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Analysis of the Impact of COVID-19 Pandemic on Trade and Economy of the Coastal Communities of Kenjeran Village, Surabaya Using the Fault Tree Analysis (FTA) Method

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ABSTRACT

The coastal area as a densely populated area with high socio-economic activity is currently experiencing impacts in various sectors due to the COVID-19 virus outbreak. However, the efforts to minimize the impact of the pandemic are still general and have not taken consider the conditions of communities in coastal areas. This analysis aims to determine the factors that cause the coastal community of Kenjeran to experience a decline and a decrease in trade and economic activity and identify the probability during the COVID-19 pandemic. The method used in this analysis is Fault Tree Analysis (FTA). The result shows that the main factors causing the decline are decreased fish sales, decreased community income, decreased activity at sea, and decreased activity of traders in the market with the probability factor of 0.2494 or 24%. Mitigation recommendations for the coastal community of Kenjeran Beach are a collaboration between the fishers and the policy of cooperation between the trade office and the marine service to conduct clustering for fishers so that they can supply scarcity of marine fish and limited marine product, also monitoring the health protocols with the swab and rapid tests for traders by permanent health service.

Keywords: *Covid-19, Coast, Fault Tree Analysis (FTA), Economy, Trade and Economy, Mitigation and Economic Downturn*

1. INTRODUCTION

For more than two decades, infectious disease outbreaks have had massive impacts on a regional and global scale, such as Ebola, Influenza A (H1N1), SARS, MERS, Zika virus and most recently COVID-19. The viruses that cause these outbreaks have a high transmission capacity and result in mortality [1] [2].

Since December 2019, when it was first detected in China as respiratory disease, COVID-19 has spread widely and on March 12, 2020, was officially declared by the World Health Organization (WHO) as a pandemic[3]. As of March 13, 2020, COVID-19 has spread to 139 countries. Globally, there were 145,369 cases with the total mortality rate reaching 5429 [4]. In Indonesia, the spread of the COVID-19 virus was first confirmed on March 2, 2020. Rapidly on April 9, the COVID-19 pandemic has spread throughout the province, as shown in Figure 2.1. Even on May 15, 2020, Indonesia recorded 16,496 cases, the second-highest in Southeast Asia after Singapore. In terms of mortality, Indonesia is ranked 5th in Asia with a total of 1,076 victims.

At the beginning of COVID-19, the Indonesian government took preventive steps such as stopping flights to and from mainland China since February 5, 2020, including stopping the issuance of visas on arrival for Chinese citizens [5]. Since March 8, 2020, the Indonesian government expanded travel restrictions to South Korea, Italy, and Iran, as countries with the largest pandemic spread [6]. However, this step cannot stem the spread of COVID-19, which has already entered Indonesia's big cities through various channels.

In the next stage, the Indonesian Ministry of Health implemented thermal scanners at 135 airports and ports [7] and then followed by its application in various public facilities [8]. On the recommendation of WHO, the Indonesian government established more than 100 referral hospitals equipped with isolation room facilities [9].

However, after the first recorded case of mortality, the Indonesian government acknowledged the difficulties in detecting the track record of spreading from the airport to the wider community. It was only on March 16, 2020, that the Directorate General of Disease Prevention and Control, the Indonesian Ministry of Health, launched Guidelines for the Prevention and Control of Coronavirus Disease (COVID-19) [10] and this was followed by the issuance of General Guidelines for Facing the COVID-19 Pandemic

for Local Governments by the Ministry of Home Affairs. RI [11], including calls for limiting public activities and implementing physical distancing. Until now, the policy is still being evaluated for its effectiveness.

The data above shows a rapid spread, especially with the density of socio-economic activities in big cities in Indonesia, such as Jakarta, Surabaya, Denpasar, Makassar, Banjarmasin, and Mataram. These big cities are located in the coastal areas of Java Island. Bali, Sulawesi, Kalimantan, and the West Nusa Tenggara Islands.

Based on its geographical conditions, Indonesia's population mainly occupies lowland areas, especially coastal and coastal areas, as supported by research data by the Indonesian Central Statistics Agency regarding Marine and Coastal Resources Statistics in 2016, where 60% of Indonesia's population lives in coastal areas (Central Agency Statistics, 2016). The population density in these coastal areas increases the risk of the spread of the COVID-19 pandemic due to physical contact and droplets[2].

