IMPLEMENTATION OF FORMAL SAFETY ASSESSMENT FOR RATIFICATION CONSIDERATION OF CLC 1969 AND FUND CONVENTION

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Abstract – In 1978, Indonesia ratified convention related to compensation for marine pollution caused by oil spill, the Civil Liability Convention 1969 and the Fund Convention 1978. Then in 1999 through Presidential Decree no. 55 of 1999 Indonesia ratified the 1992 CLC Protocol, but in 1998 Indonesia withdraw the ratification of Fund Convention 1978. So from that case, there should be a review of the extent to which the ratification requirement for compensation due to oil spill. From the historical data of oil spill accident 2000 - 2017, it can be known risk level of each accident case. Using Formal Safety Assessment method in conducting risk assessment and cost benefit analysis to obtain the recommendation how far the ratification needed. The result of this research is the potential of ship accident causing oil spills such as drowning, upside down, crash, collision and pipeline leak. The cost of clean up for oil spill accident cases is varied, with the lowest value of US $ 1,380,000 and the highest value of US $ 1,035,000,000. And the consideration to ratify the necessary convention is to ratify the Supplementary Fund.

Keywords – Tanker, Ratification, Formal Safety Assessment, Civil Liability Convention, Fund Convention

INTRODUCTION

International Maritime Organization (IMO) is an international organization formed by the United Nations that oversees and regulates maritime issues. In 1969 and 1978, the IMO issued a convention governing compensation for oil spill contamination either bulk or bunkers, the Civil Convention Liability 1969 and the 1978 Convention Fund. In 1978, Indonesia ratified the convention but in 1998 the ratification of the Fund Convention repealed its validity period and was replaced by ratification of 1992 CLC Protocol in 1999. Until now, Indonesia is in the position of 1st Tier which is a state / member state which has ratified Civil Liability Convention 1969 and Civil Liability Cnvention Protocol 1992. [1]

Based on the report of NTSC 2003 - 2008, mention that in the Indonesian waters there are 37% accident ship sinking, 18% ship burned, 15% collision ship, 13% ship aground, 17% other causes. In addition, for the case of tanker accidents from 2010 to 2016 there are 54 incidents of accidents. The biggest presentation is caused by burning / exploding. [2]

From these issues, the consideration to ratify the Fund Convention and its amendments is judged to have a good or bad impact. With reference to accident report data of Navy ship and calculation of clean up cost of contaminated waters by oil hence can be known how the level of accident risk and profit and loss with consideration ratify or not Fund Convention. In this ki study, the method used is Formal Safety Assessment.

