

# Relationship Between Climate Change and Tropical Disease in Poor Coastal Area, Serdang Bedagai

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**Abstract**— The climate change in Indonesia has affected the fishing activity of fisheries in Indonesia, because the activity of fisheries is strongly influenced by climate change. The change in climate in Indonesia led to changes within the pattern of wind speed, current speed, precipitation, sea-surface temperature and wave height. This conditions will affect the income of the fishermen, who are among the poorest Indonesian. In addition to causing loss of income, climate change also threatens the health of this fishing community. In order to understand the community's perception about climate change and its affect on the spread of tropical disease and the relationship of both, this survey study conducted. The data gathered through the interviewed based questionnaire. The samples are 71 residents of coastal communities subdistrict Tanjung Beringin, District Serdang Bedagai, who previously suffering from tropical diseases (tuberculosis, malaria, dengue and diarrhea). The results of the study shows that most coastal communities within the study area understand climate changes have occurred in their area. They also understand that climate change will cause the development of tropical diseases, they have suffered. The correlation analysis also shows that there is a significant relationship between perceptions about climate change and tropical diseases. Finally this study suggest that the study area urgently need a health promotion effort, so that people in coastal areas can implement the "clean and healthy living behavior", program to avoid the outbreak of a tropical disease in this area

**Keywords**— climate change, poor coastal area, tropical disease, health promotion, clean and healthy living behavior

## I. INTRODUCTION

The main impacts of climate change in Indonesia include increase temperature, intense rainfall and sea-level rise [11]. This situation will affect the income among the poor in Indonesia, including fishermen. This is because the fishing activity of fisheries in Indonesia is strongly influenced by climate change, which led to changes within the pattern of wind speed, current speed, precipitation, sea-surface temperature and wave height [1]-[3], [12]-[14].

In addition to causing loss of income, Indonesian fishermen who are poor in Indonesia, climate change also threatens the health of this fishing community.

Tuberculosis, for example, are very vulnerable to climate change [17]. Today, Indonesia is the country with the second largest number of TB patients around the world [19]. Temperatures risen by 1.0–3.5°C will increase the likelihood of many vector-borne diseases such as Malaria and Dengue fever in the tropics area [6]. Rainfall, shifts in precipitation affects the dissemination of water-borne pathogens. Rainy season is related to the increase of fecal pathogens as heavy rain may stir up sediments inwater, leading to the accumulation of fecalmicroorganisms [7]. Many infectious diseases are transmitted by ingestion of, inhalation of, or contact with contaminated water [14]. These infections can also lead to a wide range of clinical illness such as diarrheal disease which is the second leading cause of death among children under the age of five worldwide [18].

Serdang Bedagai (Sergei) is one of the districts in the East Coast Region North Sumatra, Indonesia. The district has the advantage in the field of marine and agriculture. Based on the Health Profile of North Sumatra (2012) note that an outbreak of tropical diseases is still high in the district, such as Tuberculosis (772 cases), Malaria (90 cases), Dengue Fever (49 cases), and the symptoms of Diarrhea (25.550 cases). Serdang Bedagai has 17 sub-districts. One of the district is Tanjung Beringin with a population of 37,497 peoples (Central Bureau of Statistics District Sergei, 2015). Community of Tanjung Beringin mostly works as fishermen because this district is located along the coast. Tropical disease cases in the district of Tanjung Beringin is fairly high. According to Central Bureau of Statistics District Sergei (2015) Tanjung Beringin Sub-district has the case of Tuberculosis

(20 cases), Malaria (4 cases), Dengue Fever (17 cases), and the symptoms of Diarrhea (632 cases).