Seeing these conditions, the readiness of the government to overcome this pandemic disaster is the key to success in reducing the number of outbreaks. Considering the demographics of the Indonesian population, whose largest distribution is in coastal and coastal areas, the main purpose of this community service activity is to provide scientific recommendations for mitigation policies for communities in coastal areas in the face of a pandemic.

This research is expected to help the government deal with a pandemic, especially residents in coastal areas, especially in the Surabaya area. Therefore, the authors will conduct research on the Impact of the COVID-19 Pandemic Risk Analysis for Coastal Communities using the Fault Tree Analysis (FTA) Method in the Kenjeran Coastal Area, Surabaya.

2. BASIC THEORY

2.1. Corona Virus

Coronavirus is an RNA virus with a particle size of 120-160 nm. This virus mainly infects animals, including bats and camels. One of them is COVID-19 which was just identified at the end of 2019 in Wuhan, China. The structure of this viral genome has a pattern like that of the coronavirus in general. According to research by Zhou P et al. (2020) [15], the SARS-CoV-2 sequence has similarities with the coronavirus isolated in bats, so the hypothesis arises that SARS-CoV-2 originated from bats which then mutated and infected humans. Mammals and birds are thought to be intermediate reservoirs.

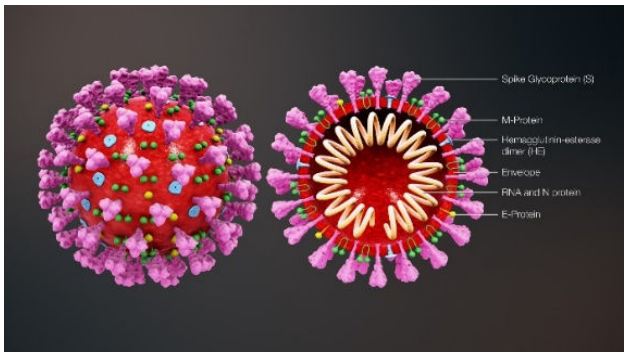

Figure 1. Corona Virus
(Source: en.wikipedia.org/wiki/Coronavirus_disease)

Currently, the human-to-human spread of SARS-CoV-2 is the main source of transmission, so the spread has become more aggressive. Transmission of SARS-CoV-2 from symptomatic patients occurs via droplets released when coughing or sneezing [16]. In the study of Doremalen et al. (2020) [17], it has been observed that SARS-CoV-2 can be viable on aerosols (generated through a nebulizer) for at least 3 hours. The stability of SARS-CoV-2 in inanimate objects is not much different from SARS-CoV. The experiments conducted by Doremalen et al. (2020) [17] showed that SARS-CoV-2 was more stable on plastic and stainless steel (> 72 hours) than copper (4 hours) and cardboard (24 hours). Viruses can be detected in door handles, toilet seats, light switches, windows, cupboards, and ventilation fans, but not in air samples [18].

In addition, the government has also appealed the handling of COVID-19 in Indonesia by implementing a system issued by WHO. These measures include issuing an appeal to self-quarantine at home, working from home, and prohibiting gathering many people in one place, wearing masks when outside the house, calling on always maintaining cleanliness, one of which is by washing hands and implementing a system of restrictions—large-Scale Social Affairs in the red zone in Indonesia.

2.2. Risk Analysis

The Standards Australia / New Zealand (AS / NZS 4360: 2004) defines that risk as the possibility of an undesirable event that will affect activity or object. This risk is measured in terms of the consequences (consequences) and likelihood (possibility/probability). The likelihood is the possibility of a period of risk that will arise. The calculation of probability or probability that is often used is frequency. The consequence is an occurrence of an effect such as loss. The calculation of risk can be formulated as the multiplication of Likelihood and Consequence.

Risk = Likelihood X Consequences …… . (2.1)

Risk analysis includes consideration of the sources of risk, consequences, and likelihood of these risks. Risk is analyzed by combining the value of likelihood (probability or frequency) and consequence (impact or effect). According to The Standards Australia / New Zealand (1999), each risk, likelihood and consequence, is assessed qualitatively in five categories. Of the five risk analyzes, it produces four levels of risk, namely Extreme, High, Medium, and Low.