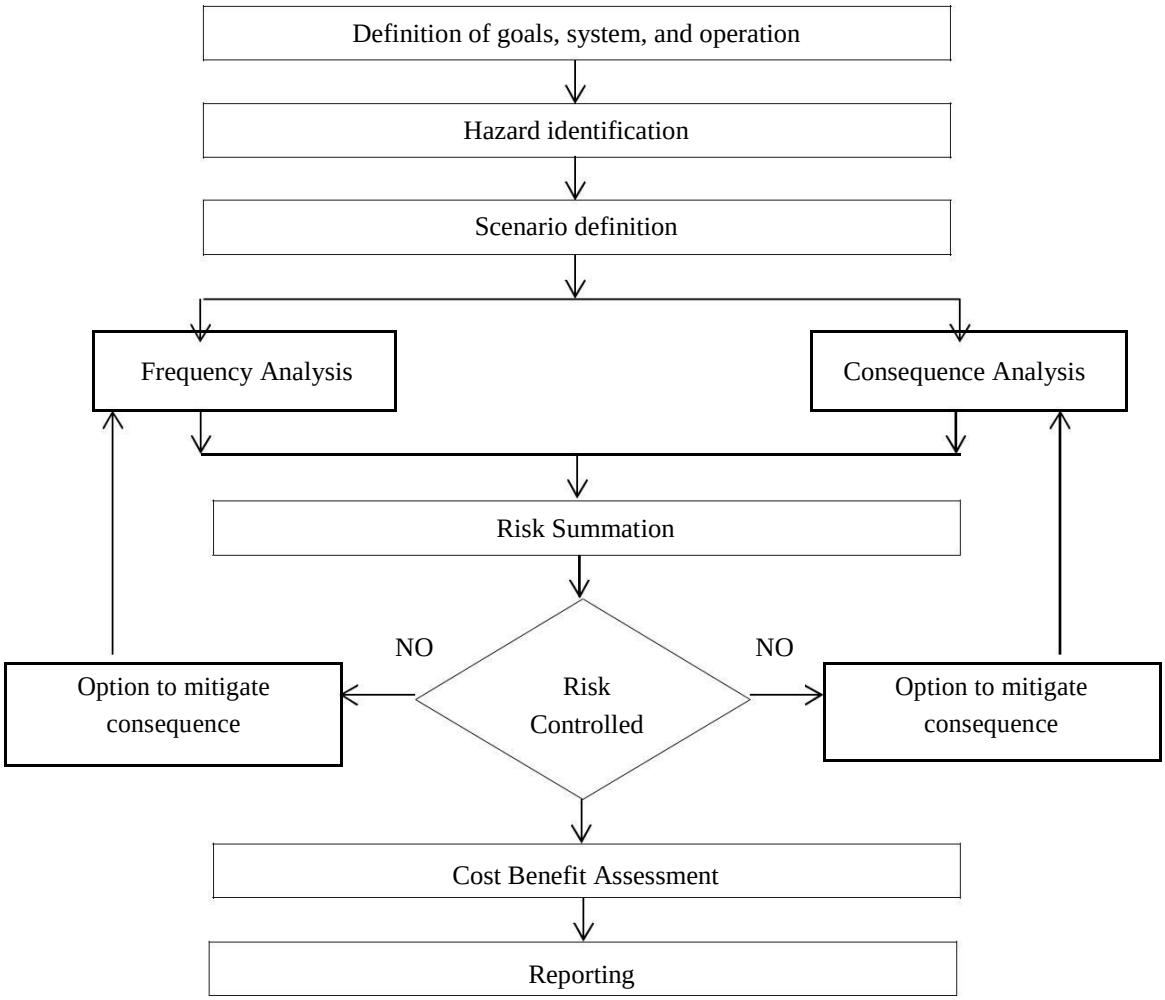
Formal Safety Assessment is divided into 5 stages including Hazard Identification, risk analysis, risk control option, cost benefit analysis, and recomendation. From these stages, we can know the level of risk of accidents occurring within a certain period of time and analyze the cost benefits derived from the consideration meratifikas / not ratify the Fund Convention and Civil Liability Convention. [3]

METHODS

The methodology used in this journal is the Formal Safety Assessment method with detailed steps as follows :

1. *Hazard Identification*

2. *Risk Analysis*
3. *Risk Control Option*
4. *Cost Benefit Analysis*
5. *Recommendation*



Flowchart 1. Scheme of Formal Safety Assessment (Source : IACS, Presentation at MSC)

RESULT AND DISCUSSION

1. Hazard Identification

There are various factors causinsg tanker crashes such as grounding, fire, collision, sinking, and others. From the report of data KNKT year 2000 - 2017 the factors that causes oil spill in Indonesian waters such as collision, crash, sink, overturned, until pipe leakage. From these data, then produce pre liminary hazard analysis as a first step to identify potential hazards, their impacts, causes, and recommendations for necessary action as described in Table 1.

Tabel 1. Pre Liminary Hazard Analysis dari kecelakaan tumpahan minyak kapal tanker

System :		Pre Liminary hazard Analysis				Analysis :	
Subsystem :						Date :	
No.	Hazard	Causes	Year	Effect	Recommendation Action	Comments	Status
PHA - 01	Collision	oil spill 9000 ton	2000	Environmental damage	a. Clean up b. Compensation for victims c. Consideration for ratification of CLC or The Fund	-	-
PHA - 02		oil spill 4000 ton	2000				
PHA - 03		oil spill 1200 ton	2001				
PHA - 04		oil spill 250 ton	2003				
PHA - 05	Sinking	oil spill 200 ton	2004				
PHA - 06		oil spill 500 ton	2007				
PHA - 07	Grounding	oil spill 150.000 ton	2008				
PHA - 08		oil spill 550 ton	2008				
PHA - 09		oil spill 2000 ton	2010				
PHA - 10	Overturned	oil spill 1100 ton	2011				
PHA - 11	Pipeline Leakage	oil spill 300 ton	2017				

2. Risk Analysis

2.1. Frequency analysis of Tanker oil spill

Frequency analysis is measured by the intensity of the event occurring over a period of time. In this case of tanker accidents that cause oil spills there are 11 cases within 17 years with an average oil spill of approximately 2000 tons per case. for further explanation, it can be seen in Table 1.

