

# The Significance of Bridge Construction on Regional Development

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**Abstract**— This study aims to analyze differences in the level of community accessibility before and after the construction of the bridge, as well as to examine the effect of bridge construction and accessibility on regional development. This research is a case study conducted in the case of the construction of the Ngujang 2 Bridge; Bukur Village, Sumbergempol District, Tulungagung Regency, Indonesia. The research method applied is descriptive statistics and regression models. Primary data collection techniques through interviews and secondary data from related agencies. Furthermore, data processing was carried out using the SPSS computer program. The results showed differences in the level of community accessibility before and after the construction of the Ngujang 2 bridge including travel intensity ( $Z$  -3.416), travel time ( $Z$  -7.213) and transportation costs ( $Z$  -5.203). In general, these findings show that bridge construction has proven successful in increasing community accessibility and mobility. Furthermore, increased accessibility has also proven to have a significant effect on the development of village areas.

**Keywords**— Bridge, regional development, regression.

## I. INTRODUCTION

Infrastructure development is one of the determinants of community welfare, which is related to income distribution, reduced poverty and reduced unemployment rates (Hadiwijoyo, 2019). Bridge facilities and infrastructure have a strong connection with the process of human movement and economic growth, if the constraints on facilities and infrastructure are resolved it will have a positive impact on the community's economy. The development of transportation supported by adequate facilities and infrastructure will encourage increased movement of people and rapid economic growth. Regency Government data shows that Tulungagung Regency has an area of 1,055.65 Km<sup>2</sup> which is divided into 19 Districts and 271 villages/wards. The main access to the district center is separated by the Brantas river. To cross the river barrier it is connected by the Ngujang 1 bridge. The separation of areas separated by the Brantas river with the lack of connecting bridges raises issues of community accessibility.

The Ngujang 1 Bridge in previous studies has proven unable to support the increasing mobility needs of the community. For this reason, the government has built the Ngujang 2 bridge as an instant solution to meet road availability for increased transportation. The Ngujang 2 Bridge located in Bukur Village, Sumbergempol District, Tulungagung Regency was inaugurated in 2019 (Flotentin, 2019). The Ngujang 2 bridge construction area itself is an eastern ring road, so that is a strong reason for the importance of bridge construction in the area, especially since the area is also an industrial area. The

construction of the Ngujang 2 bridge provides an option for the community to minimize daily mobility costs. Before the construction of the Ngujang 2 bridge, the main access to the center of Tulungagung Regency was only the Ngujang 1 bridge, or through the crossing route in Blitar Regency (a longer distance). The distance between the Ngujang 1 bridge and the Ngujang 2 bridge that has been built is 5,788.24 m.

Previous researchers generally reported that the construction of bridges contributed significantly to increasing accessibility and regional development. Among them are Effendi (2013) with his research on the construction of the Suramadu bridge that connects Surabaya with the island of Madura, Sihombing (2016) who examines the benefits of building the Taipan Nauli bridge in Sei Rampah District, North Sumatra, Ramadhany (2019) with his research related to the influence of infrastructure development (roads and irrigation) on regional domestic products in East Java Province, and Khomeini (2020) the influence of road and bridge factors on increasing the economy of Cenrana District, Bone Regency, South Sulawesi.

The Ngujang 2 Bridge is an infrastructure that really helps the community in terms of mobility, where this bridge makes travel more efficient in terms of time and costs. In order to obtain empirical evidence, this research was conducted to determine differences in the level of community accessibility before and after the construction of the Ngujang 2 Bridge, as well as to analyze the effect of bridge construction and accessibility on the development of the local area. Furthermore, the results of this research will provide benefits to the government; as material for evaluation of development results and material for consideration related to future infrastructure development plans. For academics, the results of this research can become informative literature related to civil engineering, as well as future research development.