Table 1. Risk Analysis: Assessment Likelihood

Level	***Descriptor***	***Example: Description / Indicator***
1	*Insignificant*	No injuries, low financial losses
2	*Minor*	Needs first aid, moderate financial loss
3	*Moderate*	Requires medical treatment, high financial losses
4	*Major*	This resulted in extensive losses, serious injuries, impaired production capacity, large financial losses
5	*Catastrophic*	Cause death, cause severe damage, and a very large financial loss

Table 2. Assessment of Risk Consequences

Level	***Descriptor***	***Description***
A	*Almost Certain*	Chances are it happens very often
B	*Likely*	Often occurs
C	*Moderate*	Happened several times
D	*Unlikely*	Happens sometimes
E	*Rare*	Probably very rare

2.3. Fault Tree Analysis

FTA is a widely used technique for studies related to the risk of reliability of an engineering system. The potential event that causes the failure of an engineering system and the probability of the event occurring can be determined by FTA. A TOP event, which is the definition of a system failure, must be determined in advance in constructing an FTA. The system is then analyzed to find all the possibilities defined in the top event. A fault tree is a graphical model consisting of several parallels and sequential combinations of faults that may cause the start of a predefined failure event.

After identifying the top event, events that directly contribute to the top event are identified and linked to the top event using logical links. AND gate (AND Gate) and until a mutually independent basic event is achieved. This deductive analysis shows both qualitative and quantitative analysis of the engineering system being analyzed.

A fault tree illustrates the state of the system components (basic events) and the relationship between the basic and top events. A graphic symbol is used to represent a logic gate. The output of a logic gate is determined by the events that enter the gate. An FTA is generally carried out in 4 stages, namely:

- Defines problem and boundary conditions condition) of the system
- Construction fault tree
- Identify the minimum cut sets
- Qualitative analysis fault tree

Symbols in the Fault Tree Analysis used in describing an event are presented in the following tables.

Table 3. Fundamental Operators

Gate Symbol	Name	Explanation
	*OR*	The event union operation is the output of the events occurring if one or more of the inputs occurs.
	*AND*	An intersection operation is one for which an output event occurs if and only if all inputs occur.

Table 4. Events

Graphic Symbols	Explanation
	*Rectangle* Basic ignition error requiring further development
	*Circle* Basic ignition error requiring further development
	*Rhombus* Events that were not developed further because of insufficient consequences or because information was not available
	*House* Events that are usually expected to occur

The benefits of the Fault Tree Analysis method are:

a. Can determine the causative factors that are most likely to cause failure.
b. Find the stage of the event that is most likely the cause of failure.
c. Analyze possible sources of risk before failure occurs.
d. Investigating a failure

Fault Tree Analysis is not a quantitative model. Rather it is a qualitative model that can be evaluated quantitatively. It can be used for virtually any system model. The Fault Tree Analysis is a very easy model to calculate, but it does not change the qualitative nature of the model itself. The rules for combining probability and frequency in the fault tree analysis are as follows:

Table 5. Calculation of Fault Tree Analysis

OR Gate	AND Gate
$P_F = P_A + P_B - P_A P_B$	$P_F = P_A P_B$
$P_F = P_A + P_B + P_C - P_A P_B - P_B P_C - P_A P_C + P_A P_B P_C$	$P_F = P_A P_B P_C$

To be able to calculate logic gates, the Boolean algebra equation is used, or in English, it is called Boolean Algebra is mathematics used to analyze and simplify Logic Gates in Digital Electronic Circuits. Boolean is a data type that only consists of two values, namely "True" and "False" or "High" and "Low" which are usually denoted by the numbers "1" and "0" in Logic Gates or computer programming languages. This Boolean algebra was first introduced by a mathematician who came from England in 1854. The name Boolean itself is taken from its founder name, George Boole (Dickson, 2017).

2.4. Risk Management

Risk management is an organized approach to discover potential risks to reduce the occurrence of unexpected things. Risk management must be carried out as early as possible, supported by this information. The process is a preventive action in which the real business conditions can become clear before it is too late and can avoid further failure [19].

Risk management is the stage where a company can consider alternative strategies to minimize or reduce the likelihood of risks and their consequences or consequences. This stage is known as the risk mitigation stage.

Mitigation is an activity undertaken to eliminate/reduce the possibility of unexpected events occurring or reduce consequences/consequences, including long-term risk reduction measures. At this mitigation stage, risk identification, hazards that can occur, the mechanism for emergence are carried out, and estimate the level of risk and prioritize these risks.

