

Research Paper

# Analysis Study Proportion for Need of Labour Component on Road Development Project in Indonesia

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## ARTICLE INFORMATION

### Article history:

Received: 23 June 2021

Received in revised form: 7 July 2021

Accepted: 12 August 2021

Publish on: 6 September  
2021

### Keywords:

Proportion

Labour

Road Construction

## ABSTRACT

Infrastructure development in Indonesia continues to develop very rapidly, this development has an effect on increasing the needs of elements related to infrastructure development, one of which is manpower, need to be careful planning in the use of the number of workers according to the needs of construction activities. The research aims to model the relationship between the volume of work and the needs of workers, builders, and the number of mandors on road construction projects. The data processing on this study uses the help of Microsoft Excel programs and SPSS version 22. Data analysis techniques use simple and multiple linear regression analyses, normality tests, and correlation tests. The result of a simple regression analysis shows the influence of the number of workers, the number of foreman, and the number of successive builders of the volume of work is 15.25%, 16.31%, and 16.4%. And the results of multiple regression analysis show every improvement of the variable number of workers, the number of handyman and the number of Foreman will be followed by increased volume of work on the road construction project. Result of the results from this research can be used related government to be able to predict the number of construction workers needed to build a number of KM road.

## 1. Introduction

Infrastructure development in Indonesia continues to develop very rapidly, this development has an effect on increasing the needs of elements related to infrastructure development, one of which is Labor (Tamin, 2005). Manpower is one of the most decisive aspects of success in implementing the project, which is required to work efficiently, i.e. it can work effectively according to the number of working hours and can produce the volume of work in accordance with the job description.

Discussing the problem of human resources, this is closely related to the matter of the assessment and quantity. The problem of a limited number of workers can occur due to the execution time performed simultaneously.

For example, in a span of 2 specific time simultaneously there are two or more jobs that require skilled workers with the same skills. The contractor can increase the amount of labor but what happens is the addition of costs to the wages of workers. This is, of course, not desirable by the project owner, so there needs to be careful planning in the use of the number of workers according to the needs of construction activities.

From the background of the problem, it is necessary that a study capable of providing an overview of the influence of the proportion of labor on a construction project, which can be used as one component to predict the calculation of the right proportion for road construction, this is what the

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Open Discussion Until December 2021

author took the research with the title of "STUDY of PROPORTION ANALYSIS FOR the NEED of LABOR COMPONENT ON ROAD DEVELOPMENT PROJECT IN INDONESIA".

## 2. Review of The Library

### 2.1 Construction projects

Project activity can be interpreted as a temporary activity that lasts for a limited period of time, with the allocation of certain resources and intended to produce products or deliverables whose quality criteria have been outlined clearly, (the Faith of Suharto, 1999).

Construction projects have unique characteristics that are not repeated in other projects. This is due to conditions affecting the process of a construction project differently from each other. For example, natural conditions such as geographical location, rain, earthquake and soil condition are factors that also affect the uniqueness of construction project (Wulfram, 2004).

### 2.2 Road Construction

According to UU No. 38 tahun 2004 on road defining roads is a land transportation infrastructure covering all parts of the road, including complementary buildings and equipment for traffic, which is on the ground level, above ground, below ground and/or water, as well as on the surface of the water, except railway, truck Road, and Cable road.

### 2.3 Labor

According to Suharto (1995) that to organize the project, one of the resources that became the deciding factor of success is labor. Estimate the amount of manpower required, that is by convert the scope of the project from the number of hours-people to a number of jobs. Theoretically, the average need for a workforce can be calculated from the total work scope of the project expressed in hours-person or month-person (man-month) divided by the period of implementation.

## 3. Research Methods

In the project data analyzed is the road development project in Indonesia, where the work items consist of public works, drainage work, earthwork, grain pavement, asphalt work, and structural works. So it can be said that the data of road building projects used in this research is a similar project data name from the similarity of the work item.

