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The Effect of The Implementation of International Maritime Law and The Quality of Ship Crew on The Prevention of Coastal Environmental Pollution with Ship Safety as a Mediation in The Bintan Island Area

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Abstract: This study aims to investigate the effect of the implementation of international maritime law and the quality of ship crews on the prevention of coastal environmental pollution with ship safety as a mediating variable in the Bintan Island area. With a focus on the issues of the implementation of maritime regulations that are not yet optimal and the variability of the quality of ship crews, this study uses a quantitative descriptive method approach with a sample of 160 ship crews in Bintan Island. The standard theory in takingThe samples used in this study were obtained using the Nonprobability Sampling technique with Saturated Sampling. Data were collected through a questionnaire that measured the variables of the application of international maritime law, the quality of the ship's crew, ship safety, and prevention of coastal environmental pollution. Data analysis was carried out using Structural Equation Modeling Partial Least Squares (SEM-PLS) to evaluate the relationship between variables. The results of the study indicate that the application of international maritime law has a significant effect on ship safety and prevention of coastal environmental pollution. In addition, the quality of the ship's crew also affects ship safety and pollution prevention efforts. Ship safety has been shown to play a significant role as a mediator in the relationship between the application of international maritime law andquality of ship crews with prevention of coastal environmental pollution. The discussion of these findings indicates that increasing the implementation of international maritime law and improving the quality of ship crews can improve ship safety and reduce environmental pollution. Ship safety plays a crucial role in mediating this relationship. This study concludes that stricter policies and effective training for ship crews will contribute to the protection of the coastal environment in Bintan Island. The implications of these results emphasize the importance of implementing better maritime policies and improving the competence of ship crews to achieve optimal results in preventing coastal environmental pollution.

Keyword: International Maritim Law, Crew Quality, Ship Safety, Coastal Pollution Prevention

INTRODUCTION

Globally, coastal pollution from ship activities has become a major focus in marine environmental protection efforts. According to data from the International Maritime Organization (IMO), oil spills and ship waste discharges are significant contributors to marine pollution. Waste management technology and ship monitoring systems have advanced rapidly, such as the use of more efficient ship waste management systems and satellite-based monitoring systems to track illegal dumping. Developed countries such as the United States and the European Union have implemented strict regulations, such as MARPOL Annex I which prohibits oil discharges at sea, as well as sophisticated monitoring systems to ensure compliance with these regulations. However, challenges remain in terms of consistent application of regulations in developing countries and monitoring in vast international waters.

In Indonesia, coastal pollution from ships is also a serious problem affecting various coastal areas, including island regions such as Bintan Island. Findings show that oil spills and waste discharges from ships frequently occur in Indonesian waters, contributing to coastal pollution and damage to marine ecosystems. Data from the Indonesian Ministry of Marine Affairs and Fisheries shows an increase in cases of pollution from shipping and oil activities. Ship waste management in Indonesia often faces challenges, such as the lack of adequate waste treatment facilities and difficulties in law enforcement. Preventive efforts include the implementation of national regulations and collaboration with international institutions, but challenges in terms of consistent supervision and law enforcement remain major issues. Education and training programs for ship crews and improvements to waste management infrastructure are still needed to improve this situation and reduce the impact of pollution on the coastal environment.

Efforts to prevent coastal environmental pollution have involved policies and regulations such as Law No. 32 of 2009 concerning Environmental Protection and Management, as well as various regional regulations designed to protect coastal ecosystems. Despite significant progress, challenges in implementation remain, especially in terms of effective supervision and law enforcement.

Judging from the sectors and aspects that exist in the Indonesian archipelago, which certainly contains a lot of wealth and potential that can be utilized, Bintan Island is a district in the Riau Islands province that has a strong character and relationship to the sea area with the sector and aspects, where the Riau Islands are one of the provinces in Indonesia that has an area almost entirely of 8,201.72 km², about 96% is ocean, and only about 4% is land. The Bintan Regency area is dominated by sea areas, therefore most of its people are coastal communities.

Figure 1. Seagrass is one of the marine ecosystems that is often polluted in the coastal area of Bintan Island.

As a coastal community, the majority of their livelihoods are fishermen or fishing activities, where fish are living creatures that are included in the marine ecosystem whose sustainability needs to be considered, the existence of this ecosystem is greatly influenced by marine environmental pollution around the area where they grow and develop.

The existence of this marine ecosystem has occurred in almost all coastal areas, this existence is often attacked by pollution of the surrounding sea which causes damage itself, pollution can be caused by means of transportation that cross this area or the community around the area, which we can all know that public awareness of the environment is still low in Indonesia.