Incidence Analysis measurement scale according to AS / NZS 4360: 1995:

A. Almost certainly expected to happen in all situations (almost certain)
B. Likely to occur in all situations (likely)
C. Moderate should have occurred at one time (moderate)
D. Tend to occur sometimes (unlikely)
E. Rarely does it only happen in very special situations (rare)

Consequences Analysis measurement scale according to AS / NZS 4360: 1995:

A. Insignificant: without human accidents and material loss.
B. Minor: initial accident assistance, medium material loss.
C. Moderate: required to be medically treated, the loss of material is quite high.
D. Major: serious accidents, loss of operation/production capability, high material losses.
E. Catastrophic death: radiation hazard with widespread effects, enormous financial losses.

Evaluation of risk levels to measure and assess the level of risk:

1. H (*high risk*): requires research and management considerations at the top management level
2. S (*significant risk*): requires management attention at the top level
3. M (*moderate risk*): the obligations of management must be outlined
4. L (*low risk*): arranged according to a routine procedure

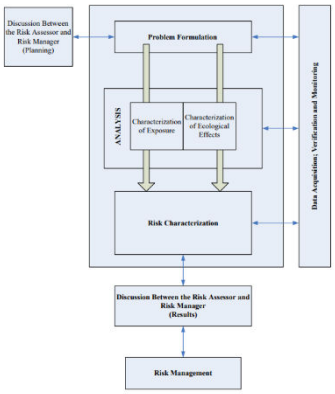

Figure 2. Framework Environmental Risk Management (US Environmental Protection Agency, 1992)

3. RESEARCH METHODS

3.1 Literature Study and Field Observation

Literature studies and field observations are useful for helping to write a final project that requires much supporting literature to be used as insight development and analysis. The literature study required includes:

a. Study of risk analysis.
b. Study of the spread of COVID.
c. Study regarding *Fault Tree Analysis.*

3.2 Identification of Cause of Decreased Trading and Economic Activities and Risk Analysis

This identification is carried out from the results of surveys and interviews conducted. The result of identifying the cause of the spread is knowing the root of the problem, which in turn can make the right mitigation to respond to the problem. The way to solve the problem of risk decision-making described above is by using the Fault Tree Analysis (FTA) method. Fault Tree was built to describe the relationship between conditions and factors that result in problem development. Then, based on the Fault Tree built, the probability of each event is calculated based on the difference in response.

3.3 Data Collection

The data used in this final project are data on community service activities "Compilation of Scientific Recommendations for Mitigation Policies for Coastal Communities in Facing a Pandemic" Department of

Marine Engineering, Faculty of Marine Technology, ITS. This data is a factor in the decline in trade and economic activity. The data is obtained through surveys and interviews with coastal communities, fishers, traders, local RT & RW, government officials (Kenjeran & Bulak Subdistricts), and the health sector.

3.4 Risk Impact Analysis Using FTA

At this stage, the analysis is carried out using the Fault Tree Analysis method, which consists of :

1. Determine the problem scenario
2. Determine the components of the problem and the causes
3. Build diagrams and input probabilities for each problem scenario
4. Validate the FTA

3.5 Determining Mitigation Based on Analysis

After finding the root of the problem that caused the spread of the COVID-19 pandemic obtained from the Fault Tree Analysis (FTA), appropriate evaluation and mitigation can be taken to deal with this problem.

4. RESULTS AND DISCUSSION

4.1. Data Collection

The first thing to do in research is data collection. This data collection was carried out by interviewing in Kenjeran Village with an area of 0.93 km2 and a population of 6,684 people. The data to be processed is data from interviews and questionnaires with coastal communities, fishers, traders, local RT and RW (one respondent takes each RW), government officials (Kenjeran Village & Bulak District), and the health sector. What will be discussed are the factors that caused the decline in trade and economic activity during the Covid-19 pandemic. The data of interviewed respondents can be seen in Table 6:

Table 6. Resource Personnel

No	Name	Position	Age	Work Experience
1	Mrs. Bunga	Public Health Center	30 Years Old	10 Years
2	Mr. Choifin	Bhabinkamtibmas	55 Years Old	32 Years
3	Mr. Agus Sumitro	Head of the Economy Section	50 Years Old	25 Years
4	Mr. Rully	Head Of Village	37 Years Old	13 Years
5	Mr. Sahlan	Fisherman (RT)	52 Years Old	40 Years
6	Mrs. Siti Aisyah	Residents (RW)	43 Years Old	23 Years
7	Mrs. Mardiana	Citizen	46 Years Old	20 Years
8	Mrs. Sulastri	Citizen	47 Years Old	13 Years
9	Mrs. Djaenah	Citizen	55 Years Old	24 Years
10	Mrs. Siti Kholilah	Citizen	36 Years Old	10 Years
11	Mrs. Eri	Citizen	39 Years Old	7 Years
12	Mr. Syahroni	Fisherman	48 Years Old	35 Years

Table 6 above shows the respondents from the results of interviews conducted to prepare the Fault Tree Analysis (FTA) diagram. The selection of the twelve sources was because each source was an economic actor that was directly related to their livelihoods as fishermen and residents who were mostly fish traders. Another resource person from the community health center as an advocate for the implementation of health protocols, while the village heads and sub-district heads (heads of the economic section) are extensions of the government in order to implement public policies made by the central government in overcoming the impact of COVID on society, especially coastal communities in the Kenjeran region.

The role of each resource person, from residents and fishers, can be used as a primary source to analyze problems that occur in the trade and economic sector as a direct impact of COVID experienced by coastal communities. The role of the health office can be used as a primary source explaining the relationship between implementing health protocols alongside the trade and economic sectors during the pandemic period. Then from the government side, as a source that explains what the government has done from public policies made during the pandemic period as well as the effectiveness and lack of application of these public policies for the trade and economy of coastal communities during the COVID pandemic.

4.2. Risk Impact Analysis Using FTA

In this study, the analysis uses FTA on trade and an economy that has experienced a decline in activity to determine the factors that cause trade and the economy of coastal communities to experience a decline.

1. Determining Problem Scenarios
   The decline in trade and economic activity has become a problem called the Top Event in the Fault Tree Analysis. DPL 9 fault tree software is used to help compile a fault tree diagram to assemble the factors that cause the problem.
2. Determining Problem Components and Causes of Problems
   Review journals, reports, and news can help determine the composition of the problem or intermediate event and the cause of the problem or basic event. Then the validation process will be carried out with the coastal community in Kenjeran Village and local government officials, namely Kenjeran Village and Bulak District. The following table shows the intermediate events and basic events in the FTA.
3. Build Diagram and Input Probability of Each Problem Scenario

After determining intermediate events and basic events, making a fault tree diagram is useful for easier understanding each failure scenario. Make a fault tree diagram using DPL 9 fault tree software. The following is a fault tree diagram image.

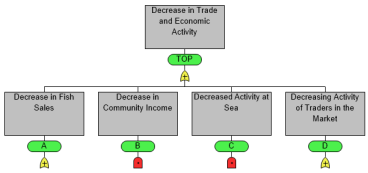

Figure 3. Top Event for Decreasing Trade and Economic Activity

In figure 3, trade and economy are the top events in the impact of the COVID-19 pandemic on fish sales, community income, activities at sea, and market trading activities in Kenjeran Village, Surabaya. The following top events have four intermediate events: a decrease in fish sales, a decrease in community income, a decrease in activity at sea, and a decrease in the activity of traders in the market.

Figure 4. Intermediate Level 2

The picture above shows that at intermediate level 1, the decline in fish sales has three intermediate events level 2, namely activity at sea has decreased, the selling price of fish has dropped dramatically, and the types of fish available are limited. The interview results stated that there was a decrease in fish sales due to decreased activity in the sea due to the limited types of fish available. In addition, the selling price of fish has also dropped dramatically. At intermediate level 1, the decrease in people's income has two intermediate events level 2: the purchasing power of public consumption decreases and the work productivity decreases. At intermediate level 1, decreasing activity at sea has three intermediate events level 2: decreasing fishers' purchasing power, decreasing fishers' productivity, and decreasing ship operations. The interview results stated that fishers' activity at sea decreased due to the decreasing purchasing power of fishers to fulfill boat operations and decrease the purchasing power of fishers. This problem affects fishers' activities at sea so that their productivity also decreases. At intermediate level 1, the decrease in the activity of traders in the market has two intermediate events level 2, namely the selling power of market traders is decreasing, and market traders are known to have COVID-19. In the intermediate event level 2, it is divided according to the selling fish process, community income, activities at sea, and activities of traders in the market. At intermediate level 1, the decrease in the activity of traders in the market has two intermediate events level 2, namely the selling power of market traders has decreased, and market traders are known to be affected by COVID.

