

Functional Feasibility Analysis of Moat – Motongkad Road in East Bolaang Mongondow Regency, North Sulawesi Province

Sisca V Pandey¹, Jeffry S.F. Sumarauw² and Lucia G. J. Lalamentik³

Faculty of Engineering, Department of Civil Engineering, Sam Ratulangi University, Manado, Indonesia

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Abstract - The Moat – Motongkad District Road in Bolaang Mongondow Timur Regency at Sta 14+000 to Sta 19+000 North Sulawesi Province is one of the access roads from Kotamobagu to Tutuyan as the capital of Boltim Regency. This road section is a strategic district road that is crowded with vehicles during rush hour. Currently, this busy road has a geometric road condition that is not wide (inadequate), so that there is a need for research on the proper function of the road on this segment.

The purpose of this study was to analyze the level of road function worthiness as well as the repairs needed to make the road feasible according to the Road Functional Feasibility Test (ULFJ) based on the Minister of Public Works Regulation number 11 / PRT / M / 2010. Road function worthiness test is the condition of a road segment that fulfills the technical requirements of roadworthiness to provide safety for its users and administrative requirements that provide legal certainty for road operators and road users so that the road can be operated for the public.

Law of the Republic of Indonesia No. 22 of 2009 explains that the government is obliged to provide a sense of security and comfort for road users. Road operators must ensure the safety of users and avoid accidents. Safe roads must be carried out through a measurable audit by road administrators both technically and administratively called Road Functionality.

Minister of Public Works Regulation No. 11/PRT/M/2010 describes the Procedures for the Road Function Feasibility Test technically and the Road Function Appropriateness Administrative Procedures. The implementation of the Road Function Feasibility Test provides audit results that are very beneficial for road users. Function Feasibility Result (LF) describes the road feasible to operate to road users. The results of the unfit function indicate that the road is not yet feasible to operate, so that the road must be closed for repairs. Road function worthiness is an effort to realize a safe road which is the responsibility of road organizers.

The results of the research on the functional feasibility of the Moat – Mongkad road section as a Regency road at Sta 16+000 to Sta 19+000 have the category of Conditional Technical Function Eligibility (LS). Conditional Functional Eligibility (LS) must provide

recommendations that need to be made by the government as the organizer of the road network to provide comfort and safety for road users.

Keywords - road organizers, road users, function-worthy

I. INTRODUCTION

A. BACKGROUND

The Moat – Motongkad road section is a district road in Bolaang Mongondow Timur with a road length of 19.6 km. Decree of the Regent of Bolaang Mongondow Timur No. 140 of 2016 concerning the Determination of the Status of District Roads and Bridges in the East Bolaang Mongondow District states that the Moat-Mongkad road is a strategic road network. This road is busy with traffic that connects Kotamobagu City as the capital of Kotamobagu and Tutuyan as the capital of East Bolaang Mongondow Regency. This road passes through the Limited Production Forest in Boltim Regency, so this road is referred to as a district strategic road.

As a district which is the result of the division of Bolaang Mongondow Regency, there are about 60% of Civil Servants (PNS) from Kotamobagu who travel daily to work to Boltim using the Moat – Mongkad road, so research is needed on the proper function of this road. In order to provide comfort to road users.

Road users want the availability of safe roads. Safety roads are roads that provide a sense of security for users. As explained in Article 23 of the Law of the Republic of Indonesia No. 22 of 2009 states that the government as the organizer of the road is obliged to provide a sense of security and safety as demand for safe roads so that users feel safe when traveling. Likewise, Article 30 of the Law of the Republic of Indonesia No. 38 of 2004 and Article 102 of Government Regulation of the Republic of Indonesia No. 34 of 2006 states that roads must meet the requirements for Functional Eligibility. This shows that the government is obliged to provide safe roads, which are realized in the form of Functional Roads. The requirements for road function worthiness both technically and administratively provide guarantees of safety for road users and legal certainty in their implementation.

Safety is a serious problem that must be realized in order to provide a sense of security for its users. In the Regulation of the Minister of Public Works No:



11/PRT/M/2010 concerning Procedures and Requirements for Road Worthiness for Public Roads, it is stated that the procedures and requirements for road serviceability (LFJ) are prepared with the aim of providing roads that meet the provisions of safety, smoothness, economical and environmentally friendly. The method used to reduce the risk of road accidents is to conduct road function feasibility tests. It is very necessary to conduct a road function feasibility test to find out whether the Regency Road Section in the East Bolaang Mongondow Regency has met the Road Functionalworthiness requirements so that the realization of an orderly road operation and meets the provisions of safety, smoothness, economy and environmental friendliness.