Table 1. Percentage Table of Polluted Ecosystems in the Coastal Area of Bintan Island

NO	POLLUTION CAUSES DAMAGE	SCALE OF DAMAGE TO SUSTAINABLE MARINE ECOSYSTEMS ON BINTAN ISLAND (%)
1	Black oil pollution (sludge oil)	30
2	Plastic waste pollution	25
3	Chemical pollution	5
4	Noise pollution	15
5	Air pollution	25

Kategori	%	Karang Mati %	Indeks Mortalitas %
Dead Coral Algae (DCA)	42.33	48.02	0.4894
Diseased Coral (DCOR)	0.07		
Old Dead Coral (ODC)	2.34		
Recently Dead Coral (RDC)	3.28		

Figure 2. Table of percentage of dead coral reefs caused by infrastructure development activities and economic development and coral mortality index values around the coastal areas of Bintan Island.

At this time, the pollutant that is dangerous and often pollutes the marine environment is oil. The results of a survey on November 4, 2009, the area affected by pollution reached 16,420 square kilometers. Pollutants in this case are oil that enters the marine ecosystem not only can directly damage the marine environment, but can also be dangerous for the food supply and marine habitat which is a source of natural wealth for a region.

Grafik: Wilayah Terdampak Minyak (Sludge Oil) di Perairan Kabupaten Bintan (sumber: DLH Bintan)

Figure 3. Graph of Oil-Affected Areas (sludge oil) in the Waters of Bintan Island

Table 2. Table of Oil-Affected Areas (sludge oil) in the Waters of Bintan Island

No	Areas affected by oil spills	Area affected (km)	Zone
1	Lagoi Beach	42, 36	1 (red symbol)
2	Sakera Beach	18.9	2 (orange symbol)
3	Berakit Beach	13.22	3 (yellow symbol)
4	Trikora Beach	27.64	4 (blue symbol)

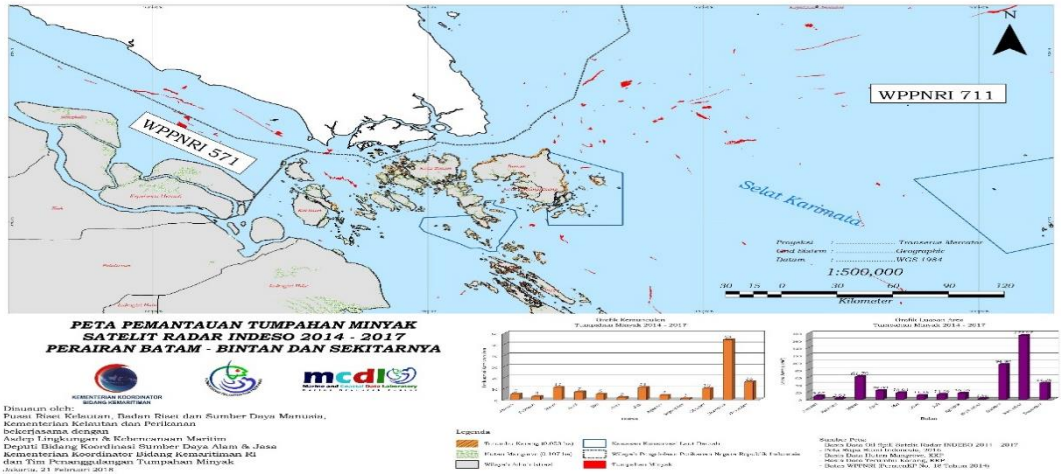


Figure 4. Oil Spill Monitoring Map of Bintan Island Waters

One interesting thing that has become an ongoing phenomenon on Bintan Island is that coastal pollution in the form of clumps of dirty oil (sludge oil) is often found during the north wind season along the northern coast of Bintan Island, stretching from Lagoi Beach to Berakit Beach. Various efforts and research have been carried out by both the local government, in this case Bintan Regency, and the central government to find out the cause of the pollution and to overcome it so that the pollution can be stopped.

Table 3. Oil Spill Monitoring Map of Bintan Island Waters

Period 2014-2017	The Emergence of Oil Spills	Change	Oil Spill Area Size	Change
January	5		9.05	
February	3	-2	2.53	- 6.52
March	11	+8	61.70	+59.17
April	7	-4	24.00	-37.70
May	5	-2	18.03	-6.87
June	2	-3	11.16	-2.43
July	11	+9	13.59	+2.43
August	4	-7	16.76	+3.17
September	1	-3	1.90	-14.86
October	10	+9	94.98	+93.08
November	54	+44	174.07	+75.09
December	16	-38	44.26	-129.81

The community must be aware and obliged to protect the existence of marine ecosystems as their life support. Because the way to overcome damage to the marine environment, actually lies within humans themselves depending on their will whether or not someone wants to do it. Damage to the marine environment causes an imbalance between the environment and life activities. This can have a bad impact on life, namely the many disasters

that threaten human life such as abrasion that erodes the coast, rising sea levels and the sustainability of resources such as coral reefs and fish can become extinct.