Just like most other Indonesian fishing communities, fishermen in this area live in poverty [10]. Poverty comes not only in economics but also in the social, cultural and even political. In addition, poverty is not only within the scope of the family, but also within the scope of the village, which is manifested under the form of poverty infrastructure. The poverty among fishing communities alone has caused them difficulty gaining access to health services, coupled with the influence of climate change on the spreading of various tropical diseases, it will make their lives even worsen. Thus climate change is an issue that should be recognized and anticipated by Indonesian fishermen, as well as policy makers also need to make efforts to help the fishermen, so it is necessary to study the relationship of climate change and tropical diseases in poor areas along the coast.

## II. METHODOLOGY

This study is a survey research using questionnaires. The questionnaires used for consist of two sections. The first section is about respondent's perception on climate change, and a second one is about the perceptions of tropical disease caused by climate change. Both using Likert scale with a scale of 1 to 4, strongly disagree, disagree, agree and strongly agree.

The diseases studied are tuberculosis, malaria, dengue and diarrhea. This relates to Central Statistics Bureau Serdang Bedagai (2015) reports regarding the tropical diseases that develop in the sub-district of Tanjung Beringin. The number of cases and the number of respondents studied are presented in Table 1.

TABLE I  
NUMBER OF CASES OF TROPICAL DISEASES IN THE DISTRICT OF TANJUNG  
BERINGIN AND THE NUMBER OF SAMPLES STUDIED

Tropical Diseases	Number of Cases (BPS, 2015)	Number of Samples
Tuberculosis	20	20
Malaria	4	4
Dengue	17	17
Diarrhea	632	30
<b>Total</b>	<b>673</b>	<b>71</b>

Respondents representing diarrhea diseases are only 30 peoples because in general the sample 30 is considered adequate for testing correlation [4]. Finally, the total samples used are 71 samples. The sampling process was done purposively based on data from the Public Health Centre Tanjung Beringin.

The collected data were analyzed descriptively to draw conclusions on the perceptions of respondents about climate change, and the tropical diseases caused by climate change. The relationship between perceptions of climate change and the spread of infectious diseases analyzed using Pearson's correlation analysis. The formula is as the following:

$$r = \frac{\sum xy - \frac{(\sum x)(\sum y)}{n}}{\sqrt{\left(\sum x^2 - \frac{(\sum x)^2}{n}\right) \left(\sum y^2 - \frac{(\sum y)^2}{n}\right)}}$$

## III. RESULT AND DISCUSSION

Climate change in Indonesia is believed to have an impact as the development of tropical diseases, an increase in surface temperatures, changes in rainfall, changes in sea-surface temperature, sea level changes, as well as extreme weather and climate events. This situation will affect the people whose livelihoods depend on natural resources because it is more sensitive to environmental changes, such as fishermen. The opinions of the fishermen about climate change gathered and presented in Table 2.

TABLE II  
RESPONDENT'S PERCEPTIONS ABOUT CLIMATE CHANGE

No	Statement	Strongly Disagree	Disagree	Agree	Strongly Agree
1	Now, if the weather is hot, its heat more blazing	0	0	59	12
2	Now, if the weather is hot, the heat longer	0	0	61	10
3	Now if the weather is rainy, the rain is heavier than before.	0	1	54	16
4	The rainy season (Sept, October and November) is the more dense, and dry season (Jan, Feb. and Mar) drier (extreme weather).	0	3	60	8
5	Seawater heat causes the fish often move, makes it difficult to catch fish..	0	0	64	7
6	Sea level surface is expanding.	0	0	60	11
7	Lately droughts happen frequently, and the droughts cause tropical disease.	0	1	52	18

No	Statement	Strongly Disagree	Disagree	Agree	Strongly Agree
8	There has been frequent flooding lately, and flooding will spread infectious disease.	0	0	63	8
9	Lower humidity causes the flu virus spread more quickly.	0	0	54	17
10	Lately, the wind blowing harder, and it can cause a whirlwind.	0	0	49	22
	Total		5	576	129
	Percentage		0.7	81.1	18.2

Table 2 shows that most respondents chose to agree to the ten questions related to climate change (81.1%). The respondent who chooses "strongly agree" is the second largest with a percentage of 18.2. The least respond is "disagreed," 0.7 percent of all answers. There is no "strongly disagree" respond from all the samples. Furthermore, the results from the "interviewed based questionnaire" to study the perceptions of tropical diseases related to climate change are presented in Table 3.

