

Analysis Of Mitigation Of The Impact Of The Construction Of The Bitung - Serpong Toll Road On Environmental Conditions

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ABSTRACT

Roads are a major form of infrastructure that plays a vital role in life. Banten Province is connected by several national roads and toll roads. These national roads and toll roads also connect regencies and cities within the region. With the increasing density of road users, congestion is unavoidable, as these national roads and toll roads are used by vehicles both heading to and leaving Banten Province. Current traffic conditions on toll roads are quite dense (saturated), so to overcome congestion, the construction of alternative roads with a higher level of quality and adequate levels of accessibility and mobility is required. The construction of toll road infrastructure, such as the Bitung-Serpong Toll Road, has a significant impact on the environment. This paper aims to analyze the environmental impacts caused by this toll road construction project, including changes in land use, impacts on ecosystems, pollution, and socio-economic impacts. Through this study, it is hoped that recommendations can be provided for mitigating potential negative impacts.

Keywords: Toll Road Construction; Environmental Impact

I. INTRODUCTION

Infrastructure development is a crucial pillar in efforts to increase economic growth and connectivity between regions. In Indonesia, toll road construction projects have become a government priority to support the program.national development and accelerating inter-regional accessibility. One significant project is the Bitung-Serpong Toll Road, designed to connect the northern and southern regions of Jakarta. Approximately 12 kilometers long, this toll road is expected to reduce congestion, speed up travel, and improve logistics efficiency.

However, despite the promised economic benefits, toll road construction also brings a number of environmental challenges that require attention. With rapid population growth and urbanization, pressure on natural resources and the environment is increasing. Toll road construction often involves land use changes, which can result in the loss of agricultural areas, forests, and green spaces. Furthermore, large infrastructure projects like these can disrupt local ecosystems, cause pollution, and alter water flow patterns, which can impact environmental quality and public health.

The environmental impacts of the Bitung-Serpong Toll Road construction are not limited to physical aspects but also encompass broader social and economic impacts. Communities living near the toll road may face the risk of extinction, loss of livelihoods, and changes in their lifestyles. Therefore, it is crucial to conduct a comprehensive analysis of the project's impacts and identify mitigation measures that can be taken to mitigate potential negative effects.

In this context, this study aims to explore the environmental impacts of the Bitung-Serpong Toll Road construction, focusing on several key aspects, including land use change,

ecosystem impacts, pollution, and economic impacts. This study is expected to provide deeper insight into the environmental implications of this infrastructure project and suggest recommendations for its sustainable management. This will enable infrastructure development to be carried out in a more responsible and sustainable manner, balancing economic needs with environmental protection.

II. LITERATURE REVIEW

Impact of Bitung-Serpong Toll Road Construction on Environmental Conditions Toll Roads and Their Role

Toll roads are paid transportation infrastructure designed to streamline traffic flow with higher capacity and service standards (Bina Marga, 2018). According to Nasution (2004), toll road construction can support economic growth, facilitate the distribution of goods and services, and improve connectivity between regions.

The Bitung – Serpong Toll Road is part of the Jakarta Outer Ring Road (JORR) 2 toll road network which aims to reduce traffic congestion on the inner ring road and strengthen connectivity from Greater Tangerang to Serpong (PUPR, 2020).

Environmental Impacts of Toll Road Construction

According to Law Number 32 of 2009 concerning Environmental Protection and Management, every development can have both positive and negative impacts on the environment. These impacts include:

- Changes in the use and conversion of green land (Sukandarrumidi, 2010)
- Increased air pollution, noise, and vibration, especially during construction (Setiawan & Nurhidayati, 2014)
- Disturbance to flora and fauna habitats (Arsyad, 2010)
- Changes in hydrological patterns, including flood risk (Wardhana, 2004)

Previous Studies Related to Toll Road Development and the Environment

Some studies related to the environmental impact of toll roads:

- Pramono (2016) found that the construction of the Cikampek II Toll Road resulted in a reduction in the area of productive agricultural land and increased vehicle emissions.
- Putra & Sari (2019) stated that the construction of the Pandaan–Malang Toll Road caused high levels of noise and disturbed wildlife habitats.
- Widiastuti et al. (2021) emphasize the importance of mitigation, such as the development of green belts, as a measure to reduce negative impacts.

Environmental Impact Analysis (AMDAL) Theory and Approach

An AMDAL is a systematic study to assess the significant impact of a development project on the environment (Glasson et al., 2012). According to Suharyadi (2015), an AMDAL helps ensure sustainable development with controlled environmental risks.

Relevance to the Bitung – Serpong Toll Road

The Bitung-Serpong Toll Road is predicted to face similar challenges, such as potential ecosystem disruption, land-use changes, and increased pollution. Therefore, mitigation measures are needed, including green lanes, environmentally friendly drainage systems, and strict supervision during construction and operation.

III. RESEARCH METHODOLOGY

Research Approach

This research uses a qualitative descriptive approach supported by quantitative analysis. The goal used to:

- Identifying the main negative impacts of the construction of the Bitung – Serpong Toll Road.
- Develop recommendations for appropriate and contextual mitigation efforts.

According to Sugiyono (2017), a qualitative descriptive approach is suitable for researching social and environmental phenomena with an in-depth focus, while quantitative analysis is useful for supporting the validity of numerical data.

Research Location

The research was conducted along the Bitung – Serpong Toll Road construction corridor, covering the areas of Curug, Legok, Cikupa Districts (Tangerang Regency), and North Serpong District (South Tangerang City).