Pasal 192-237 : Perlindungan dan Pelestarian Lingkungan Laut	• Hak berdaulat (Pasal 193) atas kekayaan sumber daya alam di laut.	• Wajib melindungi dan melestarikan lingkungan laut. • Mencegah, mengurangi, dan mengendalikan pencemaran laut. • Wajib bekerja sama regional dan global. • Membuat UU tentang pencegahan, pengurangan, dan pengendalian pencemaran laut • Penegakan hukum oleh negara pantai, negara bendera, negara pelabuhan.	• Koordinasi dengan KLH yang telah membuat peraturan perundang-undangan tentang lingkungan hidup dan pengendalian pencemaran laut. • Perlu dibuat uu tentang pencegahan dan pengen-dalian pencemaran laut, menggantikan PP No. 19 Tahun 1999

Figure 5. The Sound of the Regulations for the Protection and Preservation of the Marine Environment

Bintan Island is an area that often experiences the weak impacts of marine environmental pollution because it is a water area where ship traffic results in pollution of materials or substances from the ship, which greatly affects the condition of the existence of the marine ecosystem and the benefits of sea water for the needs of the community in the area.

Figure 6. Evidence of Marine Environmental Pollution in the Coastal Area of Bintan Island

Figure 7. Government Efforts to Combat Water Pollution on Bintan Island

The Bintan Island region, as one of the tourism destinations and maritime industry centers, faces special challenges in terms of ship safety and prevention of coastal environmental pollution. The development of ship safety in this region includes the implementation of international standards such as SOLAS and ISM Code, which aim to ensure the operational safety of ships and environmental protection. However, coastal environmental pollution due to shipping and industrial activities remains a major problem. To address this, the Indonesian Government and related parties have implemented policies that include monitoring water quality, ship waste management, and increasing awareness of the importance of the environment.

Bintan Island is experiencing rapid development in the tourism and maritime industry sectors. Modern port infrastructure, improved shipping facilities, and investment in sustainable tourism industries show significant progress. However, this growth also poses challenges, especially in terms of environmental management and ship safety. Progress on Bintan Island must be balanced with effective policies to address environmental impacts and ensure that development does not harm coastal ecosystems. Local governments, the private sector, and communities must work together to create sustainable solutions.

Preventing coastal environmental pollution caused by ship activities is an important issue that is gaining increasing attention worldwide. Coasts, which are transition zones between land and sea, have ecosystems that are highly vulnerable to various forms of pollution. Ships, whether cargo ships, tankers, or cruise ships, have the potential to become sources of pollution through oil spills, waste discharges, and exhaust emissions. With the increase in global maritime activity and the growth of the shipping industry, the risk of coastal pollution is becoming increasingly significant, affecting the health of ecosystems, biodiversity, and the quality of life of coastal communities. Factors that influence the prevention of this pollution include international regulations, waste management technologies, crew training, and effective supervision and law enforcement.

Coastal pollution prevention involves measures and strategies to reduce or eliminate the negative impacts of human activities on coastal ecosystems. This includes waste management, pollution control, and coastal habitat protection. Coastal pollution prevention issues on Bintan Island include the lack of effective waste management facilities and systems to handle industrial and domestic waste. Low levels of awareness and outreach to the community and industry about environmentally friendly practices. Challenges in monitoring and enforcing laws against violations that cause coastal pollution.

The application of international maritime law refers to the implementation and enforcement of internationally agreed regulations and conventions to govern maritime activities, including shipping, protection of the marine environment, and the safety of ships.

Konvensi Hukum Laut Internasional (UNCLOS) 1982	Hak-Hak Indonesia	Kewajiban Indonesia	Keterangan/ Rekomendasi
Pasal 1 : (4)"*Pollution of the marine environment"* *(5) dumping*	Hak berdaulat eksploitasi lingkungan laut (Pasal 193).	Wajib melindungi dan Melestarikan lingkungan laut (Pasal 192).	• Perlu ditetapkan batas wilayah perairan pedalaman. • Sudah ada di PP. No. 19 Tahun1999 sebaiknya ditingkatkan ke UU. • Dumping tunduk pada LDC 1972.