## II. METHOD

This study examines the benefits of building the Ngujang 2 bridge that connects Ngantru District and Sumbergempol District, Tulungagung Regency, East Java, Indonesia. This case study applies the quantitative method, in which the data analysis method used is descriptive statistics to examine community perceptions, regression analysis to determine the effect of increased accessibility on area development, and the Wilcoxon test to determine differences in community accessibility before and after the construction of the bridge. Data analysis was processed using the SPSS program. The research data collection technique was to use a questionnaire distributed to the

community in Ngantru District and Sumbergempol District. 100 research respondents were selected/determined based on purposive sampling technique.

III. RESULT AND DISCUSSION

A. Public Perceptions

The perceptions of local community in this study were studied using descriptive analysis methods. The results are explained as follows:

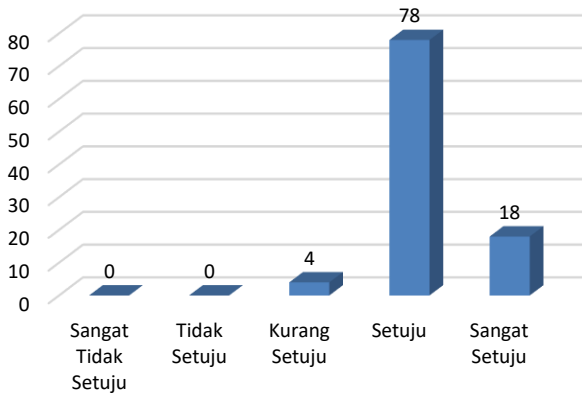


Fig. 1. Public perception regarding bridge location

Source: Research data (2022)

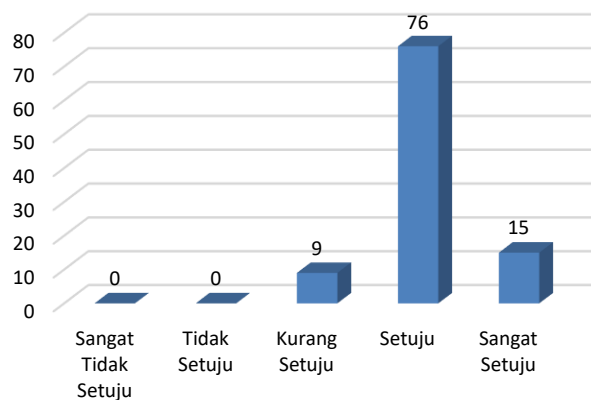


Fig. 2. Public perception on the significance of bridge construction

Source: Research data (2022)

The perception aspects analyzed included public perceptions regarding the selection of bridge construction sites

TABLE 1. Results of Wilcoxon analysis regarding accessibility

Variable	Z	p-value	Interpretation
Gap of trip intensity	-3,416	0,001	Significant
Gap of trip duration	-7,213	0,000	Significant
Gap of trip cost	-5,203	0,000	Significant

Source: Research data (2022)

The interpretation of the results of the Wilcoxon analysis above is based on the significance level ( $\alpha$ ) 0.05. If the significance value (p-value) is smaller than the significant level, then the different test results are declared significant. Overall, Table 1 shows that all aspects of community accessibility

(Figure 1), perceptions related to the benefits of bridge construction (Figure 2), and perceptions related to the results of the bridge construction function (Figure 3). In general, a descriptive analysis related to community perceptions shows that the majority of people (78%) agree that the choice of bridge location is appropriate, according to the infrastructure needs in the local area. This was clarified by the following finding that the majority of the community (76%) stated that they agreed that the construction of bridges was beneficial to the accessibility and mobility of the community. Finally, 60% of the community stated that the function of the Ngujang 2 bridge was very important for community activities. Thus, it can be concluded that the construction of the Ngujang 2 bridge in the local area has provided great benefits for the community. This needs to be proven further through Regression analysis and Wilcoxon analysis which will be discussed in the next section.

