Risk Level Analysis of Sumatera Elephant Conflicts (*Elephas Maximus Sumatranus*) With Humans at Subulussalam the Province Of Aceh

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Abstract: *This research entitled "Risk Level Analysis of Sumatera Elephants Conflict (Elephas maximus sumatranus) with Humans at SubulussalamThe Province of Aceh". This aimed this research is to determined the risk level analysis of Sumatera Elephant conflict (Elephas maximus sumatranus) with humans. The reseacrh was conducted in January 2019 until July 2019. The research method used was a survey method (observation). The research approach is a quantitative descriptive approach. The subject of the study was the Sumatera Elephant (Elephas maximus sumatranus). The research sample taken by purposive random sampling is residents who often experience conflicts with Sumatera Elephants in Subulussalam. Data instruments in the form of questionnaire sheets. The data of risk level analyzed by the risk level formula and analyzed by percentage. The results of the analysis of the level of risk in three villages in Subulussalam showed a high level of risk, namely TanggaBesiVillage (79.57%) and BatuNapal Village (78.30%), while the lowest level of risk in Penuntungan Village (63.30%). The conclusion of this study is the highest level of conflict risk occurs in TanggaBesi Village.*
Keywords: *Risk level, Sumatera Elephants (Elephas maximus sumatranus).*

I. Foreword

Conflict of Human-Elephant is a problem that is difficult to solve every year because it involves aspects of ecology, sociology and politics. One of them is in terms of ecological aspects due to deforestation or human activities that can reduce the level of biodiversity in an area. Deforestation in the development of an area that is used as economic land, plantations or settlements has resulted in the loss of wildlife habitat, triggering conflicts between wildlife and humans. This has an impact on the mortality rate of wildlife, including the Sumatera Elephant (*Elephas maximus sumatranensis*).

One effort to prevent the occurrence of cases of death of the Sumatera Elephant by conducting a risk analysis. Risk analysis is a study used in supporting decision making based on hazard analysis, vulnerability and the amount of capacity at risk [4]. The risk analysis study is conducted because of the potential loss caused by damage to an area due to the expansion of an area so that the loss of native wildlife habitat that can cause damage, disrupt people's lives, loss of security, cause damage or loss, disrupt people's lives, cause fatalities.

Sumatera elephants (*Elephas maximus sumatranus*) are determined in Critically Endangered status, the population is still significant, overall Sumatera elephants in Aceh Province number 475-500 individuals. These elephant groups are scattered in several habitats such as in Loko-Peunaron (East Aceh – North Aceh) totaling 200-250 individuals, Bengkung-Trumon habitat pockets (South Aceh -Aceh Singkil) totaling 80-100 individuals, Beutong (Nagan Raya) totaling 40-60 individuals, Ulu Masen habitat pockets (Aceh Jaya, Gempang, Pidie Jaya and West Aceh) totaling 100-120 individuals, the habitat of Peusangan with a total of 40-50 individuals, Pidie 20-30 individuals.

The Sumatera Elephant Habitat (*Elephas maximus sumatranus*) including all forests on the island of Sumatra from Lampung Province to Aceh Province, ranging from the Overgrown Wet Forest and Brackish Forest near the coast to the Mountain Forest at an altitude of 2000 m. The survival of the Sumatera Elephant (*Elephas maximus sumatranus*) is increasingly threatened due to the high pressure and disturbance as well as the lack of knowledge about how to live elephants in their natural habitat as a reference for natural population management [1].

Conflicts that occur between humans and Sumatera elephants are experienced in the Subulussalam area. Subulussalam has an area of 1,391 km^2, located at the position of 02 ° 27' 30"- 03° 00' 00" North Latitude and 97 ° 45 '00 "- 98 ° 10' 00" East Longitude with the following boundaries: north with Southeast Aceh Regency, south with Aceh Singkil, east with North Sumatra Province, and west with South Aceh Regency. Subulussalam currently consists of 5 (five) districts, namely, Longkip District, Penanggalan District, Rundeng

District, Simpang Kiri District and Sultan Daulat District. Subulussalam is a conflict-prone area of *Elephas maximus sumatranus* with humans. This problem is triggered by the increasing population and the rapid conversion of forest land to residential, plantation or agricultural areas.

