016-2017 and table 1 shows the Value of Construction Growth, Building Construction Growth, Civil Construction Growth and Especially Construction Growth in the last 12 months, with the Value of Especially Construction Growth has the highest score and Value of Especially Construction Growth has the lowest score. This is in accordance with the condition of the last 12 months where the government pushes the infrastructure especially in Java and outside of Java. Meanwhile, Construction Business Prospect, Condition and Problems in the last 12 months, with the Construction Business Prospect and Condition is over 50%, as well as Construction problem is below 30%. This shows that Construction Business is getting stable and the emerging problem is getting lower in Indonesia. This research reviews about the implementation of material management in certain construction project and relationship between construction and infrastructure development and Airport Performance in which it includes real estates.

2. Research Method
This research uses mixed method approach. In mixed method, we combine two research methods, which is qualitative and quantitative research [6]. This method is used for getting the comprehensive understanding about the research problem [7]. The population in the research is 296 airports that have the most completed data about construction project and it is obtained 148 airports.

In this research, quantitative data is acquired from Construction Indicator, 2nd Quarter-2017 that is published by Indonesian Central Statistics Department, while qualitative data is obtained through
interview. We interview several contractors that implement certain building development project that the structure of its building uses steel material. The interview is focused to know the process that is done by contractor party in taking steel material that is needed in the project. The research analysis includes correlation analysis between Y variable (construction and infrastructure development) and X Variable (airport performance) and descriptive analysis.

3. Result and Discussion

3.1. Material management in Construction Project
In construction project that is reviewed it is known that the project mainly need steel material for at least 1,460,000 kg. The material needs that are needed by contractors are taking by using two ways, which is through supplier and directly buys from the factory that produces steel. The ordering and arriving material that are needed is done by referring to the each necessity detail of steel dimension, the available cost and schedule of each necessity of steel dimension that will be worked.

The main factor that becomes the consideration of contractor in taking this steel material is that the availability of steel dimension that is needed in the market or even the level of fluctuation of steel material price for each kilogram. The phase of material management in the construction project can be categorized into three processes that is:

1. Material Identification Process
   In the material identification process that will be used in the project, can be illustrated in the Figure 1.

   Figure 1. Material Identification Process
   In the material identification process, it is an activity to know what material that will be used, in this phase all material-related matters should be able to be identified clearly and carefully so that there is no missing matters, so the needs of material will be fulfilled. This material identification process really determines towards the fulfillment of obstacles that are faced by each project construction i.e. time, quality and cost. The incapability in identifying material that is needed accurately and carefully can cause time, quality and cost incompatibility that have been determined before.

2. Material Procurement Process
   This process of material procurement involves other parties either supplier or directly from factory. Moreover, the material procurement process can be illustrated in Figure 2.

   Figure 2. The diagram of Material Procurement Process
The phase of this material procurement process is the phase where material that is required should be available to be further processed. The mistake in doing material procurement can cause the impact of lateness in job implementation in the field in which not only causes the lateness of certain job, but also it can cause the lateness of job finishing entirely.

3. Material Usage Process

In this phase, material that has been ordered and ready to be procured or sent will be processed in order to be able to be used as the part of the building as a whole. The process of material usage can be seen in Figure 4.

![Material Usage Process Diagram](image)

Material that will be used can be differentiated between workshop processed and directly to the field. When the material needs to be processed in order to be cut, base-painted and others so that material usage process is done in the workshop first, after the process in the workshop is complete, so the material is immediately sent to the field to do the following job. However, when the material sent can be directly used so that the material usage is not necessarily done in workshop but directly in the field. The evaluation towards this process relates to precision and accuracy in making the work method and project time schedule. A good teamwork is needed between workshop team and field team so that the materials that will be used in the field will not be late that is caused by the activity in the workshop. Therefore, a good coordination is needed in order to make the project activity can run well according to that has been determined.