2.2. Consequence analysis of Tanker oil spill

The analysis of the consequences of tankers' accidents is measured based on how much the cost of oil spill cleanup to replace the damaged environment. Referring to Etkin D.S (2000), determining cost clean up of oil spills by the amount of oil contaminated multiplied by the cost per ton for each region. In the case of Indonesian waters equated to the cost of each tonne in cases in Australia due to similar geographical location [4]. Figure 1 shows the average cost of clean up per tonne for the whole world and in Table 2 describes the details of the costs incurred for each of the oil spill cases. From the calculations in Table 2, the compensation costs for oil spills amount to USD 3,795,000 to USD 1,035,000,000,

Table 2. Estimated clean up costs incurred for each case of oil spills

No.	Ship's Name	Year	Kind of Accident	Oil Spill (Tonnes)	Amount of Lossess (USD)
PHA - 01	KM. HHC	2000	Grounding	9000	USD 62,100,000
PHA - 02	MT. NATUNA SEA	2000	Sinking	4000	USD 27,600,000
PHA - 03	MT. STEADFAST	2001	Grounding	1200	USD 8,280,000
PHA - 04	TONGKANG PLTU	2003	Collision	250	USD 1,725,000
PHA - 05	MT. VISTA MARINE	2004	Collision	200	USD 1,380,000
PHA - 06	MT. KHARISMA SELATAN	2007	Over turned	500	USD 3,450,000
PHA - 07	MT. ARENDAL	2008	Pipeline leakage	150.000	USD 1,035,000,000

PHA - 08	MT. AEGIS LEADER	2008	Sinking	550	USD 3,795,000
PHA - 09	MT. BUNGA KELANA 3	2010	Collision	2000	USD 13,800,000
PHA - 10	MT. AB 9	2011	Grounding	1100	USD 7,590,000
PHA - 11	MT. APL Denver	2017	Collision	300	USD 2,070,000

Figure 1. Average clean up cost per tonne in different regions (Source: Etkin, D.S., 2000)

2.3. Risk Summation

After knowing the level of frequency and consequence, then the result is plotted into risk matrix. The risk matrix used is IMO HNS Mannual Guidlines for Oil Spill as in Table 3.

Table 3. *Risk Matrix of IMO HNS Mannual Guidelines for Oil Spill*

Likelihood category	Consequnce				
	Insignificant	Minor	Moderate	Major	Catasthropic
Rare	Low	Low	Moderate	Moderate	High
Unlikely	Low	Low	Moderate	High	Extreme
Possible	Low	Moderate	High	Extreme	Extreme
Likely	Moderate	High	Extreme	Extreme	Extreme
Frequent	High	High	Extreme	Extreme	Extreme

Criteria risk matrix :

a. Frequences :

- F1 : Frequent => An event occurring once a week to once an operating year.
- F2 : Likely => An eventoccuring once a year to once every 10 operating years
- F3 : Possible => An event occurring once every 10 operating years to once in 100 operating years.
- F4 : Unlikely => An event occurring less than in 100 operating years
- F5 : Rare => Considered to occur less than once in 1000 years (e.g it may have occurred at a port or harbor elsewhere in the world).

b. Consequences :

- Level 1 : Catastrophic => Extensive damage. Cost of cleanup > $10M
- Level 2 : Major => Major damage. Cost of cleanup $1M-10M
- Level 3 : Moderate => Minor damage. Cost of cleanup $100K – 1M
- Level 4 : Minor => Slight damage. Cost of cleanup $10K - $100K
- Level 5 : Insignificant => Negligible damage. Cost of cleanup $0 - $10.000.

After knowing the consequences and frequency values each - each case, then the value is plotted into the risk matrix as shown in Table 4.

Tabel 4. Risk assessment of oil spills for all cases

Likelihood category	Consequnce				
	Insignificant	Minor	Moderate	Major	Catasthropic
Rare					
Unlikely					
Possible					
Likely			**a**	**a, b, c, d**	**b, c, e**
Frequent					

Explanation :
Note **(a)** : Risk level for collision
Note **(b)** : Risk level for sinking
Note **(c)** : Risk level for grounding
Note **(d)** : Risk level for overturned ship
Note **(e)** : Risk level for pipeline leakage

From the result of laying the note for each case, it can be concluded that the tanker oil spill accident is at extreme level with the frequency level in the likely (accident occurs once in a year to 10 years of operation) and the level of consequence in moderate, major, and catasthropic (average level of major damage). Clean up costs incurred in the case of tanker oil spill accidents are approximately $ 1M - $ 10M.