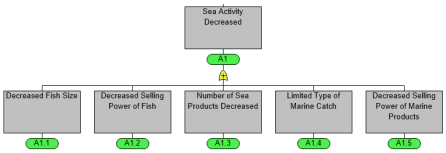

Figure 5. Sea Activity Decreased

Some of the factors that cause activity in the sea to decline are the size of the fish that has decreased from the previous one and tends to decrease frequently, thus affects the fish's selling price, which has decreased in size. Another factor, namely the decreasing selling power of fish, decreases traders' and fishermen's opinions. In addition, the amount of marine products has decreased. Thus, the income from the marine catch by fishers has decreased.

Another factor is that the type of sea catch is limited. Therefore, it makes many fish stocks and the like decrease drastically, sometimes even certain types of fish are very rare to find, so it leaves the fish stock that consumers are looking for. The last factor that can cause activity at sea to decline is the decreasing selling power of seafood. The selling power of marine products is decreasing, and sometimes it is stable, but the catch in the sea is decreasing over time, sometimes even non-existent.

Figure 6. Fish Selling Price Dropped Drastically

The drastic drop in the selling price of fish can reduce trade and economic activity in a market. The lowering factors include declining fish buying interest and low fish buyers. The selling price of fish has drastically decreased because some fish are missing or empty. Another factor that can reduce trade and economic activity is the quiet interest in buying fish. This is because the people's economy is sluggish, so that people's purchasing power also decreases.

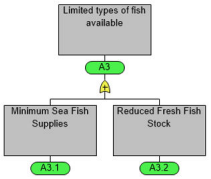

Figure 7. Limited Type of Fish Available

Lack of fish buyers can reduce the trading activity and economy of a market. The lowering factors include a decline in fish buying interest and a drastic drop in the selling price of fish. The interest in buying fish has decreased because some fish are missing or empty. Another factor that can reduce trade and economic activity is the drastic drop in the selling price of fish. This is because the people's economy is sluggish, so that people's purchasing power also decreases.

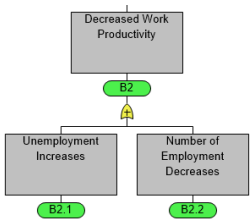

Figure 8. Decreased Work Productivity

Labor productivity has decreased due to government policies in the form of Large-Scale Social Restrictions. This policy has resulted in decreased space or productivity for coastal communities which are dominated by fishers. The policy also covers fishing activities in the sea to not go to sea as usual. As a result of this, activities in the fish market also declined due to reduced stocks. That means that the number of jobs such as fishermen and fish traders has decreased.

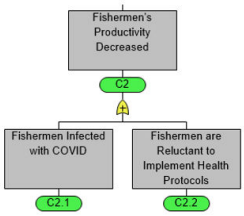

Figure 9. Fishermen's Productivity Decreased

The decreasing productivity of fishers can affect the decline in trade and economic activities. The effect of decreasing fishermen's productivity is due to two things, namely fishermen infected with COVID and fishers reluctant to apply health protocols. These things certainly affect the activities of trade and the economy in the local area.

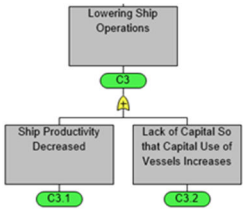

Figure 10. Lowering Ship Operations

Declining Ship Operations can affect the decline in trade and economic activity. The effect of decreasing fishermen's productivity is due to two things: decreasing ship productivity and minimal capital so that the capital to use ships increases. Ship productivity is reduced due to high storms and the Large-Scale Social Restrictions in the area. In addition, fishers have minimal capital, so that the capital to use boat increases. This makes fishers go to sea to borrow gasoline from gasoline traders and pay it in installments if they get fish. These things certainly affect the activities of trade and the economy in the local area.

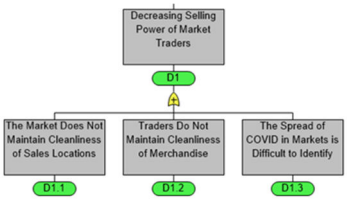

Figure 11. Decreasing Selling Power of Market Traders

The decreasing selling power of market traders can affect the decline in trading and economic activity. The effect of the decline in the selling power of market traders is caused by several things; among others, the market does not keep sales locations clean, traders do not keep their merchandise clean, and the spread of COVID in the market is difficult to identify. These things certainly affect the activities of trade and the economy in the local area.