Based on the results of interviews with local residents, herds of wild elephants tasted and damaged farmers' crops in Subulussalam and until now has not been resolved. In the recent conflict, three wild elephants were reported to have again damaged various residents' plants in BatuNapal Village, Sultan Daulat District. The elephant re-enters and damages the plant, which worries the farmer at night. The latest news on wild elephants has increasingly troubled the community in Subulussalam as it has begun to enter residential areas in the area. This elephant is even desperate to enter the settlement and damage people's homes around Subulussalam, which is not far from the lane road. The action of the wild elephant is quite reckless and fierce because the destroyed house is near a two-lane road to the Subulussalam Great Mosque. The location of the incident with a two-lane road is only about 50 meters and has entered the urban area.

Based on this background the researcher wanted to analyze the level of risk of elephant-human conflict in Subulussalam Aceh Province.

This research was conducted in three Subulussalam Subdistricts namely Simpang Kiri Subdistrict (TanggaBesi Village), Penanggalan Subdistrict (Penuntung Village), and Sultan Daulat Subdistrict (BatuNapal Village). The research activities was conducted in January to July 2019. The map of research locations in the three Equations can be seen in Figure 1 below
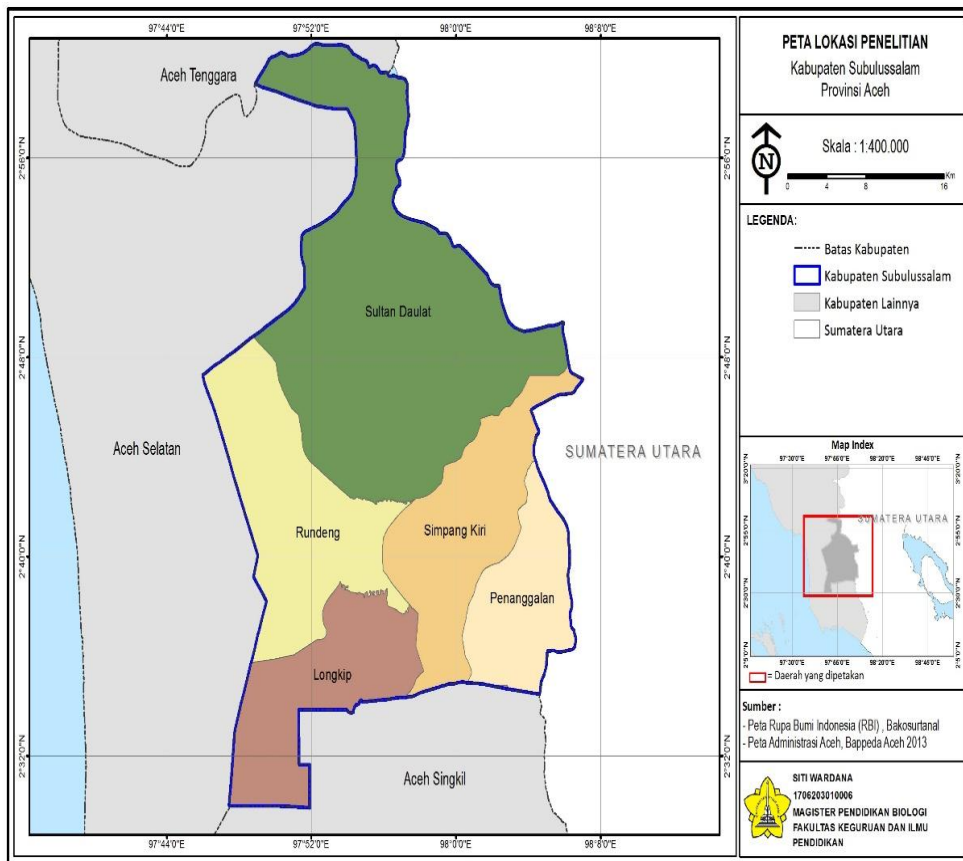

Figure 1.Map Location Reseacrh

The approach used is a quantitative descriptive approach and analyzed based on statistical analysis. The research method used is the survey method (observation). The subject in this study was the SumateraElephant (*Elephas maximus sumatranus*). Sampling of residents who made respondents was done by purposive random sampling because residents who often experience conflicts with the Sumatran Elephant. The population of the population in the three sub-districts and villages in Subulussalam can be seen in Table 1.

