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Research Paper

Food Safety Policies Implementation in a Fish Port Complex in the Philippines: Stakeholders' Perceptions

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Abstract

Ensuring food safety in fish port complexes is vital for public health and the sustainability of the Philippine seafood industry. Anchored in Stakeholder Theory, this study investigated food safety policy implementation in a premier Philippine fish port by evaluating how the alignment of diverse interests determines success. Using a descriptive-comparative and correlational design, the researchers surveyed 383 respondents, including employees, brokers, and buyers. Data were analyzed using frequency and percentage, weighted mean, median, interquartile range, Kruskal-Wallis H, and Spearman's rank-order correlation. Results revealed a demographic dominated by experienced brokers and daily fish buyers. While storage and handling were perceived as highly implemented, sanitation received the lowest ratings. A significant perceptual gap exists, with internal stakeholders rating hygiene more favorably than external buyers. Although a moderate positive correlation confirmed that active enforcement drives compliance, stakeholders identified high supply costs, infrastructure deficits (specifically clean water access), and peak workloads as primary barriers. To bridge the gap between policy and practice, the study proposes a strategic roadmap focusing on infrastructure retrofitting, digital traceability, and participatory governance through a Food Safety Council. Theoretically, this research advances Stakeholder Theory by demonstrating that alignment is a measurable indicator of policy efficacy. Practically, it provides port authorities with a localized framework to move beyond performative compliance toward a sustainable, high-integrity seafood supply chain.

Keywords: *Enforcement Mechanisms, Fish Port Complex in the Philippines, Food Safety Policies Implementation, Stakeholders' Perceptions, Stakeholder Theory*

INTRODUCTION

Implementation of food safety measures in fish port complexes is vital to fisheries governance, as these facilities are primary hubs for fishery distribution. In the Philippines, poor sanitation and improper handling heighten contamination risks, threatening public health and market credibility. This study is anchored in Stakeholder Theory, which posits that policy compliance depends on the alignment of interests among diverse stakeholders (Zanin et al., 2017; Rahman et al., 2021), including fish brokers and staff, buyers, and port employees. Rather than a top-down mandate, this framework allows for a mapping of how stakeholder positions influence perceptions of risk and responses to enforcement.

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Global research highlights a recurring friction between institutional food safety frameworks and stakeholders' behavior where time pressure and policy complexity often lead staff to ignore regulations (De Freitas et al., 2020; Dunbar et al., 2023; Kalmenovitz et al. (2025). While proactive leadership and real-time supervision can enhance safety culture (McFarland et al., 2019; Pai et al., 2024; Yu & Qi, 2026), empirical evidence on how these dynamics intersect within decentralized fish port environments remains limited. In the Philippines, prior research has identified sanitation gaps (Moreno & Martinez, 2024) and structural deficits (Zamudio et al., 2024), yet a focus on material improvement often overlooks the human dimension (Tolentino et al., 2024). This results in performative compliance, where traditional habits clash with modern standards (Flora, 2024; Salvador et al., 2024). Driven by Stakeholder Theory, this study provides an integrated analysis by simultaneously evaluating institutional enforcement, physical limitations, and the divergent compliance perceptions of distinct stakeholder groups. The new insight this integration yields—relative to prior Philippine studies focused on smaller-scale contexts—is that non-compliance in a high-volume port is driven less by a lack of awareness and more by the friction between rigid modern standards and operational bottlenecks. This clash ultimately obscures supply chain transparency (Macusi et al., 2025) at the fish port, which serves as a critical entry point for the industry.

Local literature identifies a systemic failure where infrastructure gaps and regulatory inconsistencies clash with traditional habits, resulting in performative compliance (Moreno & Martinez, 2024; Flora, 2024; Salvador et al., 2024). While existing research focuses on street vending and small-scale processing (Tolentino et al., 2024; Zamudio et al., 2024), a gap remains in understanding how these dimensions converge in a high-volume environment of port operations. By applying Stakeholder Theory, this study evaluates institutional enforcement, physical limitations, and divergent perceptions to reveal that non-compliance is driven less by ignorance and more by the friction between rigid standards and operational bottlenecks. This friction ultimately obscures supply chain transparency (Macusi et al., 2025), necessitating a targeted framework for port authorities to move beyond top-down enforcement.

As a premier Philippine fish trading hub and a critical artery for Metro Manila's seafood, this facility faces systematic challenges, including documented constraints in cold storage and sanitation gaps. While physical capacity may be limited, it is essential to distinguish between infrastructure volume and the perceived adequacy of current storage practices among those who use them daily. These lapses are critical because seafood perishability means failures directly compromise public health and erode consumer confidence (An et al., 2024). By investigating this hub, the study aims to bridge the gap between policy and practice, providing evidence-based insights to enhance post-harvest sanitation and ensure the integrity of fishery products for urban consumers.