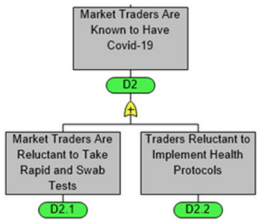

Figure 12. Market Traders are Known to Have Covid-19

Market traders known to be affected by COVID can affect trade and economic activity decline. The influence of market traders is caused by several reasons; among others, market traders are reluctant to take rapid and swab tests, which makes some buyers anxious about carrying out activities in the market. In addition, traders are reluctant to apply health protocols during trading activities. These things certainly affect the activities of trade and the economy in the local area.

The next step after identifying the basic event, input the probability obtained from the questionnaire results of coastal communities, fishers, traders, and government officials in Kenjeran Village. Because respondents have different ages and service time of work, weighting is required for each respondent.

The weighting calculation using respondent 1's data is as follows:

$$Respondent\ Quality\ 1 = \frac{Age + Service\ Time}{\sum bobot\ responden}$$

$$= \frac{5}{81} \quad = 0.061$$

After getting the weighted value for each respondent, the basic event probability is carried out, referring to the frequency index as in the table below.

Table 7. Frequency Index

FI	Rating	Qualitative	Quantitative
5	Almost Certain	Incidence occurred >80% during the COVID-19 pandemic (March 2020- November 2020)	10^{-1}
4	Likely	Incidence occurs in the 61% - 80% range during the COVID-19 pandemic (March 2020- November 2020)	10^{-2}
3	Possible	Incidence occurs in the range of 41% - 60% during the COVID-19 pandemic (March 2020- November 2020)	10^{-3}
2	Unlikely	Incidence occurs in the range of 21% - 40% during the COVID-19 pandemic (March 2020 - November 2020)	10^{-4}
1	Rare	Incidence occurs in the range of 1% - 20% during the COVID-19 pandemic (March 2020 - November 2020)	10^{-5}

Table 8. Basic Event Probability

No.	Incident Code	Event Name	Probability
1.	A1.1	Decreased Fish Size	0,0075
2.	A1.2	Decreased Selling Power of Fish	0,0378
3.	A1.3	Number of Sea Products Menurn	0,0478
4.	A1.4	Limited Type of Marine Catch	0,0463
5.	A1.5	Decreased Selling Power of Marine Products	0,03
6.	A2.1	Decreased Interest in Purchasing Fish	0,0311
7.	A2.2	Fish Selling Price Dropped Drastically	0,0287
8.	A3.1	Minimum Sea Fish Supplies	0,0001
9.	A3.2	Reduced Fresh Fish Stock	0,0028
10.	B1.1	Public Consumption Purchasing Power Decreases	0,0291
11.	B2.1	Unemployment Increases	0,0212
12.	B2.2	Number of Employment Decreases	0,0324
13.	C1.1	Fishermen's Purchasing Power Decreased	0,0322
14.	C2.1	Fishermen Infected with COVID	0,0049
15.	C2.2	Fishermen are Reluctant to Implement Health Protocols	0,0077
16.	C3.1	Ship Productivity Decreased	0,0299
17.	C3.2	Lack of Capital So that Capital Use of Vessels Increases	0,0045
18.	D1.1	The Market Does Not Maintain Cleanliness of Sales Locations	0,0007
19.	D1.2	Traders Do Not Maintain Cleanliness of Merchandise	0,0004
20.	D1.3	The Spread of COVID in Markets is Difficult to Identify	0,0042
21.	D2.1	Market Traders Are Reluctant to Take Rapid and Swab Tests	0,0040
22.	D2.2	Traders Reluctant to Implement Health Protocols	0,0004

From the results of the calculation of the intermediate event level 2 above, the results of the intermediate level 1 probability are obtained, namely:

1. Decrease in Fish Sales = 0.2150
2. Decrease in Community Income = 0.0015
3. Decreased Activity at Sea = 0.00001
4. Decrease in Trader's Activity in the Market = 0.0098

