

# CHAPTER I

## INTRODUCTION

### 1.1. **Background**

As time goes by, urban area is growing. Striebig et al. (2016) stated more than half communities in developed regions grows in the urban area; from 2011 until 2050 United Nations suspecting that populations will reach 72% (about 2.7 billion people) and growing in the urban regions. Roads are very crucial to hold the mobilization of the people in urban area. As the population increases, roads have a big role in developing life quality of urban communities.

Population increase is leading to the decreasing of the land use in urban area, especially near the main roads. Visible effects become evident when the heavy rains happened, problems caused by flood or inundation arise. Lack of soil capacity to absorb water around the road because it is covered with asphalt or concrete make the flood or inundation could easily happened (Utami, 2012).

Drainage canal is built to accommodate water from heavy rain and flood or inundation subsequently can be prevented. In some places, existed drainage canal is not functioned well or cannot accommodate rain water because of sediment or waste in the drainage canal, size of canal is too small, or rainwater discharge is increasing. It made the area is susceptible to flood or inundation.

People might see inundation as small thing which is not crucial, but inundation is dangerous. Not only will inhibit the traffic and very troublesome to the road users, but also could harm people regarding with safety and health of the

people that live near the inundation area. Flood or inundation causing almost similar effect in health of society because in both occasion the water will inundated.

Water from flood area or inundated area contains bad substances and the substances will go through the water flow. Bad substances are able to cause the dangerous diseases. Based on *Ditjen PP and PL Kemenkes*, inundation can be caused diarrhea, dengue fever, leptospirosis, respiratory infections, skin diseases, gastroenteritis, and and the worst possibility is chronic diseases (Aprilia, 2014). Eska (2016) pointed that motorcyclist or driver who pass the road are in dangerous situation if the tire condition is not good, the vehicle drove at the high speed, and aquaplaning or hydroplaning might be happen.

Skybrary (2017) define aquaplaning as the condition of vehicles when standing water, slush, or snow made the wheel of cannot be handled and people could be fall or tumbled up. Unwanted accident and consecutive accident or collision streak are the worst scenario that can be happen because of aquaplaning. Although, aquaplaning can be prevented by keeping the tire in optimum condition, do the regular check with the vehicles, and be calm when riding or driving in the inundated area (Eska, 2016), but it is better when the inundation is not happen.

Inundation may cause road damage. Surface layer of the asphalt or concrete, especially for asphalt is prone to corrosion. Roads maintenance process often disrupt the people who needs to pass through the roads. Still, maintenance costs would distress the government if the road needs to be repaired out of the road maintenance planning. Inundation do not have any effect on asphalt content and

soil stabilization strength in good quality do not guarantee the road will remain good until the age of the plan (Chairrudin et al, 2013)

In Laksda Adisucipto Road, particularly in South of Nologaten, Inundation frequently happen every year, mainly in rainy season. News article already posted online since 2008 from famous media, Kompas (Figure 1.1) which criticize about inundation in Laksda Adisucipto Road. It made the inundation problem goes public and intensity of inundation phenomenon frequently happened then became public fact.