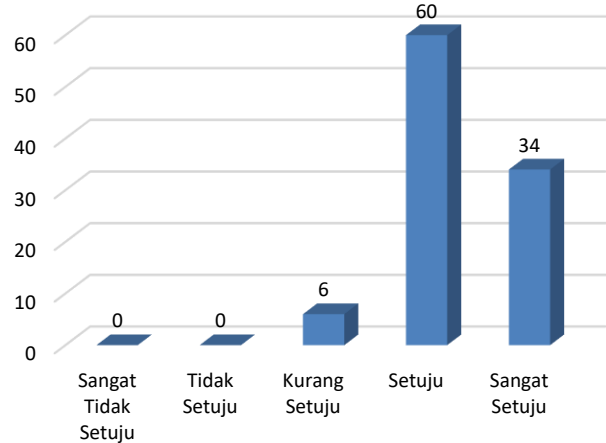


Fig. 3. Public perception regarding the function of bridge construction

B. Accessibility Improvement

The second research point is related to the significance of differences in community accessibility, between before and after the construction of the Ngujang 2 bridge. The differences in the description of this variable were analyzed using the Wilcoxon method, namely specifically related to aspects of travel intensity, travel time and transportation costs. The determination of the Wilcoxon differential test is based on the results of the data normality test.

differed significantly between before and after the construction of the Ngujang 2 bridge. In other words, the construction of the Ngujang bridge has significantly increased community accessibility. Based on the trip intensity parameter, it is known that the level of mobility becomes higher after the construction

of the bridge. Based on the travel time, it is known that the journey has become shorter after the construction of the bridge. Based on transportation costs, it is known that travel costs are cheaper due to shorter travel distances. These findings indicate that the construction of the Ngujang 2 bridge has an essential meaning for public routines.

C. The Effect of bridge construction and accessibility improvement on regional development

TABLE 2. Result of regression analysis (partial test)

Variable	Coefficient	Std. Error	t	p	Interpretation
Bridge construction (X <sub>1</sub> )	0,308	0,047	6,591	0,000	Significant
Accessibility improvement (X <sub>2</sub> )	0,424	0,048	8,859	0,000	Significant

Source: Research data (2022)

TABLE 3. Result of regression analysis (simultaneous test)

Model	F	p	R <sup>2</sup>	Adjusted R <sup>2</sup>	Interpretation
The effect of X <sub>1</sub> and X <sub>2</sub> on Y	235,917	0,000	0,829	0,826	Significant

Source: Research data (2022)

Table 2 displays the results of the partial regression analysis (t test), namely the individual effect of bridge construction on regional development, as well as the effect of the level of accessibility on regional development. In general, Table 2 shows that the construction of bridges has a significant effect on regional development. Furthermore, increased accessibility also has a significant effect on regional development. The Ngujang 2 Bridge has been proven to shorten travel time, minimize travel costs, and trigger an increase in people's mobility (See Table 1 again), so this is also a reason for regional development. Furthermore, the increase in accessibility certainly supports regional development, especially in terms of economic activity.

Simultaneously, the regression analysis shows that the construction of the Ngujang 2 bridge and increased accessibility have a significant effect on regional development (p-value < α 0.05). In addition, this point is reinforced by the adjuster R<sup>2</sup> value of 0.826, which indicates that the significance of the influence between bridge construction and increased accessibility to regional development is 82.6%. This percentage reflects such a large influence, which indicates that the Ngujang bridge with its accessibility impacts greatly determines economic development in Tulungagung Regency. The results of this study are in line with previous studies which reported the significance of infrastructure development for regional development or economy (Effendi, 2013; Sihombing, 2016; Ramadhany, 2019; Khomeini, 2020).

IV. CONCLUSION

The construction of the Ngujang 2 bridge and increased accessibility have proven to have a significant effect on regional development. The percentage of 82.6% reflects such a large influence, which indicates that the Ngujang bridge with its accessibility impacts greatly determines economic development in Tulungagung Regency. Increased accessibility can be seen from the aspect of trip intensity, travel time, and travel costs. These findings become important recommendations for the central government and local governments to prioritize infrastructure development in regional areas (districts),

The last point of analysis is related to the influence of the construction of the Ngujang bridge and increased accessibility to regional development, namely by using linear regression analysis. The results of the analysis are explained in Table 2 and Table 3. The results of the regression analysis are declared significant if the significance value (p-value) is less than the significant level (α) 0.05.

especially roads and bridges. Increased accessibility will later increase the community's economic development.

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