Volume 2 No. 2, (2024)
Page : 47-55
e-ISSN 2987-9140 (Online)
Doi:
https://doi.org/10.26740/ijgsme.v2n1.p47-55
Available online :
https://journal.unesa.ac.id/index.php/ijgsme

IJGSME
International Journal of Geography, Social, and Multicultural Education
https://journal.unesa.ac.id/index.php/ijgsme

Received: 22-07-2024
Revised: 04-09-2024
Published: 01-10-2024

UTILIZATION OF TWITTER DATA IN DEFORESTATION COUNTERMEASURES IN PUJON DISTRICT, MALANG REGENCY

Risa Amalia Kurniawati[1*)], Nursida Arif[2], Bambang Syaeful Hadi[3], Hastuti, Dyah Respati Suryo Sumunar[4]
[1,2,3,4)] Universitas Negeri Yogyakarta, Indonesia
*) email: risaamalia.2023@uny.ac.id (Corresponding Author)

Abstract

Big data such as Twitter data has been widely used in social science studies, but its use in deforestation studies is still rare in Indonesia. Therefore, the purpose of this research is to find out what information can be identified through Twitter social media data. The data used in this research is quantitative Twitter data. The geotagged Twitter data was also visualized in the form of maps to help the description analysis process, which is the main analysis in this study. The results of this study show that Twitter deforestation in Pujon Sub-district, Malang Regency has an impact on the surrounding vegetation and hydrological conditions. In the implementation of deforestation countermeasures, we argue that Twitter data can be used in all phases. Twitter data in deforestation countermeasures especially its influence on vegetation and hydrology conditions. Another weakness is that the information from the Twitter data is not certain whether it represents the same demographic characteristics as the conditions in the field and the level of validity of the information that cannot be accounted for yet.

Keywords: Twitter, social media, deforestation, Pujon, Malang

INTRODUCTION

Natural resources are something that can be utilized for various purposes and meet the needs of human life in order to live more prosperously. Natural resources are found everywhere such as in the soil, water, land surface, air, and so on, both renewable and non-renewable natural resources (Amirudin & Sumarmi,. 2014). One of the dominant natural resources in Indonesia is vegetation, so technological innovation, advances in civilization and human population, and the Industrial Revolution have led humans to an era of exploitation of natural resources, resulting in the supply continues to decrease significantly, especially in the past century. Despite the vast amount of natural resources on earth, their use must be limited and maintained to be sustainable. Over-exploitation of plants can lead to damage and even extinction, one of which is the case of deforestation changes (Chisolm & Doomsday,. 1987). Deforestation of hills into agricultural land on the one hand provides profit for the community in terms of economy, but on the other hand it also has a detrimental impact, especially on the environment and the people who live in it that also feel the loss. This is due to the increasing population growth and the increasing consumptive attitude of the community that encourages the expansion of agricultural areas to the hills. One tangible form of such loss is land degradation. Pujon Sub-district is

located in the northern part of Malang Regency. The hilly area becomes agricultural and residential land which hydrologically is a catchment area for the Malang Regency area. Land utilization that does not pay attention to soil and water conservation principles in Pujon Sub-district has the potential to cause land degradation which will eventually lead to land damage.

The consequence of deforestation that ignores the principles of environmental sustainability will result in land degradation through various processes (Dwipradnyana et al,. 2014). Soil erosion is the biggest contributor to land degradation. Although land degradation is not an economic event, this process is closely related to land degradation, which leads to decreased agricultural production and increased costs of preventing land degradation, which is an economic problem. In addition, erosion also causes hilly land to become steeper which is prone to landslides and endangers the surrounding community (Hidayat et al,. 2008). The main direct impact of soil erosion is a decrease in crop productivity due to the deterioration of soil productivity, loss of soil nutrients and loss of good/fertile soil layers for plant roots to grow in, while the indirect impacts are puddling and siltation of reservoirs, damage to aquatic ecosystems, deterioration of water quality, increased frequency and duration of droughts, and buried agricultural lands. The impact of deforestation is not immediately visible, but little by little it will become a problem that is quite complex and difficult to solve (Karim et al,. 2012). The area affected by this event is not only the Pujon Sub-district area but also the surrounding areas, especially the area below the Pujon Sub-district because it carries toxic residues from pesticides carried by the river flow. The community's low knowledge of environmental sustainability causes them to not knowing the adverse effects that will result from this land function change, so this situation continues to occur and grow. This is exacerbated by the attitude of people who do not want to restore hilly land according to its ecological function because they think it will reduce their income, which causes this situation continue to occur and land degradation is growing (Mutaqqin, 2015; Prasetya, 2015). There are many adverse impacts of deforestation of hills into agricultural land. This is not only felt by the environment but the people who live in the environment will also feel the negative impact. Therefore, it is necessary for the community, especially those living in the Pujon Sub-district area, to understand the impacts of deforestation so that they are wiser in utilizing the existing land. In addition, appropriate solutions are needed to overcome this deforestation problem.