B. PROBLEMS

The problem of this research is how the proper function according to the Regulation of the Minister of Public Works No. 11/PRT/M/2010 concerning Procedures and Requirements for Road Functionality for Public Roads.

C. RESEARCH OBJECTIVES

The objectives of this UNSRAT Primary Research Research (RDUU) in 2021 are:

1. Analyzing the level of function of Jalan Moat Motongkad as a busy local road at Sta 14+000 to Sta. 19+000.
2. Necessary repairs on the Moat Motongkad road section are in accordance with the Regulation of the Minister of Public Works No.11/PRT/M/2010.

D. BENEFITS OF RESEARCH

The benefit of this research is to find a road that is functional and safe.

II. LITERATURE REVIEW

A. Road Network in Indonesia

Road infrastructure is a very important part of people's lives to serve the movement of people and goods transportation. The movement of goods transport must be accompanied by the provision of adequate road network infrastructure (supply) for the smooth flow of distribution. According to Article 1 of the Law of the Republic of Indonesia Number 38 of 2004 and Article 1 of the Government Regulation of the Republic of Indonesia Number 34 of 2006 that roads are land transportation infrastructure that includes all parts of the road, including complementary buildings and equipment intended for traffic, which are on the surface. Land, above ground, below ground and/or water, and above water, except for railways, lorries, and cable roads.

Road infrastructure is a very important part of people's lives to serve the movement of people and goods transportation, where this must be accompanied by the provision of adequate road network infrastructure (supply) for smooth distribution. The provision of road infrastructure is the key to national economic growth and as a liaison between regions to have a positive impact on regional development and is the responsibility of the government. Meanwhile, the quality of road infrastructure

affects the accessibility and mobility of the development of an area. Provision of road infrastructure in accordance with Law no. 38 of 2004 concerning Roads, the role of roads is explained as part of transportation infrastructure that has an important role in the economic, socio-cultural, environmental, political, defense and security fields, and is used as much as possible for the prosperity of the people. Roads are also described as infrastructure for the distribution of goods and services, which are the lifeblood of the community, nation, and state. Another role of the road is that it is a unified road network system that connects and binds the entire territory of the Republic of Indonesia.

B. Road Classification According to Law No. 22 of 2009 concerning Road Transport Traffic

Road classification according to article 19 of the LLAJ Law, road classification according to road class is related to the road's ability to carry traffic loads which are stated in the Heaviest Axis Load (MST) as described in Table 1 below:

Table 1. Classification of Roads by Road Class

Function	Class	MST Heaviest Axis Load Class Function (tonnes)
Arteries Collector	I	10
Arteries Collector Local Environment	II	8
Arteries Collector Local Environment	III	8
Arteries	Special road	>10

Source: Law No. 22/2009

C. Road Classification According to Road Terrain

Classification of roads according to road environmental conditions based on the condition of the contours of the road environment is on flat terrain, hills, mountains as described in Table 2:

Table 2. Classification of Road Terrain

Field Group	Notation	Slope (%)
Flat	D	<3
Hills	B	2-25
Mountain	G	>25

Source: Geometric Planning Techniques for Inter-City Roads, 1997

D. Roadworthy Function

Regulation of the Minister of Public Works Number: 11/PRT/M/2010 states that Road Functionality is the condition of a road segment that meets the technical

requirements of feasibility to provide safety for its users and administrative requirements.

which provides legal certainty for road organizers and road users so that the road can be operated for the public. The results obtained after the Road Functionality Test (ULFJ) were carried out in the form of a Road Function worthiness Certificate in the form of a written document regarding the functional status of a road section, given by the road operator in accordance with the road status. The roadworthiness status includes, among others, Functional Eligibility (L), Conditional Functional Eligibility with recommendations (LS), and Unfit Function (T).

E. Roadworthiness Requirements

A road segment is said to be functional if it meets the technical and administrative requirements of the road. The feasibility of this function is a condition for the operation of the road. Minister of Public Works Regulation No. 11/PRT/M/2010 concerning Procedures and Requirements for Road Functional Eligibility states that LFJ is the condition of a road segment that meets the technical feasibility requirements to provide safety for its users and administrative requirements that provide legal certainty for road operators and road users so that the road open to the public.

Requirements and Implementation of ULFJ based on Minister of Public Works Regulation No. 11/PRT/M/2010 as follows:

a) Road Functionworthiness Requirements and Implementation

1) LFJ Teknis Technical Requirements

a. Road geometric technique; b. Technical road pavement structure; c. Complementary building structure technical Street; d. Technical utilization of road sections; e. Technical implementation of traffic management and engineering that embodies instructions, orders, and prohibitions in traffic; f. Technical road equipment that is directly related to road users, such as markings, signs, separators, road islands, sidewalks, APILL, and supporting facilities

b) Function Eligible Category

Minister of Public Works Regulation No.11/PRT/M/2010, road-worthy functions are divided into the following three categories:

1) Functional Worth (LF)

If the road segment meets all technical and administrative requirements so that it is suitable for operation for the public.

