

CHAPTER I

INTRODUCTION

1.1. Background

A highway is a major road that connects one region/region to another in the transportation sector, particularly for the continuous transfer of goods and services (AAHSTO, 2001). Highways are among the most vital land transportation infrastructure; hence proper road pavement design is essential. Aside from connecting one location to another, good road pavement should create a sense of safety and comfort when driving.

Roads that are used without enough planning may sustain significant harm and eventually cease to exist. Road users in Indonesia are suffering from severe losses because of the existing state of road damage, including longer travel times, traffic jams, accidents, and other issues. Losses, as previously mentioned, are the total of worldwide economic losses for regions where there is road damage.

Because of damage, the government's road construction efforts to meet transport needs are insufficient to solve the issue. Most of them have not yet reached the end of their intended lives. After that, repairs are typically made by patching the damaged areas, but the current road Even when more severe damage occurs, repairs are not long-lasting. As an example, there was additional damage to the asphalt-filled holes in the shape of new, deeper holes. This is undoubtedly harmful and highly unsettling. Water that collects on the surface of the road due to deep potholes deteriorates the surface even more. Due to excessive vehicle traffic, improper design, inadequate oversight, and execution that deviates from current norms, the road's anticipated service life will be shortened.

In this case, our goal is to create a highway that connects Yogyakarta's Special Region—Danau Jurug—to Danau Tebing Cluak'an. Naturally, there will be a variety of topographic terrain conditions along the route that will be constructed. The discussion in this paper focuses on the road design and the soil structure that will serve as the road's foundation.

1.2. Purposes

The purpose of this project is to develop the design of a local road that will connect Danau Jurug to Pantai Tebing Cluak'an by integrating geometric, pavement, and geotechnical considerations in making the road safe, functional, and sustainable. The geometric design will be geared towards optimizing horizontal and vertical alignments that suit the topography and design speed. The design of pavement will be made based

on the expected traffic loads and climatic conditions to last long and ensure riding comfort. While the geotechnical aspect will address the stability of soil, subgrade strength, and slope failure in the scenario of hilly and coastal areas, to maintain structural integrity throughout the road life cycle.

1.3. Research Problem

There are some problems that we want to research in this project:

1. How to determine the most optimal road alignment (horizontal and vertical) in varying terrain conditions?
2. What are the key factors affecting the stability of slopes and embankments in road construction projects?
3. How can the accuracy of traffic load estimations be improved for better pavement design?
4. What are the effects of soil bearing capacity variations on road structural integrity?
5. What is the purpose extent does embankment construction influence long-term settlement and road performance?

1.4. Scope of Problem

From the problems, we have some scope of problem to be consider:

1. Limited to transportation infrastructure involving road feasibility, alignment, and pavement design.
2. Geotechnical analysis is confined to slope stability, bearing capacity, and settlement under embankments.
3. Only considers road alignments within natural terrain with typical soil profiles, excluding special soil conditions (e.g., peat or expansive clays).
4. Traffic load analysis is based on projected traffic volumes over a defined design life.
5. This project is restricted to preliminary and basic design phases, not covering detailed engineering design or construction execution.