# Studi kelayakan Simpang tak sebidang Jalan Nasional Kutowiangun Kebumen, Jawa Tengah

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*To evaluate the benefits of the project being built, an economic analysis is carried out using Net Present Value (NPV), Benefit Cost Ratio (BCR), and Economic Internal Rate of Return (EIRR). The analysis resulted in NPV of Rp 178,249,491,541, BCR of 1.86, and EIRR of 18.85%. From the values of BCR, NPV, and IRR it can be seen that this project is economically feasible. Furthermore, a sensitivity test of the NPV, BCR and IRR values were conducted in this study. From the sensitivity test of the NPV, BCR and IRR values, the R2 > 0.6 is obtained, so it can be concluded that the feasibility model is quite accurate to be applied to this project. The flyover alternative crossing the railway will be technically feasible, economically viable, environmentally and socially sustainable, and will contribute to the overall economic growth of the country, which should support poverty reduction and improved living standards*

**KEYWORDS** :  feasibility study, Kutowiangun, BCR, IRR, NVP

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# Executive Summary

*This Feasibility Study Report has been prepared on behalf of the Ministry of Public Works and Housing (MPWH) in relation to the Project Preparation Consultant (PPC) for Bridges – Package 7 (Central Java, Yogyakarta, East Java).*

## Introduction

This project is part of the effort of the Government of Indonesia in implementing the Accelerating Infrastructure Delivery through better Engineering Services Project (ESP) that will help meeting the infrastructure development objectives of the MPWH's Sector Development Plan (SDP), 2015-2019 and beyond. With the aim of carrying out the Feasibility Study (FS) of a grade separated crossing in Kutowinangun, this project involves the study of traffic improvement by means of flyover (FO)/Underpass on the road section Kebumen – Prembun. It aims to facilitate and improve vehicle traffic flow at railroad crossing and reduce delays that occur when the train passes.

## Preparations and Surveys

The Kutowinangun railway crossing is administratively located within the Kabupaten Kebumen, Central Java Province. In the last 5 years the GDRP of Kabupaten Kebumen has an average of 5.22 % growth annually. Based on BPS data (Kabupaten Kebumen Dalam Angka 2019) the main commodity of Kabupaten Kebumen in 2018 is agriculture, forestry, and fishery industry which contributed 22,69% of the total Kabupaten Kebumen GDRP.

The location of the feasibility study is at crossing between double track railways with Banyumas-Kebumen national road. Banyumas-Kebumen national road is part of the road network development system plan for the Kabupaten Kebumen. However, the project to construct a grade separated crossing in Kutowinangun is not mentioned in the regional spatial plan.

Several surveys were carried out to support the analysis of this study. The surveys include a topographical survey, road conditions survey, hydrology conditions, geotechnical investigation, and traffic surveys.

A detailed topographical survey was conducted in the project area along the existing Roadway. All the requirements of topographical survey works were completed with proper accuracy along the National Road corridor. The detailed survey was carried out using high precision instrument using UAV (Unmanned Aerial Vehicle) to get an overview of the situation from the air in the form of Drone Video or Aerial Photo Orthorectification (which one is more likely). The data from the topographical survey was put on (x, y, z) format so that it could be used to establish a sophisticated digital ground model (DGM). For conducting topographical survey, Benchmarks (BM) and the control points (CM) were established which have been taken as reference by the survey team for establishing the vertical control and all

the levels are referred with respect to these. Total of 4 Benchmarks were established along the proposed alignment at suitable locations.

The existing road conditions were investigated by visual observation for the National Road in the area. It was found that the pavement on the main road was in a good condition. It was found that overlay was done not long before the observation was made on the road near the track. Road damage such as cracks, potholes, or uneven surface that may affect the traffic flow was not found.

The hydrological conditions in Kutowinangun Crossing, were investigated. The data from Rainfall Station of Taman Winangun covers observation of daily maximum rainfall from 2010 to 2019. In general, the drainage condition around the area of Kutowinangun Crossing are acceptable and the existing drainage system in Kecamatan Kutowinangun is adequate. Based on the data collected, flooding is expected in Desa Kewarisan and Desa Lundong with a flood level of 20 – 25 cm from the overflow of the Badegan River. The average flood duration is 24 hours with frequency of one time in a year.

The geotechnical exploration consisted of field and laboratory programs. The investigation was carried out at twelve locations, of which eight were boring in the bridge foundation and four were Cone Penetration Test (CPT) in the access road. The field and laboratory test were performed in conformance with applicable ASTM international codes. Terms of Reference for sub soil investigation envisages digging in a minimum of 30m bore hole on embankment and at the bridge site. All drilling and sampling equipment was in good working condition. All equipment/ instruments were calibrated at the start of work to reflect factual values. All the laboratory equipment was checked regularly to verify that they meet the required tolerances, as established by the AASHTO/ASTM test procedures.

The traffic flow data used in this study were obtained from the primary survey located in Kutowinangun. The survey method is to calculate the volume of vehicle traffic (cross-sectional vehicle traffic count) according to the type of vehicle which is carried out by using a manual counting tool for vehicles passing through the observation point. From each leg of the intersection, the amount of traffic to each direction of movement to the other leg is calculated.