To operationalize the Stakeholder Theory framework, its core concepts were mapped directly onto the study's measured variables to assess the food safety policies implementation in a fish port complex in the Philippines. First, differing stakeholder interest and operational realities were captured by profiling demographic characteristics in terms of stakeholder role, gender, years of engagement, and frequency of visit. Second, stakeholder alignment was evaluated by assessing the perceived levels of implementation across sanitation practices, handling procedures, storage conditions, and inspection protocols. This distinction is vital: the study measures how effectively stakeholders believe current policies are being executed within the existing physical constraints of the port. Third, this study examined the differences in the perceptions among stakeholders along these implementation practices. Then, institutional demands were measured through the evaluation of enforcement mechanisms. Based on the findings, the researchers proposed strategies to strengthen food safety policies implementation and ensure stakeholder compliance within the

fish port operations. In consideration of the theoretical framework of the study, the study posits that policy success relies more on the alignment of diverse interests than on traditional top-down enforcement alone. Ultimately, this approach provides port authorities with a localized strategy to resolve operational bottlenecks through collaborative compliance.

LITERATURE REVIEW

Guided by the study's objectives, this literature review assesses the perceived implementation practices of food safety policies among stakeholder groups, the influence of enforcement mechanisms, and the key barriers within Philippine fish port complexes. This section explores the theoretical foundations and operational realities that shape these policies, providing essential context for understanding stakeholder perceptions, enforcement dynamics, and the persistent challenges inherent in fish port environments.

Stakeholder Theory

This study is anchored in Stakeholder Theory, which posits that policy efficacy depends on the active participation, shared understanding, and coordinated roles of all stakeholders in a system. In the Philippine fisheries context, food safety implementation is shaped by complex interactions among government agencies, port employees, fish brokers, and buyers, groups with varying levels of authority and operational priorities that directly influence compliance behavior. Validating this, research demonstrates that policy compliance improves significantly when stakeholders are engaged through consistent monitoring, transparent feedback loops, and participatory planning rather than top-down enforcement (Cabral et al., 2023; Macusi et al., 2025; Aranzamendez et al., 2025; Macatangay et al., 2025).

Implementation Practices of Food Safety Policies

The implementation of food safety policies in Philippine fish ports is typically evaluated across four dimensions: sanitation practices; handling procedures; storage conditions; and inspection procedures. Persistent issues identified in ports include inadequate waste disposal, limited access to potable water, and insufficient hygiene facilities (Moreno & Martinez, 2024). Furthermore, local studies reveal that overcrowding and poor facility maintenance create significant contamination risks during landing and sorting (Moreno & Martinez, 2024)

Handling and storage practices remain critical bottlenecks in Philippine fish ports. Improper techniques—such as mishandling and contamination from inadequate landing facilities—are prevalent due to the absence of integrated cold chain infrastructure and market supply fluctuations (Tadifa et al., 2020). Previous studies (Macusi et al., 2022; Moreno & Martinez, 2024) further highlighted how a lack of potable water compromises sanitation, while Tanyag et al. (2021) confirmed that pathogens like *Salmonella* pose high cross-contamination risks. Consequently, storage remains the weakest link, with post-harvest losses reaching 40% due to cold-chain breakdowns (Montojo et al., 2025). Ultimately, despite frameworks aiming for stricter inspection, infrastructure deficits and high safety supply costs continue to hinder operational compliance.

Literature synthesis indicates that while food safety policies exist in Philippine fish port complexes, implementation is weakened by persistent deficiencies in major operational practices. Ultimately, these studies highlight a significant gap between policy standards and actual practices, underscoring the urgent need for strengthened infrastructure, robust inspection systems, and active stakeholder engagement to improve food safety outcomes.

Difference Between Perceived Implementation Practices of Food Safety Policies and the Stakeholders' Role

When food safety regulations are uniformly implemented and widely communicated, stakeholders are more likely to share similar perceptions of policy effectiveness. National assessments of the Food Safety Act emphasize that inclusive training and active stakeholder participation help standardize the understanding of sanitation, handling, storage, and inspection requirements across different roles (Moreno & Martinez, 2024).

However, perceptions of food safety policies often diverge based on the specific roles, daily responsibilities, and operational realities of each stakeholder group (Moreno & Martinez, 2024; Flora, 2024). Disparities in infrastructure, inconsistent enforcement, and varying levels of access to capacity-building programs lead to divergent assessments of policy success, particularly among port personnel, traders, and regulatory officers (Garcia, 2023; Notteboom et al., 2021). These inconsistencies create friction within the supply chain, as gaps in knowledge can amplify risks even when policies are technically sound. However, in a study conducted by Briones et al. (2025) in one of the Philippine's fish port complexes, they revealed services are being delivered consistently across different demographic groups, demonstrating fairness and uniformity in their delivery. Thus, the study formulated the following null hypothesis:

H_{01}: There is no significant difference in the perceived implementation practices of food safety policies (specifically sanitation, handling, storage, and inspection) across different stakeholder groups in the fish port complex in the Philippines.

To test the hypothesis, the study utilized the Kruskal-Wallis H Test, a non-parametric method selected after a Shapiro-Wilk test confirmed a non-normal distribution ($p < 0.05$). This test compared the mean ranks across three independent stakeholder groups—fish brokers/staff, employees, and buyers—serving as the independent variables. The dependent variables were the perceived implementation of food safety practices, specifically sanitation, handling, storage, and inspection

Relationship Between Enforcement Mechanisms and Food Safety Policy Implementation

When food safety regulations are based on clear guidelines and transparent inspections coupled with corrective measures, stakeholders are more likely to share similar perceptions and exhibit greater adherence to policies (Milan et al., 2021). In Philippine fish ports, combining regular inspections with technical assistance and training helps standardize understanding and bridge the gap between vendor knowledge and actual practice (Tiu et al., 2021). The visible presence of the Bureau of Fisheries and Aquatic Resources and local government unit inspectors further reinforce these shared perceptions by serving as a critical deterrent against improper handling practices across the supply chain (Rustia et al., 2021).