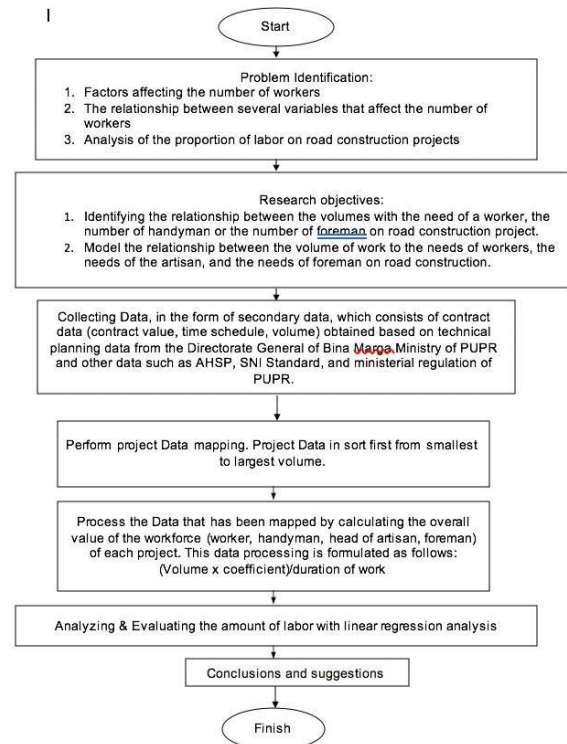
Research conducted in Makassar City, South Sulawesi by analyzing Contract Documents of 10 road construction projects from the Ministry of Public Housing and people's housing to obtain a proportion of the number of workers in road construction projects.

Based on the library studies that have been done before variables are tied and the free variables used in this research can be seen in the following table

Variabel terikat	Variabel bebas	Symbol
Volume pekerjaan (Y)	Jumlah Pekerja	X1
	Jumlah Tukang	X2
	Jumlah Mandor	X3

**Table 1.** Variable Research

Here are the stages in the study:



**Fig 1.** Research flows

## 4. Results and Discussion

### 4.1 Research Data

Data collection is done by analyzing the number of workers in the implementation of the road construction projects in particular on the number of field workers, the data on this road project obtained from the Directorate General of the PUPR Ministry. Data collection is conducted by analyzing several documents including,

No	Data needs	Source
1.	Budget plan	Project Report Document
2.	Job Volume	Project Report Document
2.	List of wage price analysis	Project Report Document
3.	Job Unit Price Analysis	Project Report Document
4.	Project Contract Value	Document contracts
5.	Implementation method	Project Report Document

**Table 2.** Data and Sourcing needs

The sample of the project used as a data source in this research is the following road development project data in Indonesia,

No	Project name	Project Location
1	Mamberamo-Elelim Road construction	Papua
2	Construction of the road access to Raknamo Dam (PPK 04)	Nusa Tenggara Timur
3	Development of GORR I-II	Gorontalo
4	Construction of the Tiong Qhang-Long Pahangai Road 4	Kalimantan Timur
5	Construction of Adaut Street-Drive (SBSN)	Maluku
6	Construction of the Tiakur-Weat Road (SBSN)	Maluku
7	Ilwaki-Lurang Road construction (SBSN)	Maluku
8	Gorr I Development	Gorontalo
9	Construction of Jaian Gor III	Gorontalo
10	Construction of the stone boundary-Mumuqu	Papua

Table 3. Project Location

4.2 Results

The relationship between the job volume and the needs of workers, artisan or foreman on road construction projects

In this analysis field workers are grouped into three groups: worker, artisan, and Mandor. Before knowing the relationship between the volume of work and the three aspects of labor first analyzing the proportion of the needs of the number of workers in road development projects, analysis is done in a descriptive way to know the magnitude of proportion for each workforce on each project sample. Then based on the worker variables (X1), the artisan (X2), and the foreman (X3) performed a linear regression analysis to find out the model of use based on the job volume (Y)