3.2. The relationship between Y variable (construction and infrastructure development) and X Variable (Airport Performance)

Multiple linear regression analysis is used to know the amount of construction and infrastructure development influence towards Airport Performance by using multiple linear regression formula. The data that is used is 148 airports in Indonesia, where each town and district is taken 1 (one) Airport. X Variable includes:

The result of the analysis by using SPSS version 20 is obtained regression coefficient as follows:

| Model | Unstandardized Coefficients | Standardized Coefficients | t | Sig. | Correlations |
|-------|-----------------------------|---------------------------|---|------|-------------|
|       | B                           | Std. Error                | Beta |       |             |
| 1     | 38.456                      | 139.384                   | -276 | .783 | .437        |
| X1    | -0.452                      | .535                      | -1.891 | .360 | .441        |
| X2    | 0.623                       | .512                      | 1.217 | .225 | .441        |
| X3    | .007                        | .002                      | 3.088 | .002 | .433        |
| X4    | -0.004                      | .002                      | -1.824 | .070 | .426        |
| X5    | .000                        | .000                      | 1.036 | .301 | .433        |
| X6    | .000                        | .000                      | -3.204 | .001 | .416        |
| X7    | -2.924E-005                 | .000                      | -2.19 | -1.979 | .050        |
| X8    | -1.444E-005                 | .000                      | -1.421 | .157 | .278        |
By using multiple linear regression formula:
\[ Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 \]

So that it is obtained multiple linear regression equation as follows:
\[ Y = 38.445 - 0.492X_{11} + 0.623X_{12} + 0.007X_{13} - 0.004X_{14} \]

Based on the multiple linear regression equation above, it can be seen that \( X_{12} \) and \( X_{13} \) (aircraft departure and passenger departure) have positive improvement impact towards construction and infrastructure development, while \( X_{11} \) and \( X_{14} \) variables (aircraft arrival and passenger arrival) have negative decline effect towards construction and infrastructure development.

### Tabel 3 Model Summary

| Model | R      | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|--------|----------|-------------------|---------------------------|
| 1     | 0.588  | 0.346    | 0.308             | 1365.78117                |

The above table shows that the number of coefficient correlation (R) is at 0.588, which means that construction and infrastructure development variable has relatively strong relation with Airport Performance variable and 30.8% influence of Airport Performance variable towards the improvement of construction and infrastructure development, while the rest 69.2% improvement of construction and infrastructure development is influenced by factors other than Airport Performance, this can be seen from Adjusted R Square score, at 0.308.

4. Conclusion
The material management phase in construction project can be categorized into three processes i.e. identification process, procurement process, and material usage process. In the last 12 months, value of especially construction growth has the highest value and value of especially construction growth has the lowest value. This is in accordance with the condition where government pushes infrastructure in java and outside java. Meanwhile, construction activities looks getting stable and emerging problem in Indonesia is getting low. Based on the coefficient correlation (R) test it is known that construction and infrastructure development has relatively strong relation with airport performance variable, but there are still other factors that influence construction and infrastructure development become bigger effect.

References

[1] Kropinova, E.G., Zaitseva, N.A. and Moroz, M., 2015. Approaches to the assessment of the contribution of tourism into the regional surplus product: case of the Kaliningrad region.
Mediterranean Journal of Social Sciences, 6(3 S5), p.275.

[2] Badan Pusat Statistik Subdirectorat of Statistical Publication and Compilation. 2017. Construction Indicator, 2nd Quarter-2017. Jakarta: Badan Pusat Statistik.

[3] Patel, K.V. and Vyas, C.M., 2011, May. Construction materials management on project sites. In National Conference on Recent Trends in Engineering & Technology (pp. 1-5).

[4] Donyavi, S. and Flanagan, R., 2009, September. The impact of effective material management on construction site performance for small and medium sized construction enterprises. In Proceedings of the 25th Annual ARCOM Conference, Nottingham, UK (pp. 11-20).

[5] Messah. Y., A., Widodo, T., Adoe, M., L. “Kajian Penyebab Keterlambatan Pelaksanaan Proyek Konstruksi Gedung di Kota Kupang”. Jurnal Teknik Sipil, Vol II, No.2 september 2013, 157-168.

[6] Morse, J.M., 2016. Mixed method design: Principles and procedures (Vol. 4). Routledge.

[7] Creswell, J.W. and Clark, V.L.P., 2007. Designing and conducting mixed methods research. Australian and New Zealand Journal of Public Health, 31: 388–389. doi:10.1111/j.1753-6405.2007.00097.x