Table 1. Total Population of the Three Districts and Villages in Subulussalam

No.	Districts Name	Number of Population	Village Name	Number of Population
1	Penanggalan	17.016	Penuntungan	1.706
2	Simpang Kiri	35.918	TanggaBesi	1.591
3	Sultan Daulat	17.580	BatuNapal	754
	Total	**70.514**	**Total**	**4.051**

(Source: BPS Subulussalam City, 2019)[6]

Determination of sample size from the three districts using the formula [12]:

$$n = \frac{N}{1 + N\,(d^2)}$$

description:
n= sample size
N= population size
d = desired level of confidence / accuracy with 0.1 accuracy
calculation:

$$n = \frac{70.514}{1 + 70.514\,(0.1^2)}$$

$$n = \frac{70.514}{706,14}$$

$$n = 100 \text{ people}$$

Furthermore, sampling from the three districts was carried out using proportional random sampling technique. After getting a proportional sample, sampling from each district is carried out by random and pay attention to the proportions in each district, namely by using the formula [16]:

$$Spl = \frac{n}{N} \; x \; Js$$

Description:
Spl = number of samples taken in each district
n = number of samples per district
N = total population
Js = the number of samples desired

Based on the number of samples taken from each sub-district for each village that has been determined, it can be tabulated in Table 2

Table 2. Distribution of Samples per Village

No.	Village Name	Total Population	Total Sample
1	Penuntungan	1.706	24
2	TanggaBesi	1.591	51
3	BatuNapal	754	25
	Total	**70.514**	**100**

(Source: Data in Field, 2019)

Data analysis of the level of risk of conflicts between elephants and humans was obtained by using questionnaire sheets which were analyzed using 2 choices namely yes / no. If "yes" then the value is 1 and if "no" then the value is 0. Then the risk level data between humans and elephants [4] is analyzed using the following formula:

$$R = \frac{H \; x \; V}{C}$$

Description:
R = Risk
H = Hazard
V = Vulnerability
C = Capacity

Then the calculation results are interpreted into a risk level table in Tables 3 [4] and [5]

Table 3. Conflict Risk Level Criteria

Interval (%)	Risk Level Criteria
65% - 100%	High
34% - 64%	Medium
1% - 33%	Low

II. Result And Discussion

The results of data analysis related to the level of risk of human conflict with Sumatran elephants in the three Sub-districts in Subulussalam were obtained from a combination of threat factors (Hazard), vulnerability (Vulnerability) and capacity (Capacity). The tabulated results of the analysis of the risk level of the respondents are shown in Table 4

Table 4. Tabulation Answers Respondents Against Risk Level Analysis of Conflict

No.	Village/District Name	Risk Level (%)	Risk Level Criteria
1	Penanggalan (Penuntungan)	63.30%	Medium
2	Simpang Kiri (TanggaBesi)	79.57%	High
3	Sultan Daulat (BatuNapal)	78.30%	High

(Source: Data in Field, 2019)

Based on Table 4 it can be seen that the highest level of risk is in the TanggaBesi Village of Simpang Kiri District having a risk level of 79.57% with a high category, while the risk level with the lowest percentage in Penuntungan Village of Penanggalan District has a risk level of 66.50% with a high category. The data obtained is in accordance with data from BKSDA in Subulussalam for the last 4 years from 2015 to 2018, where from 2016 to 2018 in Simpang Kiri District, human conflicts with elephants often occur, whereas in Penanggalan District there is only a small frequency of conflicts.