The survey resulted in a traffic volume of 592 pcu/hr in peak hour. However, the existing situation is assumed to not reflect the actual existing traffic conditions due to pandemic of Covid-19. Therefore, the estimated V/C of the road became 0. 60 with level of service grade C after adjustment to the pandemic situation.
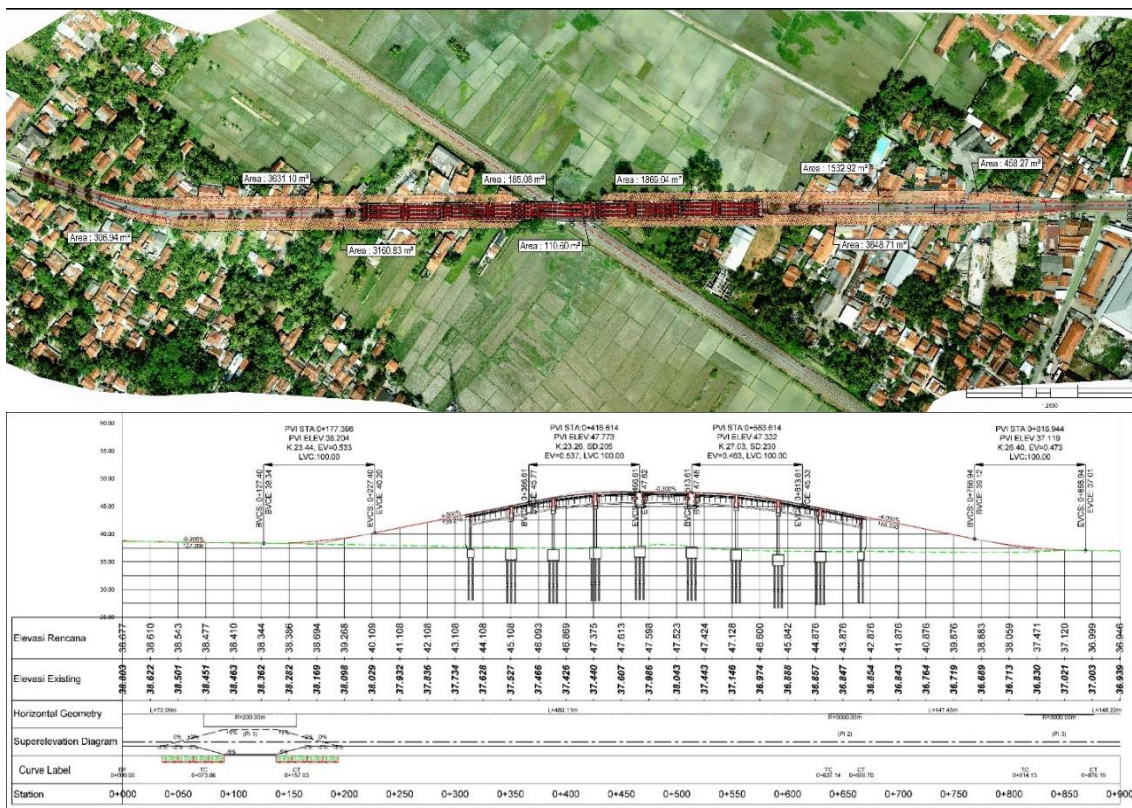
Traffic forecasting was also conducted in this study where the traffic for 20 years ahead was analyzed. The analysis assume that traffic growth based on the historical data and population and economic data is 3- 3.5 % per year.

## Engineering Analysis

During the feasibility study, three alternatives were considered, including bridge and underpass.

- Option 1: Flyover for National Road
- Option 2: Underpass for National Road
- Option 3: Flyover for National Road with Right Angle Crossing Railway



After detailed study, it was confirmed that the alternative-1, flyover option, was more suitable considering the maintenance and land acquisition for the project. This selected alternative is expected to cost Rp. 108,736,236,000.

## Environmental and Social Analysis

The project environmental screening is to be conducted according to the Indonesian Environmental Law No. 32/2009 on Environmental Protection and Management and its implementing regulations. In order to determine the type or classification of environmental documents, it is done by screening. The legal basis for the screening process is the Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number: P.38/Menlhk/Setjen/ Kum.1/7/2019 concerning Types of Business Plans and / or Activities that Require an Environmental Impact Analysis. Based on these regulations, the Kutowinangun FO in Kebumen District with a length of about 361,6 m is included in the category of UKL-UPL.

Total cost for land acquisition and resettlement estimated for the development of flyover is Rp 10,207,000,000 (10 billion). The cost estimation consists of compensation for physical losses (land, structures, and trees

if available), non-physical losses and other cost required by government regulation.

## Economic Financial Analysis

To evaluate the benefits of the project being built, an economic analysis is carried out using Net Present Value (NPV), Benefit Cost Ratio (BCR), and Economic Internal Rate of Return (EIRR). The analysis resulted in NPV of Rp 178,249,491,541, BCR of 1.86, and EIRR of 18.85%. From the values of BCR, NPV, and IRR it can be seen that this project is economically feasible. Furthermore, a sensitivity test of the NPV, BCR and IRR values were conducted in this study. From the sensitivity test of the NPV, BCR and IRR values, the $R^2 > 0.6$ is obtained, so it can be concluded that the feasibility model is quite accurate to be applied to this project.

## Conclusion and Recommendation

After analyzing all the elements of the feasibility study, the team of consultant selected the alternative-1 to build a flyover on the national road section Bts. Banyumas Tengah – Kebumen at railroad crossing. This route will pass an area, which has relatively flat ground surface contours, consisting of areas such as rice fields, market and local people economy area, offices, schools and other educational facilities, train station lying along national road towards Gombong and towards the City of Kebumen.

According to the VE/LCC analysis of the selected alternatives, the bridge crossing over the railway has emerged as the most optimal alternative and the preferred alternative for proceeding with the detailed design phase.

The flyover alternative crossing the railway will be technically feasible, economically viable, environmentally and socially sustainable, and will contribute to the overall economic growth of the country, which should support poverty reduction and improved living standards.

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