With the advancement of information technology, it is easier for us to access information, resulting in the term of big data emerged. The term big data refers to data that has a large volume, fast, valuable, diverse and complex, for example, data from social media. Twitter is a social media (medsos) whose data has been widely used for several social studies such as public opinion, social interaction values, public interest and many others

(Pratama et al,. 2019). This is because Twitter makes it easy to read, write and collect data containing temporal and spatial information. In addition to its use in social studies, there is also studies on the use of Twitter data in the field of natural resources, one of which is the problem of deforestation. This study is still rarely done even though it is very important to do considering that Indonesia has problems regarding high deforestation. In addition, Indonesia is a country with rapid progress for social culture in the field of social media, making it suitable as a study location for the use of Twitter data in this field (Anggraeni, et al,. 2019). Therefore, this study aims to describe the results of Twitter data analysis in the field of land use change. The next goal is to describe the utilization of Twitter data in deforestation prevention.

METHOD

Secondary data was obtained from journals and research reports conducted previously in the Pujon Sub-district area with cases related to deforestation. This research uses the social network analysis (SNA) method. Social Network Analysis (SNA) is used to analyze and describe the structure of social networks and reveal patterns of human interaction. It is a theoretical and methodological approach to study various social systems by analyzing data to identify the structure and dynamics of local and global networks. It can be used at both micro and macro levels. In addition, it can be used to examine networks formed across different platforms or categories (Gruzd et al., 2016; Huang, 2022; Setiamukti et al., 2023). The data collection process took place on May 28, 2024. The number of tweets recorded during the data collection process was 200. The population data used consisted of 26 tweets with the keyword "deforestation in Malang". The variables in this study include deforestation activities that will be combined with information from various mass media sources. The output data obtained from Netlytic can be managed in Excel format, which automatically shows the status of the text (original, retweet, or reply). Netlytic only collects posts that are publicly available through the social media platform's public API.

RESULTS AND DISCUSSION

General Condition of Pujon Sub-district

Pujon Sub-district is located right in the middle of East Java Province, geographically located between 112°26'113 - 122°28'923 East Longitude and 7°52'203 - 7°49'373 South Latitude with an area of 13,075.144 hectares. The altitude of the area is 1,100 meters above sea level with an average temperature of 18 - 230. The boundaries of the Pujon sub-district are as follows: North: Mojokerto District, East: Batu City, South: Blitar District, Nganjuk Sub-district, West: Ngantang Sub-district. Topography in Pujon District is a plateau that stretches from west to east and from north to south with an altitude between 1000 meters above sea level and 2500 meters above sea level surrounded by mountains, including: Mount Dworowati (Ngabab), Mount Argowayang (Tawangsari), Mount Gentong Growah (Madiredo), Mount Biru (Wiyurejo), Mount Banyak (Pandesari), Mount Anjasmoro (Coban Rondo), Mount Kawi (Pujon Kidul). Pujon Sub-district is a Brantas watershed area. Some of the springs in

the Brantas river come from the Pujon Sub-district area. Therefore, forest management is vital for the survival of the people who live along the Brantas river. The main vegetation in the Pujon Sub-district area is natural plants that are found in protected forest areas in the form of a mixed forest with three levels of vegetation, namely trees, shrubs, and undergrowth. Dominated by: kukrup (Engelhardia spicta), Sundaic oak (Quercus sundaicus), fig trees (Ficus sp), Padana figs (Ficus padana), oriental trema (Trema orientalis), while the lower plants are dominated by bamboo (Bambusa sp), Javanese edelweiss (Analphalis javanica), red leafflower (Phyllantus urinia), mountain ferns (Pteris sp), white weed (Ageratum conyzoides), and asthma plant (Euphorbhia hirta). Other vegetation outside the protected forest area is dominated by agricultural crops such as vegetables and fruits.