2) Conditional Functional Eligibility (LS)

A road segment fulfills some of the technical requirements for road function but is able to provide safety for road users or has at least a road status determination document. The road can be operated after technical repairs are carried out according to the time recommended by the function-worthy test team

3) Unfit Function (TL)

The condition of the road segment where some of the road components do not meet the technical requirements so that the road section is unable to provide safety for road users. Roads that are not fit for function are prohibited from being operated by the public.

c) Functional Feasibility Test Team

The Road Function Feasibility Test Team consists of:

1. The chairman is concurrently a member of the road organizer
2. Secretary and member
3. At least 3 members

The secretary and team members come from elements of road organizers, elements of road traffic and transportation organizers, elements of the police. All team members, including the chairman and secretary, may not be appointed from elements directly involved with road sections that are under the authority, both technically and administratively.

The road function worthiness test team consists of experts with scientific disciplines; road engineering, road geometry, bridge engineering, traffic engineering, and road environment and road engineering administration. If the needs of the expert team are difficult to meet, the road operator can appoint experts from elements of road research institutions, universities, road expert associations, or other elements that meet the criteria of expertise.

d) Functional Feasibility Test Procedure

Minister of Public Works Regulation No.11/PRT/M/2010 concerning Procedures for Road Functional Eligibility Requirements states that the implementation of road function feasibility tests includes road physical inspection and road management document inspection.

e) Functional Eligibility Determination

Determination of road function worthiness:

- National Road

1. The Minister shall conduct an Evaluation of Road Functionality on national roads.
2. Every national road segment must meet the technical and administrative requirements for road function worthiness, as well as strive for the fulfillment of functional feasibility.
3. The Minister appoints the National Road Functional Feasibility Test Team by taking into account the requirements.
4. The national road section will be evaluated, prepared, and proposed by the Technical Implementation Unit that directly manages the national road concerned, to the Minister, at the beginning of each fiscal year.
5. The National Road Functionality Test Team evaluates national roads according to their duties and functions and follows implementation procedures.
6. Functional worthiness of national roads is determined by the Minister by issuing a Roadworthiness Certificate, based on the official report on the Road Functionworthiness Evaluation, using the format from the Minister of Public Works.

f) Financing

1. Funding for the implementation of the General LFJ includes financing for conducting LFJ evaluations and financing for achieving the fulfillment of Road Functional Eligibility requirements.
2. Financing for the evaluation and achievement of LFJ for national roads shall be borne by the State Revenue and Expenditure Budget.
3. Financing for the evaluation and achievement of the proper function of provincial road sections shall be borne by the provincial Regional Revenue and Expenditure Budget.
4. Financing for the evaluation and achievement of LFJ for district/city road sections is charged to the Regency/City Regional Revenue and Expenditure Budget.

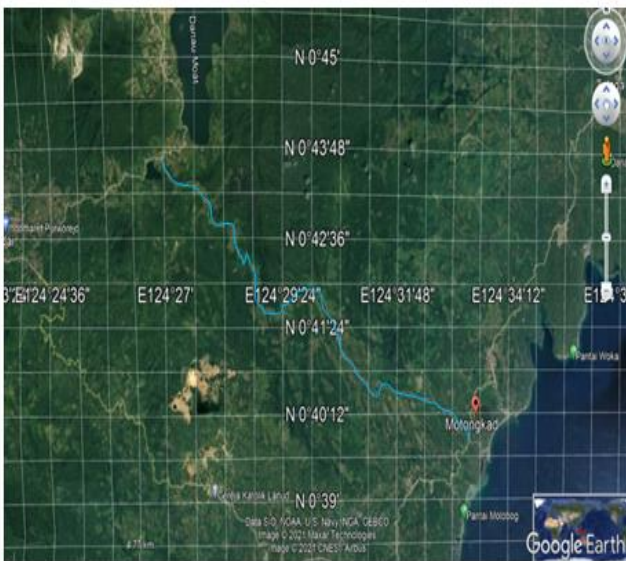
g) Supervision.