No	Kode Item Pekerjaan	Bem Pekerjaan Utama	Volume	Satuan	Pekerja (Jumlah)			Tukang (Jumlah)			Mandor (Jumlah)			
					Man	Orang	Orang	Man	Orang	Orang	Man	Orang	Orang	
1	2.3(1)	Galian untuk pemukiman dan industri	2210	M3	0.0448	544.24	77	7.02226	0	0	0.0132	136.75	77	1.74
2	2.3(2)	Georinggong pasir bagi benteng	22.91	Ton	19.7383	440.95033	29	15.84105	1.9705	44.30590	28	1.580141	1.9705	44.30
3	3.1 (1a)	Galian Basa	720.34231	M3	0.0902	6493.84199	326	314.20911	0	0	0.0223	90.19746	326	120.05
4	3.1 (2)	Galian Basa	24.97823	M3	0.3468	8627.49314	18	181.27712	0	0	0.0275	140.275	18	14.68
5	3.2 (1a)	Terdapat sisa dari sumber galian	10.00000	M3	0.0005	595	28	21.215	0	0	0.0143	140.00	28	3.32
6	3.2 (1b)	Terdapat sisa dari galian	15.56074	M3	0.0005	1162.29813	28	41.54322	0	0	0.0143	201.29	28	10.40
7	3.2 (2a)	Terdapat sisa dari sumber galian	15.56074	M3	0.0005	1162.29813	28	41.54322	0	0	0.0143	201.29	28	10.40
8	3.2 (1)	Pembuatan dan pengisian Lahan	387.50000	M3	0.0045	17164	10	450	0	0	0.0143	1425.00	10	15.00
9	3.4(2)	Pembangunan jalan diameter 15.33	388.00	M2	0.5000	1901	14	80	0	0	0.0390	126.00	14	8.00
10	7.1 (1)	Bahan mutiawan 1" 10 kg	6.75	Kan	0.7225	4.87875	7	0.00792	0.5422	0.0000	0.1007	1.22	7	0.17
11	7.1(2)	Pembangunan jembatan kayu	64.00000	M2	0.0201	1279.4	28	65.84008	0.0100	88.84	28	10.71942	10.000	10.00
12	7.1(2)	Pembangunan beton jembatan	64.00000	M2	0.0002	12.8	48	0.001224	0	0	0.0002	1.28	48	0.10
13	7.1(1)	Pembangunan jembatan dan pemangkasan jembatan	660.00	Kg	1.0000	1440	7	208.7143	0.2000	280	7	36.20071	0.2000	280.00
14	7.1(1)	Pembangunan	428.33	M1	0.3014	128.10642	35	4.433118	0.1007	171.07603	35	2.70009	0.1007	17.00
15	7.1(1a)	Berbagai dengan kawat yang dilas	720.00	M2	0.2000	1440	35	108	2.6250	1800	35	34	0.9750	69.00
16	7.1(1b)	Pembangunan rangka baja	270.00	M2	4.0000	1080	21	91.42857	0	0	21	0	0.0000	105.00
17	3.3(2)	Pembangunan kawat besi untuk kawat	270.00	M2	4.0000	1080	21	91.42857	0	0	21	0	0.0000	270.00
					Jumlah	1.98148						124.38		387.17

Table 4. Example of calculation table of employment of Mamberamo Road development project – Elim III (P1)

Analysis results influence of variable relationship free to bound variables

The Data of independent variables and the dependent variables that have been outlined are included as inputs that further undergo the process of analysis of the influence of variables so that they can know the strength of the relationship between each variable, which can be seen in the table below,

Variabel	R <sup>2</sup>	Persamaan
Jumlah pekerja	0.1525	y = 59.523x + 535
Jumlah tukang	0.16309	y = 6.9018x + 57.52
Jumlah Mandor	0.16403	y = 11.052x + 102.84

Table 5. Effect of variables on Volume of work

According to table 5, the analysis results show that donations influence the number of workers to the job volume is 15.25%. And successively for the number of handyman and the number of Foreman is, 16.31% and 16.4%.