Figure 8. International Rules Regarding Environmental Pollution

International maritime law is maritime law that is enforced internationally as part of the law between nations/countries. In this case, there are several international environmental law rules that regulate the problem of marine environmental pollution, namely:

1. *United Nations Convention on the Law of the Sea 1982 (UNCLOS)*
2. *International Conventions on Civil Liability for Oil Pollution Damage 1969 (Civil Liability Convention).*
3. *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (London Dumping Convention).*
4. *The International Covention on Oil Pollution Preparedness Response And Cooperation 1990 (OPRC).*
5. *International Convention for the Prevention of Pollution from Ships 1973 (Marine Pollution).*

In the Djuanda Declaration in 1957, it was emphasized that Indonesiais an archipelagic country that has its own characteristics, Indonesia is one of the countries included in the group of maritime countries. The geographical conditions of Indonesia make this country included in the maritime country. In this case, Indonesia as a vast maritime country certainly has many problems or obstacles in implementing environmental prevention at sea. There are several reasons that underlie Indonesia being called a maritime country, including its vast sea area, abundant marine wealth, advanced in the field of fisheries, maritime culture, geostrategic. Based on the performance report of the Coordinating Ministry for Maritime Affairs and Investment of the Republic of Indonesia in 2018, the Indonesian sea holds a lot of life, including 37% of the world's biological resource species, 17.95% of the world's coral reefs, and 30% of mangrove forests and seagrass beds. The Indonesian sea which holds a lot of wealth if utilized optimally can provide benefits for the welfare of the people.

International maritime law aims to create global standards that protect the sea and coastal areas, and regulate relations between countries with maritime interests. The application of international maritime law in Bintan Island faces several problems, including: Difficulties in coordination between different government agencies in implementing international regulations, such as MARPOL and UNCLOS. Problems in enforcing the law against violations of maritime regulations that lead to environmental pollution and violations of ship safety.

Challenges in ensuring that the shipping and tourism industry complies with international standards for preventing pollution and accidents. Crew quality encompasses the responsibilities and functions performed by crew members to ensure the safe and efficient operation of the ship. This includes tasks such as navigation, ship maintenance, cargo handling, and compliance with maritime and safety regulations. Crew quality in Bintan Island faces several issues, including deficiencies in crew training and qualifications that affect their ability to handle emergency situations and ensure ship safety. Lack of awareness among crew members regarding environmental pollution prevention procedures and their responsibilities for environmental protection. Difficulty in ensuring crew compliance with international and local regulations governing ship safety and pollution prevention.

Ship safety refers to the measures and procedures implementedto protect ships and crews from harm during shipping operations. This includes maintenance, care, crew training, and compliance with international safety regulations. Ship safety in Bintan Island faces several problems, including: Lack of routine maintenance and inspections on ships resulting in potential risks of accidents and damage. Limitations in ship safety training for ship crews, which potentially increases the risk of accidents. Problems in enforcing ship safety regulations that can result in accidents and safety issues.

International maritime law sets standards and regulations governing maritime activities and environmental protection, while the quality of the ship's crew ensures compliance with these regulations and implements pollution prevention measures. Ship safety serves as a mediator in this relationship because a safe and well-maintained ship can reduce the risk of pollution due to accidents or damage. With the existence of international maritime regulations and adequate training for ship crews, ship safety can be improved, which in turn reduces the impact of coastal environmental pollution. The combination of effective law enforcement, active participation of ship crews, and focus on ship safety are key to protecting the coastal environment of Bintan Island and ensuring the sustainability of the marine ecosystem.

Based on the description that has been presented above, the researcher is interested in taking the title "The Influence of the Implementation of International Maritime Law and the Quality of Ship Crews on the Prevention of Coastal Environmental Pollution in the Bintan Island Region with Ship Safety as a Mediation".

From the identification and limitations of the problem, the author formulates the problem as follows:

1. Is there any influence of the application of international maritime law on ship safety in the Bintan Island area?
2. Is there any influence of crew quality on ship safety in the Bintan Island area?
3. Is there any influence of the application of international maritime law on preventing coastal environmental pollution in the Bintan Island area?
4. Is there any influence of crew quality on preventing coastal environmental pollution in the Bintan Island area?
5. Is there any influence of ship safety on preventing coastal environmental pollution in the Bintan Island area?
6. Is there an indirect influence of the implementation of international maritime law on the prevention of coastal environmental pollution through ship safety in the Bintan Island area?
7. Is there an indirect influence of crew quality on preventing coastal environmental pollution through ship safety in the Bintan Island area?