The level of risk consists of threat factors (Hazard), vulnerability (Vulnerability) and capacity (Capacity). The results of risk level data for the three villages can be seen in Figure 2 below
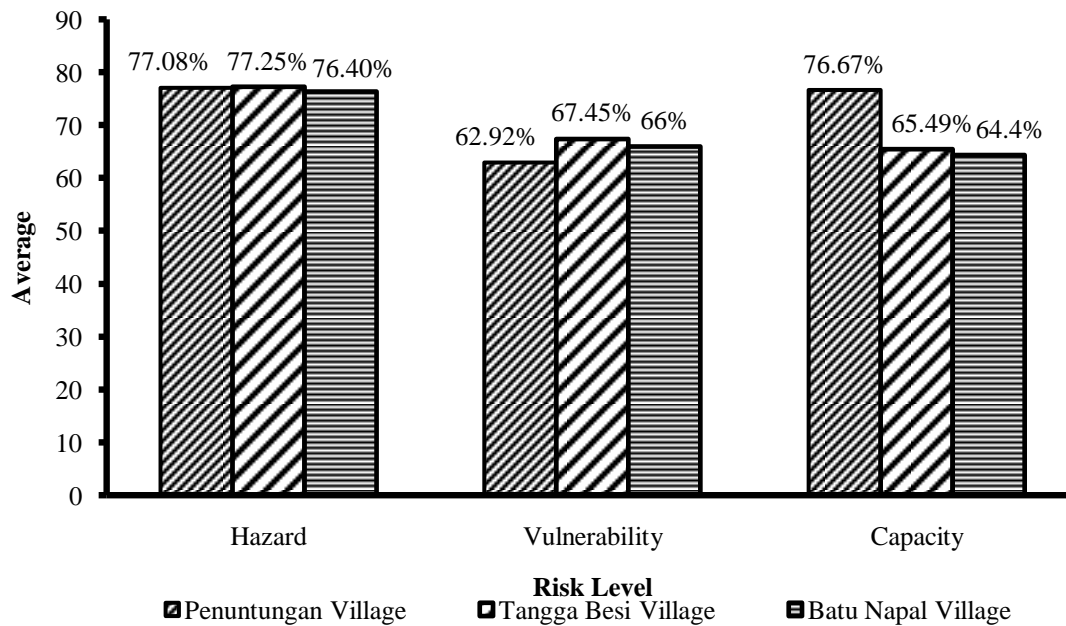

Figure 2. Risk Level in Three Village at Subulussalam City

Based on Figure 2, it can be seen that the highest threat factor (Hazard) is in the TanggaBesi Village with a percentage of 77.25% in the high threat level category, while the lowest threat factor is in BatuNapal Village with a percentage of 76.40% with a high threat level category. The highest vulnerability factor (Vulnerability) is in TanggaBesi Village with a percentage of 67.45% with a high vulnerability category, while the lowest vulnerability factor is in the Penuntungan Village with a percentage of 62.92% with a medium vulnerability category. The highest capacity factor is in the Penuntungan Village with a percentage of 76.67% with a high capacity level category, while the lowest capacity factor is in the BatuNapal Village with a percentage of 64.40% with a high capacity level category.

The high level of risk to the threat factor (Hazard) in TanggaBesi Village is due to elephants entering the village and plantation areas to look for food twice a month which occurs at night. As a result, many residents become victims and feel disturbed by the herd of elephants that often enter so that many residents experience losses both property and plantation products. The level of risk is a moderate category because elephants are looking for food one to two times a month or even not once a month.

Elephants usually rest twice a day, at midnight and noon. At night, elephants often sleep lying down on their sides in the primary forest, while during the day, elephants rest while standing under shady trees. During the day, if environmental conditions are less safe, elephants will choose to sleep while standing which serves as a standby behavior against the appearance of disturbance.

Based on the vulnerability factor in BesiBesiDesa due to the entry of an elephant herd to the village or to the plantation because the area is home range of the Sumatera elephant. The Sumatran elephant will continue to trace its range as long as food supplies are available from oil palm plantations or human settlements [7] and Sumatran elephants are able to migrate long distances to find food, water and reproductive needs [19]. In addition, many residents who grow plantations which are food for the Sumatran Elephant. Sumatran elephants need a large amount of feed consumption to meet their energy needs according to their large body size [14].

Based on the capacity factor, only in the Village of Fortune has been done a lot of mitigation socialization to reduce conflict, have an elephant repellent, and have an elephant handler. But there are still herd of elephants that appear to settlements and plantations because of the availability of elephant food. Human-elephant conflict is a major challenge for an area affected. Humans are always continuing to take up land where the animal's habitat is located as a rubber or oil palm plantation area, so that the habitat of animals, especially elephants, is reduced and the supply of elephant food is running low. This lack of food supply caused elephants to enter the village area owned by residents [15].