However, the relationship between enforcement and stakeholder perception is often strained by systemic constraints like informal practices, poor infrastructure, and economic pressures, which prevent uniform compliance (Moreno & Martinez, 2024). While visible monitoring typically drives adherence, inconsistent regulatory presence leads to a significant drop in compliance rates—as low as 59.09%—causing brokers, employees, and buyers to view the effectiveness of these policies differently (Flora, 2024; Milan et al., 2021). These operational challenges suggest that regulatory presence alone is often insufficient to override deep-seated disparities in how different groups perceive and follow safety protocols. Consequently, the researchers formulated the following null hypothesis:

H_{02}: There is no significant relationship between enforcement mechanisms and the implementation of food safety policies.

To test this hypothesis, the study employed Spearman's Rank Correlation (r), to investigate the relationship between enforcement mechanisms (the independent variable) and the implementation of food safety policies (the dependent variable).

Problems that Hinder the Effective Implementation of Food Safety Policies

Food safety implementation in Philippine fish ports is hindered by inadequate infrastructure and limited technical capacity. Literature shows that structural deficiencies—including insufficient cold storage, poor sanitation, and improper handling—heighten contamination risks and obstruct consistent hazard control (Basadre et al., 2025; Moreno & Martinez, 2024). Consequently, a substantial gap persists between regulatory requirements and actual site conditions, preventing full compliance with national standards (Borbon & Tolentino, 2020).

Overall, the literature suggests that ineffective food safety compliance in Philippine fish ports stems from interconnected challenges in stakeholder awareness, institutional capacity, and enforcement consistency. Although regulatory frameworks exist, their impact is undermined by limited training, a weak safety culture, and an insufficient regulatory workforce, leading to uneven implementation across facilities.

RESEARCH METHOD

The study utilized a descriptive, comparative, and correlational research design to fulfill a dual analytic logic: comparing differences across stakeholder groups and determining associations among specific constructs related to food safety policy implementation (Creswell & Creswell, 2023). To execute this approach, the study explicitly tested two null hypotheses aligned with their respective non-parametric statistical tests. First, to address group differences, the study tested the null hypothesis (H_{01}) that there is no significant difference in the perceived implementation practices of food safety policies across the three stakeholder groups, evaluated using Kruskal-Wallis H test. Second, to examine associations, the study tested the null hypothesis (H_{02}) that there is no significant relationship between enforcement mechanisms and the implementation of food safety policies, evaluated using Spearman's rank-order correlation. A stratified sampling strategy was employed to ensure representation of the three groups of stakeholders: fish port employees; fish brokers or staff; and fish buyers. According to Wiśniowski, (2020), this method is used to ensure that different subgroups within a population are adequately represented in the sample. Then, a mixed sampling strategy was further employed in determining the sub-sample size for each stakeholder group due to unique characteristics of the population of each sub-group. For the internal policy-implementing body (N=148), a 50% sampling fraction (n = 74) was applied to the fish port employees. This proportion was selected primarily for operational feasibility and to minimize disruption to the facility's daily administrative functions. These 74 employees were selected through simple random sampling using the official organizational roster to ensure an equal probability of selection (Taherdoost, 2017). For commercial stakeholders, Slovin's formula (e = 0.05) was used to determine a target of 311 respondents from an estimated population (N = 1,400). A proportional quota sampling approach was implemented, targeting 222 fish brokers or staff (71%) and 89 buyers (29%). Data were collected at random intervals during trading hours to minimize selection bias and capture the lived experiences of participants in port operations (Campbell et al. 2020). The final achieved sample for commercial stakeholders was 309 (220 brokers and 89 buyers). Although the original target for the brokers/staff was 222, the achieved count of 220 was retained as the final valid sample for analysis representing a 99.36% response rate. Including the 74 employees, the total sample size reached 383 respondents. This high participation rate ensures statistical stability and suggests a low risk of non-response rate (Holtom

et al., 2022).