METHOD

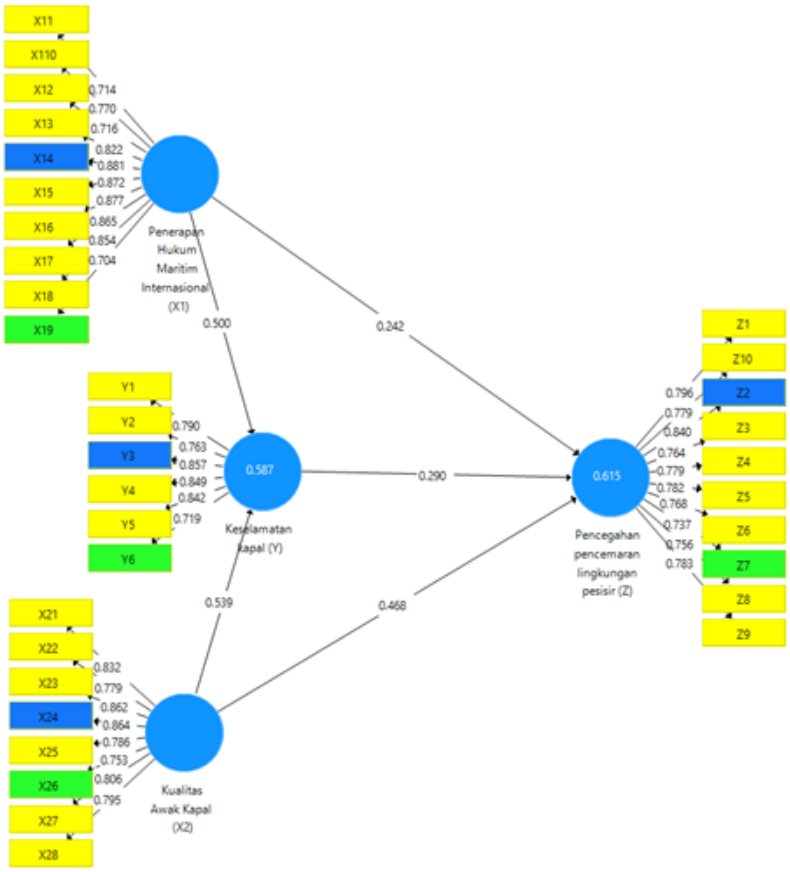
In order to write this thesis, the method used in the research is the survey method, while based on the data used is Quantitative research. According to Arikunto (2012:12): "The quantitative method is an objective research approach, covering the collection and analysis of quantitative data and using statistical testing methods" The research method is basically a scientific way to obtain data with certain goals and uses. The scientific way means that this research activity is based on scientific characteristics, namely rational, empirical, and systematic. Rational means that the research activity is carried out in reasonable ways, so that it is accessible to human reasoning.PThe general population in this study is all ships that cross the Bintan Island area during 2024, where as many as 80 ships cross the Bintan Island area every day. Therefore, the population in the study of ship crews in this case the Engineer and KKM is 160 research populations. The sample used in this study was obtained using the sampling technique (sampling technique) Nonprobability Sampling with Saturated Sampling. Researchers use this sampling technique because the population is 160 people. "According to Riduwan (2012:64), "saturated sampling is a sampling technique when the entire population is

used as a sample and is also known as a census." So Saturated sampling was carried out with a sample of 160 ship crews, in this case KKM and Engineers.

Data processing is done by testing the validity and reliability using Convergent Validity and Composite Reliability analysis. The data is then analyzed using Smart PLS 3.9.2 software to test the structural and measurement models. The analysis technique used is Partial Least Squares (PLS), which allows the analysis of causal relationships between independent, dependent, and intervening variables and hypothesis testing. Researchers test the causal relationship between independent, dependent, and intervening variables using the coefficient of determination (R2) and predictive relevance (Q2). In addition, they also test the validity and reliability of the construct through convergent validity, discriminant validity, composite reliability, and average variance extracted (AVE). Researchers also use t-statistics and p-values to determine the acceptance or rejection of the hypothesis with the criteria of t-statistics> 1.96 and p <0.05.

RESULTS AND DISCUSSION

BeBased on the analysis, it was found that the correlation of each item to its own variable has a greater value than the correlation of items to other variables. In this study, all items are categorized according to the rule of thumb of discriminant validity testing so that the data can be analyzed further.



Source: SEMPLS Processing (2024)

Figure 9. Outer Model Structural Model Validity testing or convergent validity uses outer loading values. The following are the results of validity testing for each variable.

Table 4. Validity Testing

Variables	Indicator	Loading Factor	Information
	X11	0.714	Valid

Application of International Maritime Law (X1)	X12	0.716	Valid
	X13	0.822	Valid
	X14	0.881	Valid
	X15	0.872	Valid
	X16	0.877	Valid
	X17	0.865	Valid
	X18	0.854	Valid
	X19	0.704	Valid
	X110	0.770	Valid
Crew Quality (X2)	X21	0.832	Valid
	X22	0.779	Valid
	X23	0.862	Valid
	X24	0.864	Valid
	X25	0.786	Valid
	X26	0.753	Valid
	X27	0.806	Valid
	X28	0.795	Valid
Ship safety (Y)	Y1	0.790	Valid
	Y2	0.763	Valid
	Y3	0.857	Valid
	Y4	0.849	Valid
	Y5	0.842	Valid
	Y6	0.719	Valid
Prevention of coastal environmental pollution (Z)	Z1	0.796	Valid
	Z2	0.840	Valid
	Z3	0.764	Valid
	Z4	0.779	Valid
	Z5	0.782	Valid
	Z6	0.768	Valid
	Z7	0.737	Valid
	Z8	0.756	Valid
	Z9	0.783	Valid
	Z10	0.779	Valid

Source: SEMPLS Processing (2024)

The results of processing using SmartPLS can be seen in the table above. The outer model value or correlation between constructs and variables shows that overall the loading factor value is greater than 0.7 so that the constructs for all variables are valid from the model. The following are the results of the initial outer model structural model.