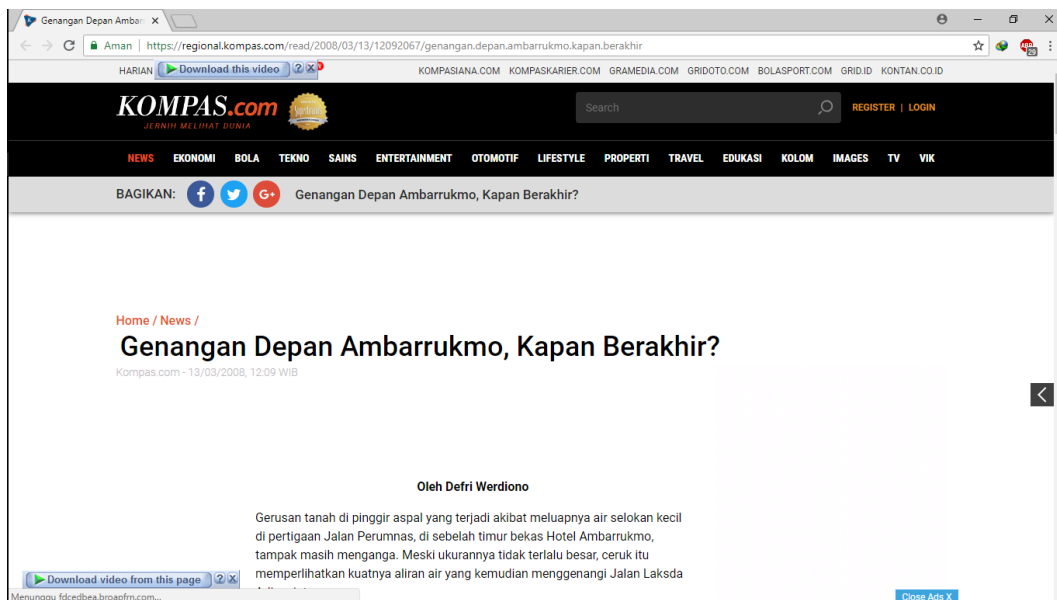


Figure 1.1. Inundation in Front of Ambarrukmo Plaza News.

Source: Werdiono, 2008

There are news and social media informations associated with inundation in Laksda Adisucipto Road especially in South of Nologaten and provided in Figure 1.1 and Figure 1.2. Further information from news and social media informations are found in Appendix 1.

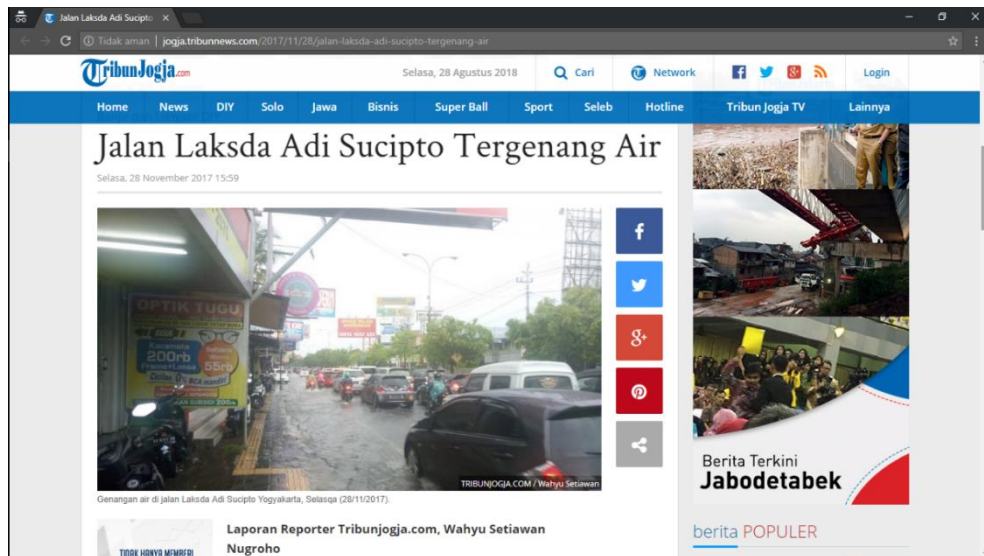


Figure 1.2. Inundation in Laksda Adisucipto Road.

Source: Nugroho, 2017(a)