The research instrument is a 34-item structured survey. Structuring of the questionnaire was adapted from established literature to map directly onto the study's primary constructs: items measuring the stakeholder profile were adapted from Macusi et al. (2022); items measuring the policy implementation construct including sanitation, handling, storage, and inspection were adapted from Rustia et al. (2021); items measuring enforcement mechanisms were adapted from Moreno & Martinez (2024); and items measuring implementation barriers were adapted from Labana et al. (2024). To ensure comprehension among all the respondents, the English survey underwent a rigorous translation and back-translation process into the local dialect (Filipino) by independent bilingual experts, ensuring conceptual and linguistic equivalence. The questionnaire utilized a four-point Likert scale to elicit clear polarized responses and avoid neutral ambiguity, where 1= Strongly Disagree, 2= Disagree, 3= Agree, and 4= Strongly Agree. While Likert-type data are strictly ordinal, this study treated the composite scores as quasi-interval data solely for descriptive purposes. This allowed for the calculation of weighted means to summarize broader implementation trends using standard numerical cut-offs (1.00–1.75 for Strongly Disagree, 1.76–2.50 for Disagree, 2.51–3.25 for Agree, and 3.26–4.00 for Strongly Agree). To ensure content validity, the instrument underwent expert review by two independent specialists, selected based on the minimum of five years of professional experience in public administration, food safety, and port management. Following the Oducado (2020) framework, an Item-Level Content Validity Index (I-CVI) was computed. Items with an I-CVI of 0.78 or higher were retained; while those below were revised or eliminated based on qualitative feedback regarding clarity. Internal consistency was verified through a pilot test (n = 30), with participants strictly excluded from the final study. Reliability was calculated per construct rather than relying solely on the overall average (α= 0.815), as Cronbach's alpha is the appropriate metric for these unidimensional scales. Most subscales demonstrated strong internal consistency: Sanitation (α=0.790), Handling (α = 0.885), Storage (α= 0.828), Inspection (α= 0.816), and Implementation Barriers (α= 0.868), enforcement mechanisms (α= 0.702). While the enforcement subscale was borderline, an item-total correlation analysis confirmed that removing items would not further improve reliability; therefore, all items were retained, as they met 0.70 threshold (Taber, 2017).

Table 1. Reliability Statistics

Indicators	**Cronbach's Alpha**	**No. of Items**
Food Safety Policies Implementation in a Fish Port Complex		
A. Sanitation Practices	0.790	5
B. Handling Procedures	0.885	5
C. Storage Conditions	0.828	5
D. Inspection Procedures	0.816	5
Enforcement Mechanisms	0.702	5
Problems that Hinder Effective Implementation and Compliance	0.868	5
Average	**0.815**	

Data were collected from January 22 to 23, 2026, using a hybrid approach of Google Forms and on-site pen-and-paper surveys. All 383 respondents provided informed consent to ensure voluntary participation and confidentiality. Demographic profiles were summarized using

frequency and percentage distributions, while weighted means evaluated policy implementation and operational barriers. Medians and interquartile range were also computed as additional tool to assess the policy implementation by stakeholders. Following a Shapiro-Wilk test indicating a non-normal distribution ($p < 0.001$), non-parametric methods were applied. Consistent with literature, the Kruskal-Wallis H test (Rodriguez et al., 2025) assessed perceptual differences across stakeholder categories, while Spearman's rank-order correlation (El-Hashash et al., 2022) investigated the relationship between enforcement and compliance. All tests were conducted at a 0.05 significance level to ensure a robust analysis of ordinal data.

FINDINGS AND DISCUSSION

This section presents, analyzes, and interprets the data obtained from the survey questionnaire in relation to the objectives of the study.

Demographic Profile of Respondents

The demographic profile of stakeholders of the fish port complex includes stakeholder role, gender, years of engagement in the fish port, and frequency of visits to the fish port. Table 2 presents the profile of the study respondents.

Table 2. Demographic Profile

Indicator	Frequency	Percentage (%)
Stakeholder Role		
Fish Port Employees	74	19.32
Fish Brokers/Fish Broker Staff	220	57.44
Fish Buyers	89	23.24
Total	**383**	**100.00**
Gender		
Male	192	50.13
Female	191	49.87
Total	**383**	**100.00**
Years of Engagement in the Fish Port		
Less than 5 years	65	16.97
5 - 10 years	176	45.95
11 - 20 years	105	27.42
21 - 30 years	31	8.09
More than 30 years	6	1.57
Total	**383**	**100.00**
Frequency of visit at the Fish Port		
Daily	311	81.20
2 - 3 times a week	62	16.19
Weekly	9	2.35
Monthly or less	1	0.26
Total	**383**	**100.00**

The demographic profile highlights an experienced stakeholder base of brokers, staff, and buyers, ensuring findings reflect the perspectives of the port's primary economic drivers (Rustia et al., 2021). The nearly even gender distribution suggests a gender-inclusive environment, allowing for a diverse evaluation of policy implementation. This balance aligns with national gender-

responsive frameworks, which emphasize that capturing risks managed by both men and women leads to more robust safety compliance (Mutia et al., 2020; Moreno & Martinez, 2024).

Daily transaction frequency strongly shapes stakeholder perceptions of service quality and safety, corroborating Golimlim and De Castro (2023), who argue that frequent engagement correlates with more critical evaluations. With nearly half of respondents possessing five to ten years of experience, the study is grounded in significant experiential knowledge. This ensures the analysis reflects consistent, real-world practices, reinforcing the principle that long-term operational experience is a key determinant in successful food safety adoption (Macusi et al. 2022).

Level of Implementation of Food Safety Policies

The study measured four critical dimensions: sanitation practices; handling procedures; storage conditions; and food safety inspection procedures. Table 3 summarizes the perceptions across different stakeholder groups.