3. Risk Control Option

3.1. Option to decrease frequence

Option to lower the risk level on the risk matrix is to decrease the frequency level. It is known that the frequency level refers to the high intensity of tankers passing through Indonesia for a year. If the frequency for the voyage is limited in number then the trade that passes through the sea lane can not be maximized. In the case of Malacca Strait, the intensity of continental shipping occurs every day and the high number of oil demand to East Asia causes the Malacca Strait to be one of the sea road options used for trade routes. Currently, oil traffic through the Malacca Strait is three times greater than oil traffic passing through the Panama Canal and 15 times larger than the Suez Canal [5]. Therefore, if the oil spill prevention option by lowering the frequency of tankers passing through the Malacca Strait needs to be reexamined because it affects the industrial sector and the economy of the affected area.

3.2. Option to decrease consequence

In addition to lowering the frequency level, how to lower the risk level on the risk matrix is to lower the level of consequences. Consequences resulting from oil tanker spill accidents are the cost of oil spill compensation to be paid by the sacrifice, the environmental impact of oil spill, the socio-economic impact of fishermen due to the polluted sea area, etc.

Countermeasures to prevent oil spills can be done by:

a. Enforce a double hull rule for tankers.
b. Tightening will be regulation in terms of the procedure of transporting oil and oil disposal at sea.
c. Tightening the minimum insurance value that must be paid as a guarantor in case of oil spill accidents
d. Enforcement of government regulations in terms of minimum oil spill compensation costs, etc.

4. Cost Benefit Analysis

Cost-benefit analysis method is a method used to analyze a set of costs and benefits relevant to an activity / decision-making [6].

4.1. Cost Analysis

Cost analysis is obtained from the amount of clean up cost required plus the cost of ratification paid annually for member state. Each country with oil imports of more than 150,000 tonnes per year will be charged a ratification fee as a premium if an oil spill accident occurs in the coastal state or port state [7]. Each year, Indonesia's oil needs vary. In 2013, the average Indonesia needs oil imports of 600,000 barrels per day or 29,871,600 tons per year [8]. So from the value can be estimated the value of the costs incurred by Indonesia when ratified the convention. The calculation equation can be seen:

Cost (ΔC) : (Total contribution of oil per year x Contribution per ton for each oil (in US $) + Total Cleaned Loss

For CLC 1969 and 1992 CLC Protocol, there is no obligation to pay premiums per year, whereas in the Fund Convention and Supplementary Fund there is a premium to be paid per year as a guarantor fee in case of oil spill accidents.

Table 5. Cost analysis results for each case and convention

Ship's Name	Cost = Cost of ratified (US$) + Cost of Clean up (US$)				
	CLC 1969	Fund Convention 71/78	CLC Protokol 1992	Fund Protokol 1992	Supplementary Fund
KM. HHC	$62,100,000	$62,100,000	$62,100,000	$62,366,837.84	$62,166,882.21
MT. Natuna Sea	$27,600,000	$27,600,000	$27,600,000	$27,866,837.84	$27,666,882.21
Mt. Steadfast	$8,280,000	$8,280,000	$8,280,000	$8,546,837.84	$8,346,882.21
Tongkang PLTU	$1,725,000	$1,725,000	$1,725,000	$1,991,837.84	$1,791,882.21
MT. Vista Marine	$1,380,000	$1,380,000	$1,380,000	$1,646,837.84	$1,446,882.21
MT. Kharisma Selatan	$3,450,000	$3,450,000	$3,450,000	$3,716,837.84	$3,516,882.21
Mt. Arendal	$1,035,000,000	$1,035,000,000	$1,035,000,000	$1,035,266,837.84	$1,035,066,882.21
MT. Aegis Leader	$3,795,000	$3,795,000	$3,795,000	$4,061,837.84	$3,861,882.21
MT. Bunga Kelana 3	$13,800,000	$13,800,000	$13,800,000	$14,066,837.84	$13,866,882.21
MT. AB9	$7,590,000	$7,590,000	$7,590,000	$7,856,837.84	$7,656,882.21
MT. APL Denver	$2,070,000	$2,070,000	$2,070,000	$2,336,837.84	$2,136,882.21

4.2. Benefit Analysis

The benefits derived from ratify the 1992 Convention Convention is :

- ✓ Should there be a vessel in an accident causing an oil spill, then the flag-affected country in particular Indonesia will receive the compensation costs required by the 1992 Convention Fund.
- ✓ Reduce the impact of larger losses by the shipowner in terms of payment of compensation provided to the victim.