1. Evaluation of road function feasibility and achievement of road function worthiness is monitored by road administrators in accordance with their authority, periodically based on the results of monitoring functions and benefits;
2. The status of the functional feasibility of Regency and City road sections is reported by the Regency/City regional government to the provincial, regional government at the end of each fiscal year;
3. The status of the functional feasibility of Provincial, Regency, and City road sections is reported by the provincial government to the government at the end of each fiscal year;
4. The status of the function of the National, Provincial, and Regency/Municipal road sections are published to the public by the government at the end of each fiscal year through national publication media.

III. METHODOLOGY

A. Research Location

The research location is on the East Bolaang Mongondow Regency Moat – Motongkad road Section for STA 14+000 to STA 19+000 along 5.00 km



Source: Google Maps, 2021

Figure 1: Research Location



Figure 2. Map of Boltim Regency

This research was conducted based on the following flow chart:

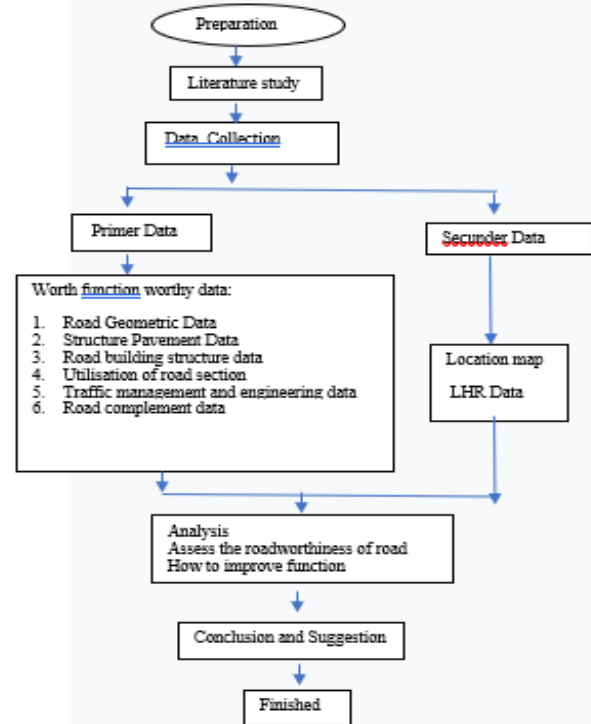


Figure 3. Research Flowchart

IV. DATA AND ANALYSIS

A. DATA

The primary data taken in the field in accordance with the Regulation of the Minister of Public Works number 11 / PRT / M / 2010 are:

a) Road geometric data

The geometric data of the road in this research are in the form of the cross-section of the road, horizontal alignment, and vertical alignment. In the cross-section of the road

body, there is an assessment of the condition of the traffic lane, road shoulder, side ditch, and traffic safety devices. In the horizontal alignment, there is an assessment of the length of the straight section of the road, visibility, road environment, bend radius, and the number of intersections. In the vertical alignment, there is an assessment of longitudinal slope, visibility and road environment.

b) Pavement structure data

The pavement structure data in this study are the type of pavement, the condition of the pavement, and the strength of the road construction. In the condition of the pavement, there is an assessment of road flatness, depth of holes, the width of cracks, depth of grooves, and pavement texture. The road pavement structure data is in the form of the IRI (International Roughness Index) value which is visually correlated from the RCI (Road Condition Index) data which is taken on average.

c) Structural data of complementary road buildings

Data on road structures in this study are in the form of an assessment of the condition of bridges, culverts, parking lots, retaining walls, roadside canals. Collecting data on road structures such as:

- Measurement of pavement width, shoulder, and bridge pavement
- The ability of culverts and roadside canals to collect water
- Availability of parking space
- Condition of retaining wall

d) Traffic management and engineering data

The data on the implementation of traffic management and engineering in this study are in the form of road markings, traffic signs, sidewalks, and traffic signaling devices (APILL). Management implementation data and traffic engineering is an analysis of the existence of road markings and traffic signs on the road.

e) Road equipment data

Road equipment data in this study is divided into 2, namely those that are directly related to users. The data must be changed in the form of junior high school/day (passenger car unit/day) in accordance with the existing technical guidelines. To change the data, it is converted using the number emp (passenger car equivalent). So that the LHR value in this study was 3,072 smp/day. The analysis was carried out based on the results of the initial identification of the road that became the research location, namely the Moat - Mongkad Regency road at Sta 14+000 to Sta 19+000.

B. ANALYSIS

a) TECHNICAL APPROPRIATE TEST

1) Traffic Lane, LS Eligibility

The Moat Mongkad road section is a 2-lane 2-way road with a width of 4.80 meters and a width of 2.40 meters per direction.