The relationship between the work volume and the needs of workers, builders, and foreman on road construction projects

Based on the analysis of the road development project that has been analyzed, from the Excel output it appears that with a confidence level of 95%, the regression coefficient for each independent the is the number of workers (X1), the number of builders (X2), and the number of foreman (X3) on the Volume of work (Y) is as follows,

No.	Variabel (X)	Koefisien Regresi (Beta)
1.	Jumlah Pekerja	0.002747414
2.	Jumlah Tukang	0.03168928
3.	Jumlah Mandor	0.00502728

Table 6. Multiple regression analysis test results

According to the table above, can be obtained model of linear regression equation as follows:

$$Y = \beta_1X_1 + \beta_2X_2 + \beta_3X_3$$

$$Y = 0.002747414 X_1 + 0.03168928 X_2 + 0.00502728 X_3$$

Variable regression coefficient of worker number (X1) of 0.002747414 means that if the number of workers is increased by 1 unit, the volume of work has also increased by 0.002747414 units. Coefficient of positive value means there is a direct connection between the number of workers and the volume of work. This indicates that any increase in the number of workers, will be followed by increased volume of work.

Variable regression coefficient of the artisan number (X2) of 0.03168928 means that if the number of the artisan increased by 1 unit, the volume of work also increased by 0.03168928 units. Coefficient of positive value means there is a direct relationship between the number of handyman and the volume of work. This suggests that any increase in the number of handyman, will be followed by increased volume of work.

The variable regression coefficient of the amount of 0.00502728 foreman (X3) means that when the number of mandors is increased by 1 unit, the volume of work has also increased by 0.00502728 units. Coefficient of positive value means there is a direct connection between the number of workers and the volume of work. This indicates that any increase in the number of workers, will be followed by increased volume of work.

## 5. Conclusions and suggestions

### 5.1 Conclusions

Based on the results of data analysis and the discussion obtained the following conclusions:

1. Results of analysis with simple regression analysis on each road construction project, resulting in the value of R square that can explain the influence of the number of workers, the number of the worker or the amount of foreman to the volume Where:

- The influence of the number of workers to work volume 15.25%
- Influence of the number of handyman to the volume of work 16.31%
- Influence of the number of mandors on the volume of work 16.4%

2. Analysis results with multiple regression analysis where,

$Y = \text{Job Volume}$

$X_1 = \text{number of workers}$

$X_2 = \text{number of handyman}$

$X_3 = \text{number of mandors}$

Produced the following mathematical models,

$$Y = 0.002747414 X_1 + 0.03168928 X_2 + 0.00502728 X_3$$

From the mathematical models above can be concluded that, if the number of workers, the number of the artisan, and the number of the mandor is increased by 1 unit, then the volume of work will also increase the amount of the coefficient owned by each variable based on the result of the above modelling.

## References

- Dipohusodo, Istimawan. 1995. *Manajemen Proyek & Konstruksi Jilid 1*. Yogyakarta : Badan Penerbit Kanisius.
- Ervianto, Wulfram I. *Manajemen proyek konstruksi*. Yogyakarta. Andi Yogyakarta. 2004
- Herizal, 2004, *Penerapan Cost Significant Model sebagai Dasar Estimasi Biaya Proyek Gedung-gedung Pemerintah*, UII, 2004
- Hermiaty, Dessy, *Pemodelan dan Analisis Proporsi Upah Tenaga Kerja pada Proyek Konstruksi*, Tesis Magister Manajemen Konstruksi, UII, 2007
- Meredith, G.G. 2000. *Kewirausahaan: Teori dan Praktik*. Jakarta: Pustaka Binaman Presindo
- Mulya. 2012. *Kebutuhan Kompetensi pada Perusahaan Jasa Konstruksi Bidang Pelaksanaan Bangunan di Malang Raya*. Tesis tidak diterbitkan. Malang: Pascasarjana Universitas Negeri Malang.
- Ofyar Z. Tamin, *Perencanaan dan Pemodelan Transportasi*, ITB 2003.
- Soeharto, Iman. 1995. *Manajemen Proyek: Dari Konseptual Sampai Operasional*. Jakarta: Erlangga.
- Silvia Sukirman, *Dasar-dasar Perencanaan Geometrik Jalan*, Nova-Bandung 1999.
- Trijono, Lambang.2007.*Pembangunan Sebagai Perdamaian, Yayasan Obor Indonesia :Jakarta.*
- Undang-undang Republik Indonesia No 18 Tahun 1999, *Tentang Jasa Konstruksi*. Vaza, Herry, *Sistem dan Teknologi Konstruksi*, Pusat Penilaian Mutu Konstruksi,
- BAPEKIN, Kimpraswil