Land Use

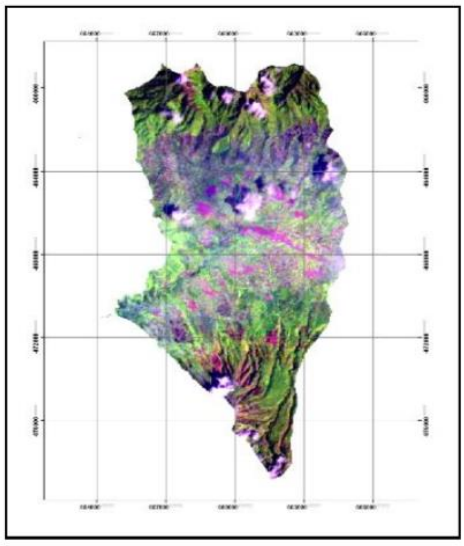


Figure 1. Map of Pujon Sun-district Land Use

Source: Gamma Journal, 2014

The figure above shows the condition of land cover in the Pujon Subdistrict area, taken from the Landsat ETM 2000 image processed on February 2, 2015. From the picture, it can be seen that the existing condition of Pujon Subdistrict is mountainous and has steep slopes. From the results of observations made directly in Pujon Sub-district, most of the land use is used as settlements and agriculture. Residential areas are mostly located in flat/sloping areas while other areas such as hills, slopes and open land are used as agricultural and plantation areas. The agricultural crops grown are vegetables such as carrots, mustards, cabbages and others, while the plantation crops are dominated by apples and oranges.

Table 1: Percentage of Land Use

Land Use Type	%Total/ha	%
Dry Land Forest	5006.53	39.26
Plantation Forest	4182.93	32.80
Settlement	429.17	3.37
Dry Land Farm	3068.54	24.06
Shrubs	66.63	0.52
Open Land	0	0.00
	12753.8	**100**

Source : Muttaqin, Tatag. 2015. Evaluasi Kekritisan Lahan di Kawasan Lindung Kecamatan Pujon Kabupaten Malang Jawa Timur dengan Teknologi SIG. Jurnal Jurusan Kehutanan, Fakultas Pertanian dan Peternakan, Universitas Muhammadiyah Malang : Malang.

Land Slope

Based on the results of research conducted by Tatag Muttaqin in his journal on the level of slope in the Pujon Sub-district area, the slope value is shown in the table below.

Table 2: Land Slope

Slope Percentage	Slope Type	Total/ha	%
<8 %	Flat	636.54	4.99
8 - 15 %	Sloping	1088.84	8.54

15 - 25 %	Somewhat Steep	1790.57	14.04
25 - 40 %	Steep	1645.65	12.90
>40 %	Very Steep	7592.20	59.53
		12753.8	**100**

Source : Muttaqin, Tatag. 2015. Evaluasi Kekritisan Lahan di Kawasan Lindung Kecamatan Pujon Kabupaten Malang Jawa Timur dengan Teknologi SIG. Jurnal Jurusan Kehutanan, Fakultas Pertanian dan Peternakan, Universitas Muhammadiyah Malang : Malang.

From the table, more than 40% of the land has very steep conditions. The results of observations made directly in the field also show that the land conditions in Pujon Sub-district are hilly and steep.

Identification of Malang District Deforestation through Twitter Platform

Based on data collected on May 28, 2024, 200 tweets using the keyword "deforestation in Malang" were obtained. However, only 26 tweets or about 13% were related to deforestation, especially the phenomenon of deforestation in the true sense. There were 491 unique tweets with the keywords "vegetation" and "hydrology", accounting for about 87% of the total tweets, which could not be included in the data analysis process as depicted in Figure 2 below.

Figure 2. Tweet Comparison

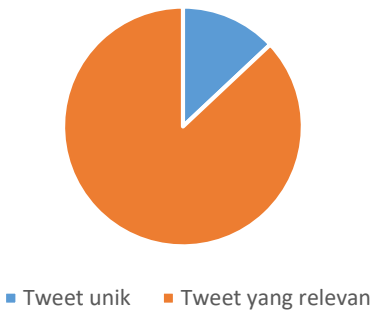
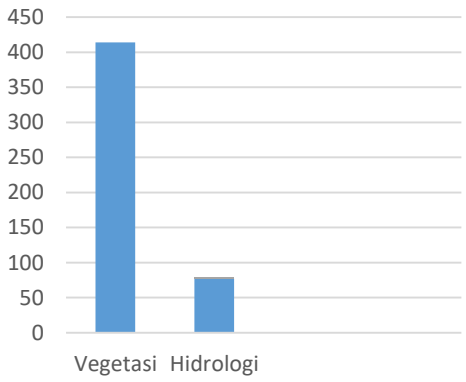


Figure 2 illustrates a comparison of the number of relevant and irrelevant tweets containing the keywords "vegetation" and "hydrology" based on the number of tweets recorded in the Netlytic database during the study period. Among the unique tweets there were allusions and posts that did not refer to deforestation events.