TABLE III  
RESPONDENT'S PERCEPTION ABOUT TROPICAL DISEASES THAT  
CAUSED BY CLIMATE CHANGE

No	Statement	Strongly Disagree	Disagree	Agree	Strongly Agree
1	Malaria disease is increasing now, because there are a lot of Anopheles mosquitoes, due to the increasingly hot weather.	0	0	59	12
2	At first, malaria occurs because the Anopheles mosquito bites and there has been a lot of Anopheles lately, because of the higher temperatures	0	0	61	10
3	After being bitten by mosquitoes, persistent fever, hot and cold alternately, dizziness and sleepiness, they are all the sign of malaria, the symptom is now more common in this village than in the past.	0	1	54	16
4	Heavy rain resulted in waterlogging, causing dengue mosquito (Aedes) develops rapidly.	0	3	60	8
5	The air is getting hot when it does not rain, shortening the time required the development of the egg phase into adult mosquitoes. So there are a lot of mosquitoes that cause dengue fever in this village.	0	0	64	7
6	After being bitten by Aedes mosquitoes, dengue fever occurs, headache, pain in the bones and muscles, nausea, vomiting, mild cough and symptoms of bleeding also happen. This is a symptom of dengue fever, and it is more common now than in the past.	0	0	60	11

No	Statement	Strongly Disagree	Disagree	Agree	Strongly Agree
7	Heavy rainfall often causes flooding, and this condition led to the widespread pollution of water contaminated with feces.	0	1	52	18
8	The unhygienic water (contaminated feces) continued to be used because there is no other source of clean water.	0	0	63	8
9	The use of contaminated water is causing more people to become stomachache (diarrhea) than in the past.	0	0	54	17
10	The weather gets humid, lower revenue due to difficulty to catch fish, housing that does not meet the health requirements, are all the causes of many cases of tuberculosis in this village.	0	0	49	22
	Total	0	5	576	129
	Percentage	0	0.7	81.1	18.2

Table 3 shows that the majority of respondents chose to agree with the phenomena, they have seen that climate change is likely to lead to the spreading of tropical diseases. The process during the interview is not as easy as expected. There are a lot of respondents do not understand the effect of climate change in the spread of tropical diseases, but when the interviewer explained the processes that occur, most fishermen justify each proposed statement.

Having described the respondent's perception about climate change and tropical diseases that develop due to climate change, correlation analysis was also done to analyze the relationship between the two. Correlation analysis results are presented in Table 4.

TABLE IV  
RESULTS OF CORRELATION ANALYSIS BETWEEN TROPICAL DISEASES AND  
PERCEPTION OF CLIMATE CHANGE

Variabel	Pearson Correlation	Sig. (2-tailed)
1. Perception about Climate Change	0,597**	0,000
2. Tropical disease		

Based on the table it can be seen that there is a significant correlation between perceptions of climate change and the widespread tropical disease caused by climate change. However, the effect of climate change is can be lowered with clean and healthy living behavior. Fixing a clean and healthy life behavior (the program from the health ministry) under conditions of climate change has become a

very important agenda in an effort to make the healthy community, especially to avoid these tropical disease outbreaks.

#### IV. CONCLUSION

- 1) Most coastal communities within the study area understand climate changes have occurred in their area.
- 2) Most coastal communities within the study area to understand that climate change will cause the development of tropical diseases, they have suffered .
- 3) There is a significant relationship between perceptions about climate change and tropical diseases.

#### V. SUGGESTION

The study area urgently need a health promotion effort, so that people in coastal areas can implement the "clean and healthy living behavior" program to avoid the outbreak of a tropical disease in this area.

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