Estimated mathematical calculations of benefits derived from the ratification of the 1992

Protocol Fund and the Supplementary Fund among others :

Benefit (ΔB) : The amount of compensation received

Table 6. Results of benefit analysis issued for each case and convention

Ships Name	Benefit : Amount of benefit (US$)				
	CLC 1969	Fund Convention 71/78	CLC Protokol 1992	Fund Protokol 1992	Supplementary Fund
KM. HHC	$19,116,300	$136,545,000	$122,576,447	$277,186,350	$1,024,087,500
MT. Natuna Sea	$19,116,300	$136,545,000	$122,576,447	$277,186,350	$1,024,087,500
Mt. Steadfast	$19,116,300	$136,545,000	$122,576,447	$277,186,350	$1,024,087,500
Tongkang PLTU	$19,116,300	$136,545,000	$122,576,447	$277,186,350	$1,024,087,500
MT. Vista Marine	$19,116,300	$136,545,000	$122,576,447	$277,186,350	$1,024,087,500
MT. Kharisma Selatan	$19,116,300	$136,545,000	$122,576,447	$277,186,350	$1,024,087,500
Mt. Arendal	$19,116,300	$136,545,000	$122,576,447	$277,186,350	$1,024,087,500

Table 6. Results of benefit analysis issued for each case and convention (Continued)

Ships Name	Benefit : Amount of benefit (US$)				
	CLC 1969	Fund Convention 71/78	CLC Protokol 1992	Fund Protokol 1992	Supplementary Fund
MT. Aegis Leader	$19,116,300	$136,545,000	$122,576,447	$277,186,350	$1,024,087,500
MT. Bunga Kelana 3	$19,116,300	$136,545,000	$122,576,447	$277,186,350	$1,024,087,500
MT. AB9	$19,116,300	$136,545,000	$122,576,447	$277,186,350	$1,024,087,500
MT. APL Denver	$19,116,300	$136,545,000	$122,576,447	$277,186,350	$1,024,087,500

In principle, cost benefit analysis is used to analyze / calculate the output obtained from the cost and benefit ratio resulting from the selected risk control option [9]. According to the Marine Pollution Bulletin, to calculate the cost benefit of oil spill cases, it can be calculated using the formula :

Where :

Where :

a. BCR = Benefit Cost Ratio
b. *(PV) B* = Amount of Benefit
c. *(PV) C* = Amount of Cost

Indikasi :

If the index ratio> 1 then the proposal is accepted, and if the index ratio <1, then the proposal is rejected. The greater the ratio then the consideration for ratifying the convention is better [10].

Table 7. Ratio of benefit benefits derived from consideration of ratification of convention in each case

Ships name	Ratio Benefit Cost each convention				
	CLC 1969	Fund Convention 71/78	CLC Protokol 1992	Fund Protokol 1992	Supplementary Fund
KM. HHC	0.31	2.20	1.97	4.44	16.5
MT. Natuna Sea	0.69	4.95	4.44	9.95	37.0
Mt. Steadfast	2.31	16.49	14.80	32.43	122.7
Tongkang PLTU	11.08	79.16	71.06	139.16	571.5
MT. Vista Marine	13.85	98.95	88.82	168.31	707.8
MT. Kharisma Selatan	5.54	39.58	35.53	74.58	291.2
Mt. Arendal	0.02	0.13	0.12	0.27	1.0
MT. Aegis Leader	5.04	35.98	32.30	68.24	265.2
MT. Bunga Kelana 3	1.39	9.89	8.88	19.70	73.9
MT. AB9	2.52	17.99	16.15	35.28	133.7
MT. APL Denver	9.23	65.96	59.22	118.62	479.2

CONCLUSION

Based on the results of the research of risk assessment steps to the analysis of economic terms then it can be concluded as follows:

1. As for the cause of the accident tanker that resulted in oil spills Tubrukan, Kandas, Tenggelam, Reversed, Leakage Pipe.
2. As a result of the tanker's accident, causing oil spills and polluting the affected environment. During the period of 2000 - 2017 there were 11 tanker accidents causing oil spills. In this case, the cleanup costs incurred by the shipowner to reduce environmental impacts are seen in Table 13.
3. Risk control selected among which is ratified international convention, from calculation table 7 can be concluded that consideration ratify to supplementary fund. The effects of ratifying the Fund protocol and Supplementary Fund are: :
   a. The cost of contributions made each year to the IOPC Fund.
   b. The compensation cost is more than IOPC fund, but the compensation cost is given in case of accident.
   c. Compensation is provided if there is a claim from the owner / victim of the accident case.
   d. Payments for oil spill cases will be fully done by IOPC Fund.

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