Figure 3. Number of Vegetation & Hydrology Tweets



Two types of deforestation impact factors are vegetation and hydrology. Figure 2 is a diagram of data collection regarding tweets containing vegetation and hydrology. Based on Figure 3, it can be seen that the number of Twitter users who posted tweets with the keyword "vegetation" is higher than "hydrology". Tweets containing vegetation were only found on May 28, 2024. This finding suggests that the hydrological deforestation impact factor is only experienced by a small proportion of Twitter users, covering a limited geographic area and occurs over a shorter period of time. Another factor, vegetation, was identified on May 28, 2024. The highest number of tweets with the keyword "vegetation" and "hydrology" was found on May 28, 2024 with 491 tweets.

Utilization of Twitter Data in Deforestation Countermeasures in Malang District

The problem of deforestation in Pujon Subdistrict due to the conversion of

forest land and hills is realized to cause many problems such as decreased soil fertility, erosion, extinction of flora and fauna, floods, droughts and even global environmental changes. There is a shared responsibility between the community and also the government in managing the land. Land use change for agriculture and settlements is unavoidable, but this must be limited and carried out according to the principles of environmental sustainability. Land conditions that have experienced excessive degradation must be addressed immediately so that the damage does not get worse. In this case, Twitter data can be used as a basis for developing effective communication methods. Through Twitter, institutions such as Regional Disaster Management Agency (BPBD) provide information regarding the conditions caused by deforestation and what actions must be taken. Through Twitter data, we can find out which areas need help. This can also be recognized by the sentence "Pray for Malang" and "Twitter please do your magic" which is another alternative form of victims asking for help (Figure 4).

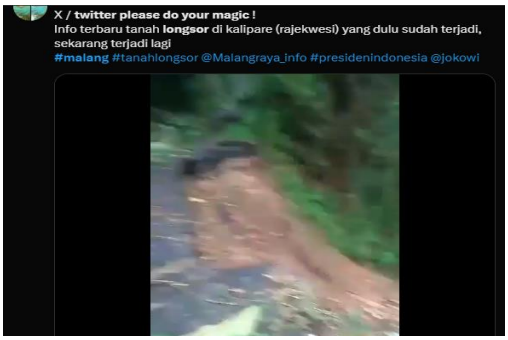


Figure 4. The Use of "Pray for Malang" and "Twitter please do your magic"

Twitter data can be used to find out information from users about recovery efforts and policy decisions. Twitter data can also be used to provide insights into mitigation strategies such as its use to estimate the impact of damage incurred. The results of analysis such as sentiment can also be used to evaluate a policy and preparedness, whether it is optimal and in accordance with the geographical characteristics of the area. The use of Twitter data in this case also has weaknesses. The first is that Twitter users are only in big cities in Indonesia, especially on the island of Java, so it is difficult to use in areas other than big cities, except for disasters that have a large and broad impact such as tsunamis and earthquakes. Second, the truth of the information is not 100% guaranteed. This is because every Twitter user can be a source of information, and every Twitter user will get plenty of information in a vulnerable state, making it difficult to realize its validity. Not to mention the narratives spread by buzzers in the form of real, anonymous and bot accounts that are more politically nuanced, thus reducing the value of information. Practitioners and academics need to conduct several studies on the use of Twitter data in areas such as interoperability, diversity,

credibility, data visualization and regulation.

CONCLUSION

Pujon Sub-district has a hilly topography with land use mostly for settlement and agriculture. Based on the results of the above research, it can be concluded that Pujon Sub-district has experienced land conversion of forests and hills into agricultural land and settlements. This land conversion has resulted in land degradation due to erosion processes and is prone to landslides. This is exacerbated by the community's low knowledge and concern for environmental sustainability. The agroforestry system is expected to be a solution to the land problems that occur in Pujon Sub-district. In this case, although the number of users is not as many as Facebook and Instagram, Twitter has the ability to easily extract data to identify deforestation in Pujon District, Malang. So that Twitter does not only function as a platform for delivering information, but the data can also be used to help the countermeasure process.

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