Conflicts between elephants and humans are caused by human activities that deforested protected forests for economic activities. Causing many cases of death of Sumatran elephants due to the conflict between elephants and humans [17]. Although residents sympathize with elephant dilemmas and acknowledge that elephants have the right to life, economic reality and people's dependence on harvests, especially for those who depend on agriculture as their main source of income, make them tend to support elephant conservation [2]. Mapping of conflict areas between Sumatran elephants and humans (*Elephasmaximussumatranus*) based on the level of risk that occurred in the three villages in Subulussalam is shown in Figure 3
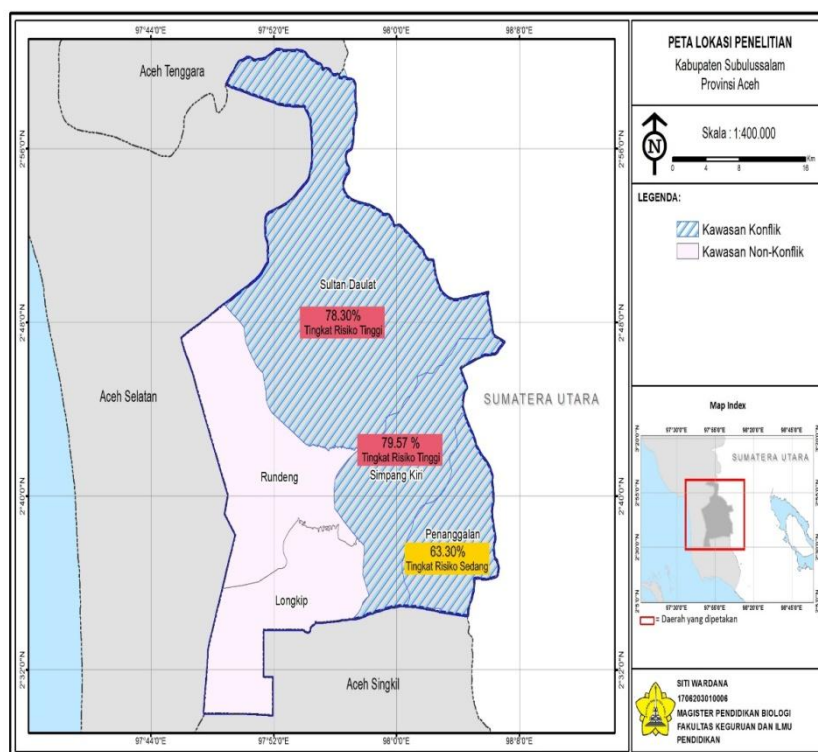

Figure 3. Regional Mapping with Intensity Conflict Different

Based on Figure 3 it can be seen that the intensity of the presence of Sumatera Elephants in the three Villages in Subulussalam based on the results of interviews and questionnaires with local residents obtained data that the intensity of Sumatran elephant presence most often occurs in areas that border directly with forests and areas with fragmented forest conditions. Based on Figure 4.3 above it can be seen that the area that is close to the forest becomes an area that has a very high level of intensity of Sumatran elephant presence, because Sumatran elephants cross the same home range for each period [20].

The large number of forests that have been converted into settlements, plantations, and even offices have made protected forest land for displaced wildlife. Deforestation and elephant home range in East Aceh

District show that elephant home range occurred in Peunaron District at 79.94% (60100.88 hectares), RantoPeureulak District at 10.80% (2425.61 hectares) and at SerbaJadi District at 37.96 % (47,411.16 hectares). Deforestation in elephant home range results in loss of habitat, elephant food and water sources for elephants. As a result, elephants increasingly search for suitable locations for their habitat and elephants enter the village, and eat commodities that are cultivated by the community [9].

Based on the results of the study, it is known that most of the residents sampled in the study are in the 30-50 years age category. Tabulation of data on citizens' age as samples can be seen in Table 5.