Table 3. Perceived Level of Implementation of Food Safety Policies

Dimension	**Fish Port Employees**		**Fish Brokers/Staff**		**Fish Buyers**		**Overall Weighted Mean**	
	WM	**VI**	**WM**	**VI**	**WM**	**VI**	**WM**	**VI**
Sanitation Practices	2.90	A	2.74	A	2.67	A	2.75	A
Handling Procedures	3.25	A	3.35	SA	3.14	A	3.28	SA
Storage Condition	3.32	SA	3.37	SA	3.15	A	3.31	SA
Inspection Procedures	3.07	A	3.11	A	2.97	A	3.07	A
Overall Weighted Mean	**3.14**	**A**	**3.14**	**A**	**2.98**	**A**	**3.09**	**A**

Legend:
1. Strongly Disagree (SD)
2. Disagree (D)
3. Agree (A)
4. Strongly Agree (SA)

The study reveals a solid regulatory baseline but identifies a critical disconnect between infrastructure and daily hygiene. High confidence in storage alongside lower sanitation scores suggests the facility prioritizes static product management over dynamic environmental upkeep. This reflects an industry trend noted by Flora (2024), who attributed such gaps to operational constraints that force a focus on inventory security over routine cleaning.

While high storage and refrigeration ratings suggest that physical infrastructure is no longer the primary bottleneck at this site, diverging from literature that typically identifies cold-chain deficits as the main barrier, the persistent sanitation deficiencies reveal a deeper issue. These findings indicate that the presence of robust hardware has not yet translated into a consistent culture of cleanliness. This reflects a core tenet of Stakeholder Theory: policy efficacy is not merely a product of resource availability, but of how stakeholders prioritize environmental upkeep against operational pressures. This observation mirrors the challenges identified by Rustia et al. (2021) regarding the difficulty of managing diffuse environmental risks, suggesting that in high-volume

ports, the capacity to comply is often undermined by the friction between rigid protocols and the speed of daily transactions

Differences in Perception Among Stakeholders

Testing for normality is a critical step in statistical analysis, as it ensures that the chosen method accurately reflects the data's distribution and prevents misleading conclusions (Gosselin, 2024). To verify this requirement, a Shapiro-Wilk test was performed on all dimensions of food safety implementation. The test yielded significance values of $p < 0.001$ for all variables, indicating a significant deviation from a normal distribution. Because the data violated the assumption of normality and utilized an ordinal scale for survey responses, the Kruskal-Wallis H test was employed as shown in Table 4. This non-parametric procedure is the most robust alternative for comparing three or more independent groups when data are skewed (Vrbin, 2022). While the Kruskal-Wallis H test evaluates differences based on mean ranks, the median (Mdn) and interquartile range (IQR) are reported in Table 4 to represent the central tendency and spread of data, satisfying the standard requirements for non-parametric reporting. Additionally, the weighted mean (WM) and standard deviation (SD) are retained to provide a more granular measure of stakeholder perception intensity. This approach treats the Likert scale as a quasi-interval measure, allowing for a clearer interpretation of the direction and intensity of stakeholder perceptions which the median often obscures on a limited 4-point scale (Kusmaryono et al., 2022). The analysis tested the first null hypothesis (H_{01}), as follows: There is no significant difference in the perceived implementation practices of food safety policies (specifically sanitation, handling, storage, and inspection) across different stakeholder groups in the fish port complex in the Philippines.

Table 4. Significant Differences in Perceived Implementation Practices of Food Safety Policies

Variable	Group	WM	SD	Mdn	IQR	p-value	Remarks
Sanitation Practices	Fish Port Employees	2.90	0.36	3.0	0.6	0.016	Significant
	Fish Brokers	2.74	0.50	2.8	0.8		
	Fish Buyers	2.67	0.55	2.6	0.8		
Handling Procedures	Fish Port Employees	3.25	0.42	3.2	0.6	0.105	Not Significant
	Fish Brokers	3.35	0.56	3.4	0.6		
	Fish Buyers	3.14	0.86	3.2	1.0		
Storage Conditions	Fish Port Employees	3.32	0.38	3.4	0.4	0.259	Not Significant
	Fish Brokers	3.37	0.54	3.4	0.6		
	Fish Buyers	3.15	0.86	3.2	1.2		
Inspection Procedures	Fish Port Employees	3.07	0.34	3.0	0.4	0.618	Not Significant
	Fish Brokers	3.11	0.42	3.2	0.6		
	Fish Buyers	2.97	0.64	3.0	0.8		

The findings reveal that for sanitation practices, the null hypothesis was rejected ($p = 0.016$), indicating a significant divergence in how stakeholders evaluate hygiene standards. This divergence is statistically evident when comparing the medians across groups: Fish port employees reported the highest central tendency (Mdn = 3.0), while fish brokers (Mdn = 2.8), and fish buyers

(Mdn = 2.6) showed a more skewed distribution toward lower scores (IQR = 0.6). This split reflects distinct operational roles: port employees and brokers, who maintain a sense of ownership over the process, view sanitation more favorably than external buyers do. While internal stakeholders likely focus on administrative efforts and the existence of protocols, buyers judge implementation based on visible, immediate outcomes. This corresponds with Caruso et al. (2025), who found that hygiene practices vary by context and motivation, and mirrors Sarmiento and Apritado's (2022) observation that internal handlers often perceive higher compliance than external observers.