On the tablel 2 it can be seen that the criteriaria in Ave*rageVarianceEextractd*is aeach indicator thatngumyr the construction must bes memasterAVE value calculation> 0.5 seuntil memenosharknsur construct validityk. Uyouk mengeknowi Discriminant Validity between indicators and variablesl, can be seen meTheni Cross Loadings value and uJi Forne*ll Larcker* in table 5.

Table 5. Fornell-Larcker Criterion between Variables

	Ship safety (Y)	Crew Quality (X2)	Prevention of coastal environmental pollution (Z)	Application of International Maritime Law (X1)
Ship safety (Y)	0.805			
Crew Quality (X2)	0.582	0.810		
Prevention of coastal environmental pollution (Z)	0.694	0.658	0.779	
Application of International Maritime Law (X1)	0.547	0.086	0.440	0.811

Source: SEMPLS Processing (2024)

Table 6. Cross Loading between Latent Variables and Indicators

	Application of International Maritime Law (X1)	Crew Quality (X2)	Ship safety (Y)	Prevention of coastal environmental pollution (Z)
X11	0.714	0.056	0.471	0.325
X12	0.716	-0.001	0.446	0.263
X13	0.822	0.133	0.468	0.393
X14	0.881	0.107	0.447	0.413
X15	0.872	0.119	0.478	0.422
X16	0.877	0.014	0.438	0.321
X17	0.865	0.125	0.469	0.411
X18	0.854	0.150	0.474	0.394
X19	0.704	-0.058	0.325	0.238
X110	0.770	-0.026	0.381	0.332
X21	0.094	0.832	0.554	0.595
X22	0.072	0.779	0.449	0.477
X23	0.047	0.862	0.481	0.604
X24	0.111	0.864	0.527	0.590
X25	0.029	0.786	0.388	0.422
X26	-0.016	0.753	0.390	0.430
X27	0.055	0.806	0.458	0.572
X28	0.140	0.795	0.492	0.522
Y1	0.382	0.495	0.790	0.579
Y2	0.415	0.467	0.763	0.527
Y3	0.484	0.475	0.857	0.545
Y4	0.514	0.478	0.849	0.560
Y5	0.461	0.460	0.842	0.604
Y6	0.375	0.438	0.719	0.537
Z1	0.262	0.551	0.501	0.796
Z2	0.367	0.487	0.551	0.840
Z3	0.313	0.544	0.597	0.764
Z4	0.386	0.490	0.582	0.779
Z5	0.335	0.569	0.534	0.782
Z6	0.371	0.459	0.545	0.768
Z7	0.295	0.509	0.512	0.737
Z8	0.364	0.464	0.509	0.756
Z9	0.280	0.507	0.519	0.783

	Application of International Maritime Law (X1)	Crew Quality (X2)	Ship safety (Y)	Prevention of coastal environmental pollution (Z)
Z10	0.442	0.532	0.545	0.779

Source: SEMPLS Processing (2024)

The results of the Fornell-Larcker Criterion and cross loading between all latent variables with indicator variables that have been shown in the table above that the value of an indicator is greater in calculating variables from other constructs. Based on these results, it can be stated that each indicator used has good discriminant validity to form its respective variables.

Table 7. R-Square (R2) Test Results

	R Square	R Square Adjusted
Ship safety (Y)	0.587	0.582
Prevention of coastal environmental pollution (Z)	0.615	0.608

Source: SEMPLS processed data (2024)

DadFrom the table above, it can be seen that the ship safety variable has a large R2 value, the R2 value is 0.587 with an Adjusted R2 value of 0.582, indicating that the contribution of the variables of the application of international maritime law and the quality of the ship's crew to ship safety is 58.7%, while the remaining 41.3% is the influence of other variables not used in this study.

YesThe variable for preventing coastal environmental pollution has a large R2 value, the R2 value is 0.615 with an Adjusted R2 value of 0.608 indicating that the variables for the application of international maritime law, the quality of the ship's crew and ship safety on preventing coastal environmental pollution are 61.5% while the remaining 38.5% is the influence of other variables not used in this study.

The significance of the estimated parameters provides very useful information about the relationship between the research variables. The basis used in testing the hypothesis is the value contained in the output path coefficient.