Table 5. Characteristics of Residents in Three Villages in Subulussalam

Indicator	Percentage of Resident (%)		
	Penuntungan Village	TanggaBesi Village	BatuNapal Village
Age (Years)			
20 – 39	10.52	52.63	36.84
40 – 60	27.20	50.60	22.20
Education Level			
Junior High School	20	60	20
Senior High School	24.70	49.40	25.80
College	0	100	0
Main Job			
Civil servants	0	100	0
Farmer	23.40	51.10	25.50
Does not work	40	40	20

(Source: Research Results in the Field, 2019)

Based on Table 5, it can be seen that the age category of 40-60 years the number of residents sampled in the study were 41 people with a percentage of 50.60% in the Ladder Village, as many as 22 people with a percentage of 27.20% in the Village of Fortune, and as many as 18 people with a percentage of 22.20% in BatuNapal Village. This age is a productive age for working. Thus people who work with productive age have the potential to do work to the maximum, so they have high spirits and are creative enough to find various businesses to generate income in order to meet the needs of family life.

Based on Table 5, it can be seen that the education level of the residents is the first lowest sample in TanggaBesi Village with 60% graduates for junior high school graduates, and 49.40% for high school graduates and college graduates by 100%. The second low level of education is in BatuNapal Village with 20% graduates for junior high school graduates, and 25.80% for high school graduates. The low level of education in TanggaBesi Village and BatuNapal Village, causes the community to not have the opportunity to get adequate work, so most residents only work as farmers or do not work. Communities that mostly work as farmers tend to be very dependent on the surrounding land resources in meeting their needs [11].

The education level of the residents sampled in TanggaBesi Village is mostly high school graduates, so that the types of work are more diverse than as farmers and plantation laborers (51.10%). In BatuNapal Village and Penuntungan Village the livelihoods of farmers were 25.50% and 23.40% respectively. The low level of community education is caused by economic factors and knowledge possessed by the local community. They assume the higher the level of education the school fees will also be expensive, so many parents do not want to send their children to school.

Low education level causes understanding and perception towards elephant conservation to be very low [8]. The level of formal education has an important role in shaping the people's mindset in acting. People with low levels of education find it difficult to accept new things or innovations that can add insight, experience, and knowledge [10]. The low level of education has an effect on people's understanding of wildlife conservation because of their perspective and limited knowledge [8]. This is possible to be a strong driving factor for the community around the area to exert pressure in the form of utilization of forest resources, especially people who have a dependency to live with the area [3]. The low level of education is also very closely related to people's perceptions of forest resources. Low education causes limited livelihood choices other than as farmers or farm laborers to meet their daily needs, so the community is forced to utilize the resources that are around it. The low level of education leaves the community with no choice but to work as farmers or oil palm plantation workers [11].

Many residents who were used as research samples worked as oil palm plantation workers. This is because both the three villages and subdistricts have a large area of oil palm plantations. In TanggaBesi Village of Simpang Kiri District has an area of oil palm plantations of 4940 ha, in BatuNapal Village of Sultan Daulat District has an area of oil palm plantations of 4205 ha, while in Penuntungan Village of Penanggalan District has an area of oil palm plantations of 2142 ha. Palm production twice a month. Many residents own oil palm plantations and also work as oil palm promoters. Usually in 1 ha of land, will be paid depending on the village topography, the more hilly topography is located, the more will be paid. Usually in 1 hectare, *pendodos* will get

a wage of Rp. 150,000 per person or Rp. 200,000 per person for a flat village topography, but if the hilly topography is paid Rp. 200,000 per person. If a lot of *pendodos* do *Dodos* in a lot of oil palm plantations, then the income will also increase. In one day the *pendodos* can earn as much as Rp. 500,000 - Rp. 600,000 per person, then the income of the *pendodos* can reach Rp. 3 million - Rp. 5 million per month.

Around the village there is a protected forest, but by residents converted into oil palm plantations. Oil palm plantations which are converted by residents are the elephant path (home range) so that the elephants eat and devastate the plantations and even leave their manure. The Sumatran face continues to explore its home range for food [20]. Sumatran elephants also travel long distances to also obtain their ecological, social and reproductive needs [18].

III. Conclusion

Based on the results of the study, it can be concluded that the level of conflict risk of the Sumatera Elephant with Humans that occurred in TanggaBesi Village of Simpang Kiri District and BatuNapal Village of Sultan Daulat District is included in the high category, while in Penuntungan Village of Penanggalan District is included in the medium category. The level of risk of conflict between Elephant and Human is triggered by the encroachment of human activity land into the home range of the elephant.

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