Anchored in Stakeholder Theory, specifically the concept of stakeholder salience (Mitchell et al., 2020), the rejection of the null hypothesis for sanitation confirms that food safety perceptions are fundamentally shaped by institutional interests and the specific stake an individual holds in the operation (Freeman et al., 2021). Internal handlers possess the power to implement rules, while external buyers possess the legitimacy to demand results, creating a natural variance in their evaluative lenses. In contrast, for the dimensions of food handling, storage, and inspection, the null hypothesis was accepted ($p > 0.05$). This indicates that these specific policies are experienced with greater consistency across all stakeholder groups. This uniformity suggests that these dimensions are governed by standardized frameworks and rigid technical protocols—such as refrigeration temperature logs and formal inspection checklists—emphasized by Macusi et al. (2025) and Flora (2024), which leave less room for the subjective interpretation that characterizes general sanitation. This variation serves as a diagnostic tool, identifying a coordination gap where internal management's operational efforts are not yet fully aligning with the expectations of external clients.

Enforcement Mechanisms

Table 5 quantifies the enforcement mechanisms influencing stakeholder compliance. The weighted mean identifies which regulatory actions most significantly influence behavior, while the Spearman rank correlation measures the relationship between enforcement intensity and compliance levels. This dual-statistical approach systematically identifies the policy levers that most effectively drive safety standards across the fish port complex.

Table 5. Enforcement Mechanisms Influencing the Stakeholder Compliance with Food Safety Policies

Enforcement Mechanisms	Fish Port Employees		Fish Brokers/ Staff		Fish Buyers		Overall Weighted Mean	
	WM	VI	WM	VI	WM	VI	WM	VI
1. Inspections are conducted frequently enough to ensure constant compliance	3.00	A	3.19	A	3.00	A	3.11	A
2. The penalties for violating food safety policies are strictly applied without bias.	3.15	A	3.23	A	3.00	A	3.16	A
3. Port authorities provide clear, written reports after every safety inspection.	3.04	A	3.19	A	2.94	A	3.10	A
4. The threat of sanctions is the main reason I follow the rules.	3.22	A	3.17	A	3.00	A	3.14	A
5. I feel that the current monitoring system effectively catches safety	2.99	D	2.41	A	2.51	A	2.55	A

violations.

Overall Weighted Mean	**3.08**	**A**	**3.04**	**A**	**2.89**	**A**	**3.01**	**A**

Legend: 1. Strongly Disagree (SD) 2. Disagree (D) 3. Agree (A) 4. Strongly Agree (SA)

A major finding of this study is the significant disconnect between the existence of food safety penalties and the stakeholders' belief in the system's ability to catch violators. While sanctions are established on paper, fish brokers and fish port employees perceive monitoring as inconsistent. This implies that the enforcement framework functions as a hollow threat that fails to provide a meaningful deterrent for non-compliance. This result is directly supported by Nyarugwe et al. (2020), who argued that accountability erodes when monitoring lacks transparency and visibility. Furthermore, the findings align with Flanagan and Soon-Sinclair (2024), confirming that sanitary compliance is driven less by the severity of written rules and more by the perceived credibility and active nature of enforcement on the ground.

Relationship Between Enforcement Mechanisms and Implementation of Food Safety Policies

Prior to analysis, the data were evaluated for normality. Results from the Shapiro-Wilk test indicated a significant deviation from a normal distribution ($p < 0.001$), violating parametric testing assumptions. Consequently, Spearman's rank order correlation was utilized as the non-parametric measure to test the second hypothesis (H_{02}): There is no significant relationship between enforcement mechanisms and the implementation of food safety policies. For this study, compliance is defined as the behavioral manifestation of policy implementation; thus, the correlation coefficients measure how formal regulatory pressures translate into realized safety practices on the ground. The magnitude of these relationships was interpreted using the criteria proposed by Schober et al. (2018).

Table 6. Spearman's Rank Correlation Between Enforcement Mechanisms and Food Safety Implementation

Correlation		Correlation Coefficient	p-value	Magnitude
Independent	**Dependent**			
Enforcement Mechanisms	Sanitation Practices	0.424	0.000	Moderate
	Handling Procedures	0.286	0.000	Weak
	Storage Conditions	0.275	0.000	Weak
	Inspection Procedures	0.563	0.000	Moderate

Note: Magnitude interpretation: 0.00–0.30 (Weak), 0.31–0.60 (Moderate), 0.61-0.80 (Strong), 0.81-1.00 (Very Strong)

The rejection of H_{02} demonstrates that enforcement mechanisms—including audits, inspections, and penalties—are active drivers of food safety implementation rather than passive administrative outcomes. Enforcement shows a moderate positive relationship with sanitation and inspection procedures, while showing a weak positive relationship with handling and storage. These results indicate that rigorous oversight is a primary motivator for behavioral compliance; without this regulatory push, the consistency of implementation diminishes. This aligns with Nyarugwe et al. (2020), who argued that monitoring and corrective actions are fundamental to

safety management performance, ensuring that procedural adherence is maintained even under operational stress.