1. Direct Influence Analysis

Table 8. Direct Influence Analysis

Hypothesis	Influence	Original Sample (O)	T Statistics (|O/STDEV|)	P Values	Information
H1	Implementation of Maritime Law International (X1) -> Ship safety (Y)	0.500	6,799	0.000	Significant
H2	Crew Quality (X2) -> Ship safety (Y)	0.539	8.242	0.000	Significant
H3	Implementation of Maritime Law International (X1) -> Pollution prevention coastal environment (Z)	0.242	2.986	0.003	Significant
H4	Crew Quality (X2) -> Pollution prevention coastal environment (Z)	0.468	4.625	0.000	Significant
H5	Ship safety (Y) -> Pollution prevention coastal environment (Z)	0.290	2.413	0.016	Significant

Source: SEMPLS Processing (2024)

Based on the direct influence hypothesis testing above, it can be explained as follows.

1) Hypothesis Testing 1: Direct Effect of Implementation of International Maritime Law on Ship Safety.

   Based on Table 8 above, it shows that the influence of the Implementation of International Maritime Law on ship safety with a parameter coefficient of 0.500 which indicates that the direction of influence between the Implementation of International Maritime Law on ship safety is positive at 0.500. This means that if there is an increase in the Implementation of International Maritime Law by 1 unit, ship safety increases by 0.500. Furthermore, based on the T-Statistics H1 of 6.799 which is greater than its level or 6.799> 1.64, and the P-values H1 of 0.000 which is smaller than the real level or 0.000 <0.05, this shows that the direct influence of the Implementation of International Maritime Law on ship safety is significant. Therefore, it can be concluded that H1 is accepted, then there is a positive and significant direct influence of the Implementation of International Maritime Law on ship safety.

2) Hypothesis Testing 2: Direct influence of Crew Quality on Ship Safety.

   Based on Table 8 above, it shows that the influence of Crew Quality on ship safety with a parameter coefficient of 0.539 which indicates that the direction of influence between Crew Quality and ship safety is positive at 0.539. This means that if there is an increase in Crew Quality by 1 unit, ship safety increases by 0.539. Furthermore, based on the T-Statistics H2 of 8.242 which is greater than its level or 8.242> 1.64, and the P-values H2 of 0.000 which is smaller than the real level or 0.000 <0.05, this shows that the direct influence of Crew Quality on ship safety is significant. Therefore, it can be concluded that H2 is accepted, so there is a direct positive and significant influence of Crew Quality on ship safety.

3) Hypothesis Testing 3: Direct Effect of Implementation of International Maritime Law on Prevention of Coastal Environmental Pollution.

   Based on Table 8 above, it shows that the influence of the Implementation of International Maritime Law on the Prevention of Coastal Environmental Pollution with a parameter coefficient of 0.242 which indicates that the direction of influence between the Implementation of International Maritime Law on the Prevention of Coastal Environmental Pollution is positive at 0.242. This means that if there is an increase in the Implementation of International Maritime Law by 1 unit, the Prevention of Coastal Environmental Pollution increases by 0.242. Furthermore, based on the T-Statistics H3 of 2.986 which is greater than its level or 2.986> 1.64, and the P-values H3 of 0.003 which is smaller than the real level or 0.003 <0.05, this shows that the direct influence of the Implementation of International Maritime Law on the Prevention of Coastal Environmental Pollution is significant. Therefore, it can be concluded that H3 is accepted, so there is a positive and significant direct influence of the Implementation of International Maritime Law on the Prevention of Coastal Environmental Pollution.

4) Hypothesis Testing 4: Direct influence of Crew Quality on Coastal Environmental Pollution Prevention.

   Based on Table 8 above, it shows that the influence of Crew Quality on Prevention of Coastal Environmental Pollution with a parameter coefficient of 0.468 which indicates that the direction of influence between Crew Quality on Prevention of Coastal Environmental Pollution is positive at 0.468. This means that if there is an increase in Crew Quality by 1 unit, Prevention of Coastal Environmental Pollution increases by 0.468. Furthermore, based on the T-Statistics H4 of 4.625 which is greater than its level or 4.625> 1.64, and P-values H4 of 0.000 which is smaller than the real level or 0.000 <0.05, this shows that the direct influence of Crew Quality on Prevention of Coastal Environmental Pollution is significant. Therefore, it can be concluded that H4 is accepted, so there is a

direct positive and significant influence of Crew Quality on Prevention of Coastal Environmental Pollution.

5) Hypothesis Testing 5: Direct influence of ship safety on prevention of coastal environmental pollution.

Based on Table 8 above, it shows that the influence of Ship Safety on Prevention of Coastal Environmental Pollution with a parameter coefficient of 0.468 which indicates that the direction of influence between Ship Safety on Prevention of Coastal Environmental Pollution is positive at 0.290. This means that if there is an increase in Ship Safety by 1 unit, Prevention of Coastal Environmental Pollution increases by 0.290. Furthermore, based on the T-Statistics H5 of 2.413 which is greater than its level or 2.413> 1.64, and the P-values H5 of 0.016 which is smaller than the real level or 0.016 <0.05, this shows that the direct influence of Ship Safety on Prevention of Coastal Environmental Pollution is significant. Therefore, it can be concluded that H5 is accepted, so there is a direct positive and significant influence of Ship Safety on Prevention of Coastal Environmental Pollution.