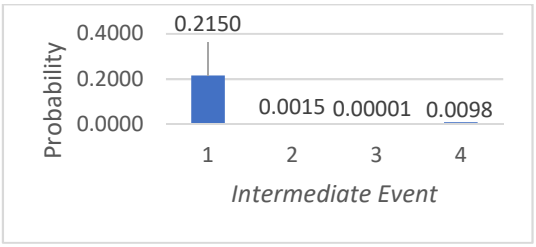

Figure 13. Intermediate Event Probability Graph

Then the top event probability of a decrease in trade and economic activity is as follows:

Table 9. Decrease in Trade and Economic Activity

No	Basic Event	Probability
1.	Decrease in fish sales	0,2150
2.	Decrease in people's income	0,0015
3.	Decreased activity at sea	0.00001
4.	Decreased activity of traders in the market	0,0098
Total (Decrease in Trade and Economic Activity)		0.2240

4. Validate Fault Tree Analysis
   This validation process has been validated by all respondents regarding the Fault Tree Analysis that has been built. The results of the probability and factors causing the decline in trade and economic activity have been presented and are considered following the conditions in Kenjeran Village, Surabaya.

4.3. Determining Mitigation Based on Analysis

COVID-19 has a major impact in almost all aspects of life, including trade and economic aspects, due to the problem factors that make it happen. Therefore, the state is struggling to overcome the various impacts of the COVID-19 outbreak in addition to coordination, an important action to reduce the impact of the COVID-19 pandemic. This requires a joint response to overcome any existing problems. One of them is in the aspect of the decrease of trade and economic activities.

Therefore it is necessary to coordinate and cooperate with all parties to overcome this problem. Amid efforts to contain the spread of the virus, it is time to think about the future and plan for recovery. Consider the various causal factors, there needs to be a policy to mitigate the impact of COVID-19 on the aspects of trade and economy in coastal areas, so it is recommended that the following policies, the government in collaboration with the health department, prioritize prevention and strict implementation of health protocols in various public places, especially trade and market locations. This is because economic activity is the main factor that cannot be left out of the view that the government's financial condition is not sufficiently funded to cover the costs of middle to lower-class citizens who rely on as traders. Changing or moving media online is one

way, but this needs to be supported by the ease of delivery. A good understanding is given by the government to traders and SMEs in order to understand technology.

From an economic perspective, the government helps maintain fish price stability, provides social assistance to revive the national economy (for example, MSMEs and fishing boats). The government should tighten the use of health protocols for traders by providing education about the importance of using health protocols. The policy of cooperation between the trade and marine fisheries offices with fishers is to conduct clustering for fishers to supply the scarcity of marine fish and limited marine products. The health office continues to monitor health protocols with the existence of swabs and rapid tests for traders.

5. CONCLUSION

Based on the Final Project, Analysis of the Impact of the Covid-19 Pandemic for Coastal Communities Using the Fault Tree Analysis (FTA) Method in the Kenjeran Coastal Area, Surabaya, conclusions can be drawn including:

1. The main factors causing the decline in trade and economic activity are divided into four factors: decreased fish sales, decreased community income, decreased activity at sea, and decreased activity of traders in the market. The decline in fish sales occurred due to three problems: decreased activity in the sea, the selling price of fish has dropped drastically, and limited types of fish that available. The decline in community income occurred due to two problems: decreasing purchasing power of public consumption and decreasing work productivity. The decline in activity at sea occurred due to three problems: decreased fishers' purchasing power, decreased fishers' productivity and decreased boat operations. The decline in the activity of traders in the market occurred due to two problems, namely the decreasing selling power of market traders and market traders who were known to be affected by COVID.
2. The results of the Fault Tree Analysis (FTA) of coastal communities facing problems with trade activities and a decline in the decline during the COVID-19 pandemic obtained a probability of 0.2240 or 22%
3. Mitigation recommendations for the coastal community of Kenjeran Beach to face a decline in trade and economic activity during the COVID-19 pandemic are as follows:
   A. The health office continues to monitor health protocols with swab tests for traders.
   B. The government, in collaboration with the health office, prioritizes prevention as well as strict implementation of the main health protocol and health protocol education in various public places, especially trade and market locations
   C. Changing or moving media online is one way, but this needs to be supported by the ease of delivery. Good understanding is given by the government to traders and SMEs in order to understand technology
   D. The government from the economic side helps to maintain fish price stability, the existence of social assistance to revive the national economy (Examples of MSMEs and Fishing Boats)
   E. The policy of cooperation between the trade, marine fishery, and fisheries offices to conduct clustering for fishers in order to supply scarcity of marine fish and limited marine products

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