From the perspective of Stakeholder Theory, these mechanisms drive implementation by aligning the expectations of regulators, administrators, and operators (Freeman et al., 2021). Visible, consistent enforcement encourages stakeholders to internalize safety goals, transforming enforced compliance into internalized implementation. This fosters the coordination and long-term trust essential for effective governance within the fish port complex (Mitchell et al., 2020; Phillips et al., 2019).

Problems Hindering Implementation

While enforcement and implementation show a positive correlation, stakeholders identified significant systemic barriers that prevent full compliance. These were investigated via a 5-item questionnaire, with results summarized in Table 7.

Table 7. Problems that Hinder the Effective Implementation of Food Safety Policies

Problems	Fish Port Employees		Fish Brokers/ Staff		Fish Buyers		Overall Weighted Mean	
	WM	**VI**	**WM**	**VI**	**WM**	**VI**	**WM**	**VI**
1.The cost of safety supplies is too high for my budget.	3.28	SA	3.48	SA	3.33	SA	3.41	SA
2.The port lacks reliable access to clean running water and waste disposal.	3.27	SA	3.49	SA	3.27	SA	3.40	SA
3.I find it difficult to keep up with changes in food safety policies.	3.26	SA	3.50	SA	3.35	SA	3.42	SA
4.Workload during peak hours impacts compliance with food safety policies.	3.41	SA	3.44	SA	3.20	A	3.38	SA
5.There is a lack of training sessions available.	2.62	A	2.57	A	2.64	A	2.60	A
Overall Weighted Mean	**3.17**	**A**	**3.30**	**SA**	**3.16**	**A**	**3.24**	**A**

Legend:
1. Strongly Disagree (SD)
2. Disagree (D)
3. Agree (A)
4. Strongly Agree (SA)

Data reveals that policy implementation is severely limited by operational and structural bottlenecks. A critical nuance emerges when comparing these results with earlier findings: while stakeholders reported high scores for storage conditions (suggesting the presence of primary cold-chain hardware), they strongly agree that the port lacks reliable access to clean running water and waste disposal (WM = 3.40). This indicates that while the macro-infrastructure (storage facilities) may be adequate, the utility-level infrastructure (sanitation resources) remains a primary barrier. Furthermore, the high means for operational costs and workload pressures suggest that compliance levels are constrained by the stakeholders' environment. Rather than a lack of intent, these results indicate that the capacity to comply is hindered by high costs (WM = 3.41) and

logistical strain during peak hours (WM = 3.38). Consistent with Stakeholder Theory, food safety effectiveness depends on stakeholders' ability to meet institutional demands within their specific operational constraints (Freeman et al., 2021).

These findings align with Jaffee et al. (2018), who argued that sustainable food safety requires systemic governance more than just knowledge transfer; it demands structural investment in utility infrastructure and affordable access to safety supplies. Ultimately, policy effectiveness hinges on systematically addressing these material challenges (Ogawa et al., 2023). Survey results demonstrate that resource scarcity and logistical pressure make the practical application of standards exceptionally difficult, reinforcing the need to move from performative adherence toward meaningful, long-term compliance through organizational support.

Proposed Strategies to Address and Strengthen Food Safety Policies Implementation and Stakeholder Compliance

Table 8 presents the proposed strategies designed to strengthen food safety policies implementation and ensure stakeholder compliance within the fish port operations.

Table 8. Proposed Strategies to Address and Strengthen Food Safety Policies Implementation and Stakeholder Compliance

Strategic Pillar	Proposed Strategies	Expected Outcomes
Infrastructure & Sanitation	• **Retrofit Docking Areas:** Install automated sanitation stations and sensor-based handwashing. • **Smart Storage:** Upgrade cold storage with IoT-enabled real-time temperature sensors.	• Promotes hygiene, minimizes cross-contamination, and enhances supply chain safety performance; Strengthens cold-chain integrity, maintains fish quality, and reduces spoilage/waste (Sy et al., 2020; Zhao et al., 2021)
Capacity Building	• **Tiered Training:** Conduct quality management/ best practices workshops using visual aids and local dialects for diverse educational backgrounds. • **Role-Specific Coaching:** Specialized handling drills for brokers and buyers.	• Increases knowledge retention across diverse groups; Bridges the perception gap, improves compliance rates, and unifies the understanding of food safety protocols (Sarmiento & Apritado, 2022)
Enforcement Reform	• **Digital e-Inspection:** Launch a mobile app for real-time auditing and photo-documentation of violations. • **Transparency Code:** Implement a tiered, public penalty system for violations.	• Enables faster detection and immediate correction of violations via digital audits; Fosters public accountability, deterrence, and improved regulatory compliance (Chen & Yu, 2022)

Strategic Pillar	Proposed Strategies	Expected Outcomes
Traceability Systems	• **QR Tagging:** Implement crate-level tracking to monitor fish origin and handling duration. • **Centralized Digital Log:** Establish a unified database for all quality and inspection results.	• Enables real-time monitoring of fish movement from ports to distribution points; Enhances safety compliance, and boosts consumer confidence (Shamsuzzoha et al., 2024).
Stakeholder Engagement	• **Food Safety Council:** Form a committee with representatives from employees, brokers, and buyers. • **Grievance Hotline:** Establish a feedback loop to report systemic problems hindering policy execution.	• Inclusive governance fosters collaboration and shared accountability; Identifies problems early, improving policy execution and stakeholder trust (Kujala et al., 2022)

The proposed strategies address operational gaps through a multi-dimensional approach aligned with Limon et al. (2021), who advocated for combining physical infrastructure with monitoring, training, and digital oversight. Enhanced sanitation and temperature-controlled storage target contamination, while role-specific training strengthens adherence to best practices. Furthermore, digital inspection and QR-based traceability facilitate enforcement and rapid tracking. Finally, consistent with Wu et al. (2018), the inclusion of a food safety council and grievance mechanisms foster the stakeholder engagement necessary for sustainable compliance.