2. Analysis of Mediation Effect

Table 9. Analysis of Mediation Influence

Hypothesis	Influence	Original Sample (O)	T Statistics (|O/STDEV|)	P Values	Information
H6	Implementation of Law International Maritime (X1) -> Ship safety (Y) -> Pollution prevention coastal environment (Z)	0.145	2.166	0.031	Significant
H7	Crew Quality (X2) -> Ship safety (Y) -> Pollution prevention coastal environment (Z)	0.156	2.194	0.029	Significant

Source: SEMPLS Processing (2024)

Based on the testing of the indirect influence hypothesis above, it can be explained as follows.

1) Hypothesis Testing 6: Indirect EffectApplication of international maritime law to the prevention of coastal environmental pollution through ship safety.

Based on Table 9 above, it shows that the indirect effect of the Implementation of International Maritime Law on the Prevention of Coastal Environmental Pollution through Ship Safety is positive with a parameter coefficient of 0.145 which indicates that the direction of influence between the implementation of international maritime law on the prevention of coastal environmental pollution through ship safety is positive at 0.145. This means that if there is an increase in the implementation of international maritime law through ship safety by 1 unit, the prevention of coastal environmental pollution increases by 0.145. Furthermore, based on the T-Statistics H6 of 2.166 which is greater than its level or 2.166> 1.64, and the P-values H6 of 0.031 which is smaller than the real level or 0.031 <0.05, this shows that the indirect effect of the implementation of international maritime law on the prevention of coastal environmental pollution through ship safety is significant. Therefore, it can be concluded that H6 is accepted, so there is a positive and significant indirect effect of the implementation of international maritime law on the prevention of coastal environmental pollution through ship safety.

2) Hypothesis Testing 7: Indirect EffectQuality of ship crew towards prevention of coastal environmental pollution through ship safety.

Based on Table 9 above, it shows that the indirect effect of the crew quality on the prevention of coastal environmental pollution through ship safety is positive with a parameter coefficient of 0.156 which indicates that the direction of the effect between the

crew quality on the prevention of coastal environmental pollution through ship safety is positive at 0.156. This means that if there is an increase in the quality of the crew through ship safety by 1 unit, the prevention of coastal environmental pollution increases by 0.156. Furthermore, based on the T-Statistics H7 of 2.194 which is greater than its level or 2.194> 1.64, and the P-values H7 of 0.029 which is smaller than the real level or 0.029 <0.05, this shows that the indirect effect of the crew quality on the prevention of coastal environmental pollution through ship safety is significant. Therefore, it can be concluded that H7 is accepted, so there is a positive and significant indirect effect of the crew quality on the prevention of coastal environmental pollution through ship safety.

CONCLUSION

1. The direct impact of the application of international maritime law on ship safetymeans that the implementation of international maritime law has a direct positive and significant impact on ship safety. That is, the better the ship's compliance with international regulations (such as MARPOL and SOLAS), the higher the level of ship safety.
2. The direct influence of crew quality on ship safetymeans that the quality of the crew also has a positive and significant influence on ship safety. This shows that the technical ability, knowledge, and competence of the crew play an important role in keeping the ship safe during operation.
3. The direct impact of the application of international maritime law on the prevention of coastal environmental pollutionmeans that the implementation of international maritime law also has a direct impact on preventing coastal environmental pollution. This indicates that strictly implemented international regulations, especially those focused on waste management and oil spill prevention, help reduce the risk of pollution in coastal areas.
4. The direct influence of crew quality on preventing coastal environmental pollutionmeans that the quality of the ship's crew plays an important role in preventing environmental pollution. Ship crews who have knowledge and skills in waste management, the use of environmentally friendly technology, and compliance with environmental regulations can significantly reduce the risk of pollution in coastal areas.
5. The direct influence of ship safety on preventing coastal environmental pollutionmeans that ship safety also has a significant direct influence on pollution prevention. Safe ships tend to have more organized systems, which include good waste management and effective procedures to prevent leakage of hazardous materials.
6. The indirect effect of the application of international maritime law on the prevention of coastal environmental pollution through ship safety means that the application of international maritime law not only directly affects pollution prevention, but also through increasing ship safety. This means that well-implemented international regulations can improve ship safety, which in turn strengthens pollution prevention efforts.
7. The indirect effect of crew quality on coastal environmental pollution prevention through ship safety means that crew quality also has an indirect effect through ship safety. This means that competent crew not only maintains ship safety but also indirectly contributes to pollution prevention.

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