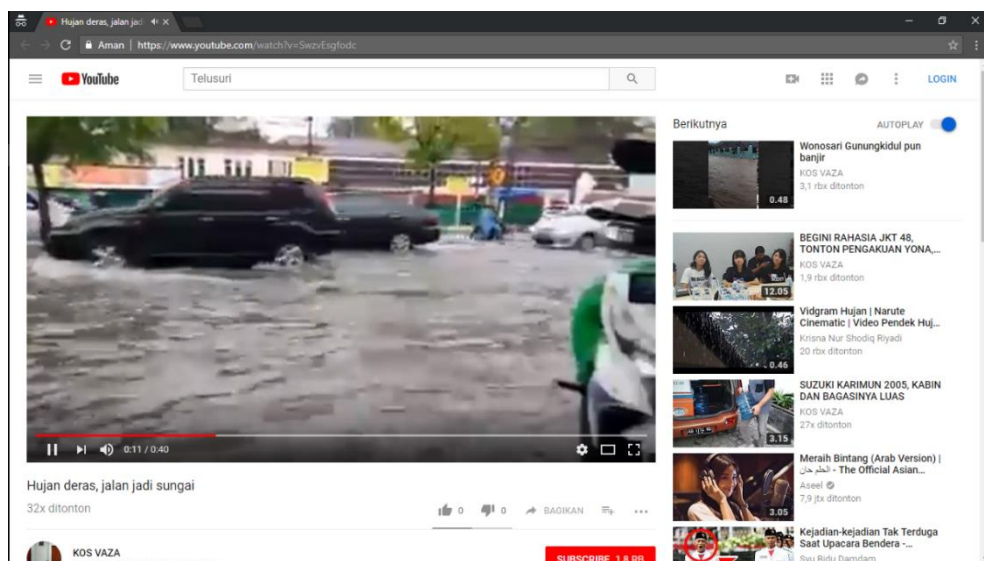


Figure 1.3. Heavy Rain Causing Inundation in Laksda Adisucipto Road.

Source: Vaza, 2017

Proper identification and analysis is necessary. The necessity to solve the inundation problem is because the needs to provide comfortable environment for communities. Moreover, the research are made to find the solution in order to improving and optimizing the drainage canal.

## 1.2. Boundary Conditions

In detailing the informations regarding boundary conditions, problem limitation of the research sites is set. The purpose is to make sure the scope of the problem is right on target and not widened. The limitations of the research is adopted from Utami (2014) and can be found below:

1. Nologaten and South of Nologaten location details area found in the Figure 1.4. and Figure 1.5.

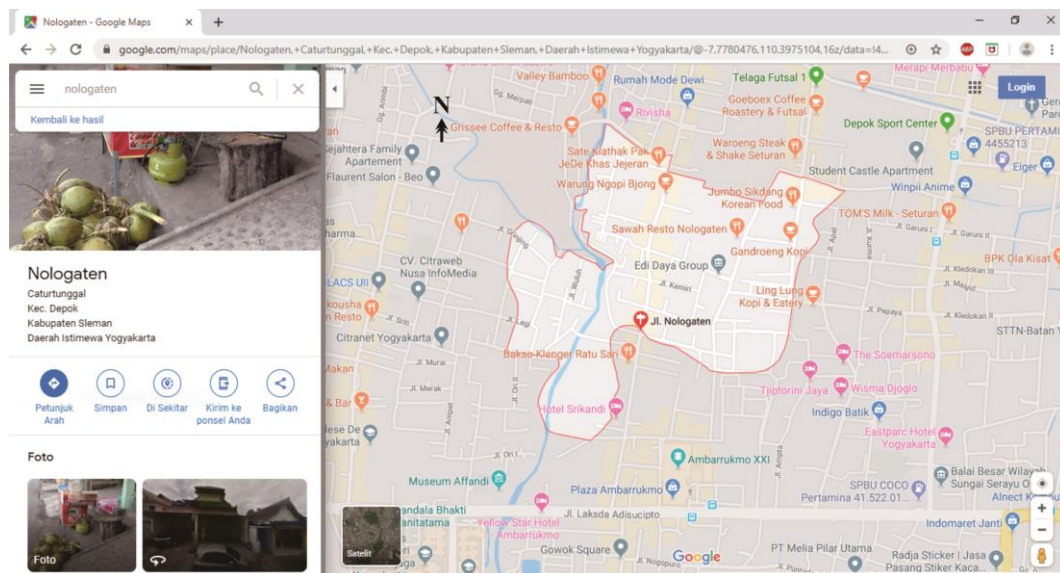


Figure 1.4. Nologaten Area

Source: Maps, 2019

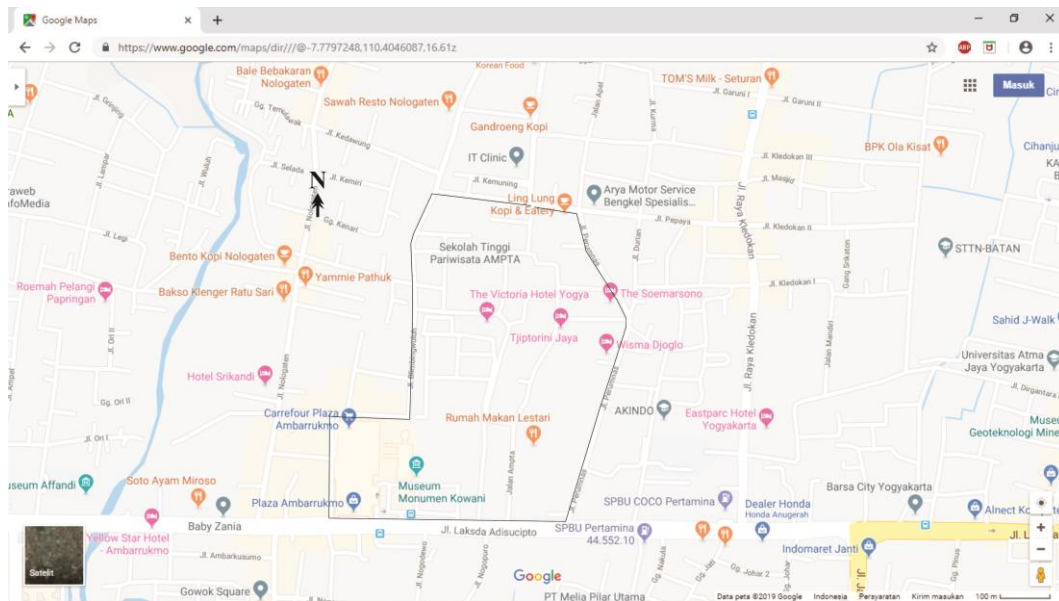


Figure 1.5. South of Nologaten Area

Source: Maps, 2019

2. Initial design is assumed to have fulfilled the standard criteria.
3. Drainage canals assumed to have steady flow.
4. Drainage canal water flow calculated based on rainwater (non-residential wastewater) or water from rainfall.
5. Examined drainage canal in site location has open channel type.
6. Freeboard is not calculated and amount of sediment is ignored during capacity canal calculation.
7. Design discharge calculation is using 2, 5, and 10 years return period (to determine canal capacity in accommodating the water out of planned return period) and rainfall calculated for 34 years (1983 - 2016) with using data from BBWSSO (*Balai Besar Wilayah Sungai Serayu Opak*).

### **1.3. Problem Statement**

Research questions is needed in directing the examination to the core of problem. The research questions are formulated with problem statement and listed below.

1. Are the drainage canals in South of Nologaten adequate to accommodate rainwater in 2, 5, and 10 years return period?
2. How is the analysis of discharge in drainage canals compared with discharge from 2, 5, and 10 years return period rainfall data in South of Nologaten?
3. What are the alternative solutions if drainage canals discharge is not adequate to accommodate discharge from 2, 5, and 10 years return period rainfall data in South of Nologaten?

### **1.4. Research Objectives**

Definite research objectives helps to indicate the goals of the research. The research objectives can be found below:

1. To identify whether drainage canals in South of Nologaten adequate to accommodate rainwater in 2, 5, and 10 years return period,
2. To analyze discharge in drainage canals compared with discharge from 2, 5, and 10 years return period rainfall data in South of Nologaten,
3. To determine the alternative solutions to improve drainage canal in accommodating rain water in South of Nologaten.

### **1.5. Expected Benefits**

The result of this study is expected to be useful for various parties, below is the objects of the expected benefits:

1. For the government: This research can give the alternative solutions or suggestions to solve the inundation problem in Laksda Adisucipto Road especially in South of Nologaten Area,
2. For academicians/readers: This research can give information about the inundation analysis in Laksda Adisucipto Road especially in South of Nologaten Area.