Road Technical Requirements (Permen PU 19/2011 concerning Road Technical Requirements) stipulates a

lane width of at least 3.50 meters measured from the roadside lane boundary (full marking line on the inner side of the road) to the traffic lane boundary on the other side (middle marking line is broken). -breaks or sides in full marking lines).

Looking at the markings and the width of the road type 2 lanes, 2 directions (2/2T) has a traffic lane width of 2x2.40 m. Thus the width of the traffic lane does not meet the Road Technical Requirements.

Recommendation: it is necessary to widen the road up to 7 m



Figure 4. The width of the traffic lane is 2.4 m

2) Shoulders, LS Eligibility

The average width of the road shoulder along the road segment is 2.0 meters, with the position of the shoulder surface not being continuous with the road surface. Technical regulations require a shoulder of at least 1.5 meters with a continuous pavement position with a road surface with a slope of 3-5%

Recommendation: it is necessary to smooth the shoulder of the road parallel to the road surface



Figure 5 . Road shoulder

3) Side Gutter, Eligibility L

There are open gutters that meet technical standards in certain sections

Recommendation: We need to build a ditch along Moat Motongkad road



Figure 6. Side Gutter

4) Curve Section, L worthiness

The curve radius partially meets the technical requirements of at least 110 meters, superelevation 10%, minimum visibility is 4-5 m.



Figure 7. Radius of Curve

5) Persil Access, LS Eligibility

Access to parcels, more than one vehicle, and vehicles can directly enter the main route. Vehicles in the form of light vehicles and motorcycles.

Recommendation: coordination with the Boltim Regency Transportation Service to arrange and place road signs and markings



Figure 8. Persil access

6) Type of Pavement, L. Worthiness

The type of pavement along the segment is AC-WC



Figure 9. Pavement Type

7) Road Construction Strength, L. Worthiness



Figure 10. Strength of road construction

8) Bridge Cross Over, Cross Down, LS Eligibility

The condition of the bridge is good, and there are no pedestrian paths

The Technical Requirements require that the bridge must have traffic lanes and pedestrian paths with a width of 0.5 m

Recommendation: Provide pedestrian paths in the bridge area



Figure 11. Bridge

9) Road Benefit Room (Rumaja), LS Eligibility.

Rumaja ranges from 9.6 meters (9 – 10m) . Technical requirements require a minimum width of 13 m. Recommendation: Installing Rumaja pegs



Figure 12. Teenagers

10) Road Owned Space (Rumija), LS Eligibility

Rumija 12 m and no Rumija pator. Technical requirements require that the minimum width of Rumija is 15.m. Recommendation :

Installing Rumija stakes in coordination with relevant agencies



Figure 13. Rumija

11) Road Monitoring Room (Ruwasja), LS Eligibility

Ruwasja varies from 10 to 12 meters. Technical requirements require a minimum of 15 m ruwasja. Recommendation: install ruwasja stakes in coordination with relevant agencies



Figure 14. Ruwasja

12) Marka, LS worthiness

There are road markings in the form of continuous and dotted lines. Some locations need faded signs. Recommendation: Installation of markings in coordination with relevant agencies.



Figure 15. Markings

13) Steering Committee, LS Eligibility

There are guideposts made of concrete. Technical requirements require that the guideposts are made of metal material, are reflective, provide safety instructions for road users

Recommendation : Installing guide stakes made of metal in coordination with relevant agencies



Figure 16. Benchmark

a) Road Administration Function Feasibility Test

Each segment of the road is conditional with the conditional function of the district road; the status of the road is functional, the status of the regency road is based on the Decree of the Regent of the Regency. Boltim No. 140 of 2016 concerning the determination of the status of Boltim district roads and bridges.

There is no data on Rumija's land ownership, so this ownership document needs to be completed.

Environmental documents in the form of UKL UPL and AMDAL documents do not yet exist, so they need to be completed. The recommendation for the Road Administration Function Feasibility Test is that it is necessary to complete administrative documents in coordination with the relevant agencies

V. CONCLUSIONS AND SUGGESTIONS

A. CONCLUSION

Based on the results of the research on road function feasibility, the Moat – Mongkat road section as a Regency road at Km 16+000 to Km 19+000 has a Conditional Technical Function Eligibility (LS) category. Conditional Functional Eligibility (LS) must provide recommendations that need to be made by the government as the organizer of the road network to provide comfort and safety for road users.

B. SUGGESTIONS

1. It is necessary to adjust the technical standards of each component of the road being tested against the development of technical standards from Laws and Regulations, Government Regulations, and related Regulations from the Directorate General of Highways.
2. As a strategic road network, the Moat - Mongkat road needs development in the form of increasing the width of the road body in accordance with the technical specifications of the road, namely the minimum width of the road body, which is 7 meters

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