CHAPTER I INTRODUCTION

1.1 Research Background

Landslide is a shift in slope-forming material in the form of rock, debris, soil, or mixed materials moving down or out of the slope (ESDM, 2009). Landslide is considered to be one of the hydrometeorological disasters which often occur in countries with mountainous or hilly topography and have a high amount of rainfall, for example in Indonesia. There are at least 918 landslide-prone locations in Indonesia (Muntohar et al., 2010). Every year the losses caused by landslides in Indonesia reach around IDR 800 billion with the number of victims affected reaching 1 million (ESDM, 2009).

One example area in Indonesia which prones to landslides is West Sumatra. Based on the information obtained from the ESDM website in 2020, there are 100 landslide-prone points in West Sumatra. This point spreads in all regencies/cities including the Padang City. During 2013-2016 there had been 25 landslides occured in Padang City (BPBD, 2013).

Lambung Bukik Village, where Gunung Nago is located, is an area that has recently occured landslide in Padang City. Gunung Nago has a height of 300 m above sea level with an average slope angle of $35^{o} – 45^{o}$. Based on information from the website of Dinas Pengelolaan Sumber Daya Air Provinsi Sumatera Barat (DPSDA), in 2019 Gunung Nago received 350 mm of rainfall during January. On the other hand, the rainfall in other months is lower, such as in October and December 2019, is within range 238 mm to 274 mm. Thus, the accumulation of

groundwater capacity in Gunung Nago is quite high due to the high intensity of rainfall. This can increase the tendency of landslides to occur, other than any other factors such as density of loads, rocks on the slopes, the type of land use, the density of the soil and the angle of the cliff slope.

Research on landslide potential susceptibility in the Gunung Nago area is carried out as an effort to minimize the impact caused by landslides. Currently around the foot of Gunung Nago there are densely populated settlements, which have the potential to be affected if a landslide occurs. There are several methods to investigate the landslide potential of an area; such as the electrical resistivity exploration method (Telford et al., 1990; Reynolds, 1997), high resolution reflection seismic method (Bruno and Marillier, 2000; Bichler et al., 2004; Ferrucci et al., 2000), refraction seismic method (Kearey et al., 2002), tomographic seismic method (Méric et al., 2005; Jongmans et al., 2000), and various any other geophysical methods. There are several advantages of geophysical techniques, for instance they are flexible, relatively quick and deployable on slopes, they are non-invasive and give information on the internal structure of the soil or rock mass, and they allow a large volume to be investigated. On the other hand, their main drawbacks are the decreasing resolution with depth, the non-uniqueness of the solution for a set of data and the resulting need for calibration and the indirect information they yield (physical parameters instead of geological or geotechnical properties). It is worth noting that almost all the advantages of geophysical methods correspond to disadvantages of the geotechnical techniques and vice-versa, outlining the complementarities between the two

investigation techniques. In this bachelor's thesis, landslide potential in Gunung Nago will be predicted through superparamagnetic grains which depend on susceptibility (frequency dependence susceptibility), χ_{FD} (%) (Tarling et al., 1994). χ_{FD} (%) is a ratio between low frequency susceptibility (χ_{LF}) with high frequency susceptibility (χ_{HF}). This method is chosen due to its convenience and economical of utilization.

There are several previous researchers who have studied the potential for landslides based on superparamagnetic grains. Ramadhani (2016) found that the soil sample in Pasir Ipis Lembang, Bandung has magnetic susceptibility value between 193×10^{-8} m^3/kg to 673.88×10^{-8} m^3/kg. The existence of super fine grain size has a relation with the tendency of the soil to be prone to landslides. This has been proven by Aulia (2020) who conducted a research in Bukit Karan, Padang.

The slope surface is one of the main things that can be used as a determinant of landslide potential. Yamazaki et al. (2017) investigated the relationship between magnetic susceptibility and the slope surface. They used electrical resistivity exploration using 2D ERT method and soil sampling by drilling in the landslide area in Nishiikawa, Miyoshi City, Tokushima Prefecture. The anisotropy in the magnetic susceptibility of the soil structure which has the possibility of being the slope surface was investigated. The ratio of the magnetic field and magnetization is calculated by measuring the induced magnetization generated by the magnetic field against the obtained soil sample. There is a possibility that the appearance of induced magnetization in soil samples has

depedency on the orientation of the applied magnetic field, which referred as anisotropy in magnetic susceptibility.

Based on the review, it shows that the magnetic susceptibility value can also be used to determine the landslides potential on Gunung Nago. Research based on magnetic susceptibility in Padang City has been carried out by Aulia (2020) in Bukit Karan, Padang. This is the motivation behind the research conducted on the determination of the magnetic susceptibility value of soil on Gunung Nago.

1.2 Aims and Objectives of Research

The aim of this bachelor's thesis was to analyze magnetic susceptibility value in Gunung Nago, Padang in order to estimate the landslide potential in this area.

The results of this research are expected to determine landslides potential on Gunung Nago, Padang hence there will be preventive actions which can be taken by the parties involved in reducing the impact of landslides which will occur in the future.

1.3 Scoop and Limitations of Research

Early indications of landslides were analyzed based on the magnetic susceptibility value of the soil at Gunung Nago as a research location, where most of the areas are residential. Futhermore the landslide potential map was made based on the magnetic susceptibility value of the soil.