Data Types and Sources

1 Primary Data

- Direct observation of environmental conditions around the toll road route (vegetation, air quality, erosion potential, noise).
- In-depth interviews with project implementers, the Environmental Agency, and affected communities.
- Questionnaire for local residents regarding perceptions of the impact and effectiveness of mitigation efforts that have been carried out.

2 Secondary Data

- Environmental Impact Analysis (AMDAL) and Environmental Management Plan (RKL-RPL) documents.
- Satellite image data or land cover change maps.
- Official documents from local government and previous study reports.

Data collection technique

- *Field observation*: documenting critical impact points, such as landslide-prone areas, high noise points, and areas with potential for flooding.
- *Interview*: dig up in-depth information about mitigation efforts that have been planned or implemented.
- *Questionnaire*: evaluate the effectiveness of mitigation efforts from a community perspective.
- *Documentation*: collect photos, maps, and project reports.

Data Analysis Techniques

1. Identify Negative Impacts

- Analyze the results of observations, secondary data, and interviews to identify important impacts, such as:
 - Conversion of green land
 - Deterioration of air quality
 - Increased noise
 - Local ecosystem disturbance
 - Changes in drainage patterns and potential for flooding

2. Preparation and Evaluation of Mitigation Efforts

- Compare actual conditions with AMDAL and RKL-RPL documents.

- Assess whether the listed mitigation efforts are appropriate to field conditions.
- Compile recommendation repair or step addition If gaps were found.

3. *SWOT Analysis*

Used to identify:

- Strengths: mitigation steps that have been implemented effectively.
- Weaknesses: obstacles or deficiencies in mitigation efforts.
- Opportunities: supporting policies or programs.
- Threats: environmental risks that may still occur.

Preparation of Mitigation Recommendations

Recommendations are prepared based on the results of the analysis, taking into account:

- Technical feasibility and costs
- Social and cultural conditions of the surrounding community
- Compliance with regulations (eg Law No. 32 of 2009)

Examples of mitigation efforts that can be proposed:

- Planting vegetation (buffer zone/green belt) to reduce noise and dust.
- Eco-friendly drainage system to prevent flooding.
- Regular monitoring of air quality and noise.
- Public education regarding environmental management.

Research Instruments

- Observation guidelines (field physical condition recording form)
- In-depth interview guidelines
- Public perception questionnaire
- Air quality and noise measuring instruments (if available)

Research Flow Scheme (Stages)

1. Identification and collection of environmental impact data
2. Analysis of significant impacts and their causal factors
3. Evaluation of existing mitigation efforts
4. SWOT Analysis
5. Preparation of mitigation recommendations

IV. RESULT AND DISCUSSION

Identifying Significant Impacts

The results of the research and analysis of the AMDAL documents show several main negative impacts of the construction of the Bitung – Serpong Toll Road, namely:

1. Conversion of green and agricultural land into construction areas and roads.
2. Increased noise especially around densely populated areas.
3. Increased dust and air pollution due to heavy equipment and project vehicle activities.
4. Disruption of flora and fauna habitat in river border areas and open land.
5. Changes in water flow patterns and potential flooding at several points close to residential areas.

2. Evaluation of Mitigation Efforts That Have Been Carried Out

Based on the RKL-RPL documents and field observations, the project implementer has implemented several mitigation efforts, including:

- Construction of temporary drainage channels to reduce flooding.
- Regular watering of project roads to suppress dust.
- Installation of barriers in construction areas near residential areas.
- Planting trees in several buffer zones.

However, from the results of interviews and questionnaires with the public, several notes were found:

- Road watering is not always routine, so dust still feels annoying.
- The buffer zone is considered to be insufficiently large and the vegetation types are less varied.
- Noise monitoring has not been carried out regularly and transparently.

3. Recommendations for Additional Mitigation Efforts

Based on the results of the SWOT analysis and field conditions, additional mitigation recommendations prepared include:

1. Adding green lanes with local broad-leafed plants to reduce noise and air pollution.
2. Optimization of a permanent drainage system that is integrated with the drainage of the surrounding area.
3. Increased frequency of watering project roads, especially in the dry season.
4. Regular monitoring of air quality and noise, with results announced to the public.
5. Environmental outreach and education to local residents to help maintain the buffer area.

V. CONCLUSION AND SUGGESTIONS

Based on the results of the research that has been conducted, it can be concluded that:

Conclusion

1. The construction of the Bitung – Serpong Toll Road has had a negative impact on environmental conditions, particularly in the form of:
 - o Conversion of green areas and agricultural land into construction areas and roads.
 - o Increased air pollution due to heavy equipment and project vehicle activities.
 - o Increased noise felt by the community around the toll road route.
 - o Disruption of flora and fauna habitat in open areas and river borders.
 - o Changes in water flow patterns increase the risk of flooding at some points.
2. Mitigation efforts implemented by the project implementers, such as road sprinkling to reduce dust, constructing temporary drainage, installing project barriers, and planting green belts, were deemed beneficial but not yet fully effective. Deficiencies remain, such as limited green space, irregular noise monitoring, and a lack of variety in dust- and noise-reducing plants.
3. Additional recommended mitigation efforts include:
 - o Addition and maintenance of green belts (buffer zones) with local plants that can absorb pollutants and reduce noise.
 - o Optimization of permanent drainage systems to reduce the potential for flooding.
 - o Increase the frequency of road watering, especially during the dry season.
 - o Regular monitoring of air quality and noise with transparent results to the public.

- o Socialization and education to the community to protect the environment around the project.

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