This study's strategic framework is clearly supported by and aligned with the cited literature. By integrating the digital and participatory elements suggested by prior studies (Limon et al., 2021; Wu et al., 2018; Faller et al., 2025) these strategies move beyond basic infrastructure to create a holistic governance system tailored to the operational realities of the fish port.

CONCLUSION

This study evaluated the implementation of food safety policies in a premier Philippine fish port complex to bridge the gap between regulatory frameworks and operational practices. The research was anchored in Stakeholder Theory, exploring how the alignment of diverse interests—rather than mere top-down mandates—determines policy success. In this study, stakeholder alignment was operationalized through observable indicators, including differences in perceptions of policy implementation among stakeholder groups, the influence of enforcement mechanisms on compliance behavior, and the operational constraints affecting stakeholders' ability to adhere to food safety policies.

The findings, sequenced by the study's objectives, reveal that the port's workforce is largely composed of experienced brokers and staff with 5–10 years of engagement, whose daily transactions anchor their perceptions in operational reality rather than abstract policy. While the facility demonstrates a solid baseline of regulatory adherence in handling and storage, environmental sanitation remains a critical weakness. This implies that stakeholders prioritize

immediate product preservation over broader hygienic maintenance, creating a perception gap where internal employees and brokers rate implementation more favorably than external buyers.

Furthermore, a strong positive correlation was established between enforcement mechanisms and policy implementation. This underscores that active, visible regulatory oversight—specifically in inspection procedures—is the primary driver of compliance. However, systemic barriers such as high supply costs, infrastructure deficits, and workload pressures during peak hours restrict full policy exploitation, suggesting that without institutional support, safety standards risk becoming symbolic. Relative to these study's findings, the researchers proposed strategies to address and strengthen food safety policy implementation and stakeholder compliance.

This study bridged the gap between regulatory frameworks and operational realities in a premier Philippine fish port by anchoring the analysis in Stakeholder Theory. The findings demonstrate that policy success relies on the alignment of diverse interests rather than top-down mandates alone. While the facility maintains a solid baseline in handling and storage, environmental sanitation remains a critical weakness, driven by a perception gap where internal employees and brokers rate hygiene more favorably than external buyers. Furthermore, while a strong correlation exists between enforcement and implementation, the hollow threat of inconsistent monitoring and high operational costs restricts substantive compliance.Theoretically, this research refines Stakeholder Theory by operationalizing alignment through measurable indicators: perceptual differences, compliance behaviors shaped by enforcement, and operational constraints. It demonstrates that stakeholder salience is expressed in practice when legitimacy and urgency determine whether compliance is substantive or merely symbolic. By integrating institutional, operational, and behavioral dimensions, the study illustrates that policy efficacy in decentralized governance depends on reconciling rigid modern standards with traditional practices and operational bottlenecks..Managerially, the study provides a roadmap for port authorities to move beyond performative compliance. By investing in sanitation infrastructure, adopting digital traceability systems, and fostering participatory governance models, authorities can reconcile institutional rules with stakeholder behavior. These strategies directly address the initial problem statement—systemic sanitation gaps and inconsistent enforcement—ensuring the long-term integrity of the seafood supply chain and enhancing public health in the Philippines.

LIMITATIONS AND FURTHER RESEARCH

This study acknowledges limitations that may affect the generalizability of its findings. First, as a case study of a single premier fish port, the results may not apply to smaller landing sites with different infrastructures or management styles. Second, the reliance on self-reported questionnaires introduces potential response bias; stakeholders may provide socially desirable answers that do not fully reflect objective, daily adherence during peak hours. Finally, the cross-sectional design prevents an analysis of how food safety behaviors evolve over time, limiting insights into the long-term durability of compliance and policy interventions.

To address these limitations, future research should consider employing a multi-site comparative analysis across various fish ports in the Philippines to assess whether systemic problems, such as sanitation deficits and enforcement gaps, are consistent nationwide. To gain a more comprehensive understanding of the policy-practice gap, researchers should utilize mixed-method approaches—combining surveys with direct on-site observations and key informant interviews—to triangulate perceived compliance with actual workplace habits. It would also be valuable for future studies to adopt longitudinal designs to track the impact of targeted training programs and facility upgrades over extended periods. Additionally, investigating the specific

economic pressures and socioeconomic realities of frontline operators would provide deeper insight into why behavioral noncompliance persists despite established regulatory frameworks. Finally, future work could explore the role of digital traceability systems and real-time monitoring technology in bridging the transparency gap within the fishery supply chain, ensuring that food safety remains a practical reality rather than a performative mandate.

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