# Assessment of Compliance with Local and International Safety Regulations for Marine Vessels on Inland Waters in Tanzania: A Case of Lake Victoria

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**Abstract:** This study assessed the compliance with local and international safety regulations for marine vessels operating in Tanzania's inland waters. Focusing on Lake Victoria, the study involves a total of 80 respondents including vessel operators, governmental officials, maritime safety inspectors, vessel crew members and maritime regulatory officer. The study employed a mixed-methods approach using structured questionnaires, interviews, and documentary review. The data were analyzed using descriptive statistics and thematic analysis to uncover compliance trends and deficiencies in regulatory enforcement. Findings reveal high awareness and engagement with safety regulations but also highlight major challenges such as limited financial resources, insufficient training, and regulatory capacity gaps. Statistical analyses, including regression and reliability tests, support the presence of strong awareness but identify inconsistencies in enforcement. The results indicated that although awareness of safety regulations is quite high over 60% of respondents showed familiarity with both local and international safety standards compliance is frequently obstructed by logistical and financial challenges. More than 80% of participants acknowledged the significance of inspections, yet inconsistent enforcement and a lack of follow-up were identified as major deficiencies. The study concludes with strategic recommendations for enhancing compliance and safety standards, including targeted training, enhanced inspection practices, and greater regulatory resourcing.

**Keywords:** Maritime Safety, Inland Waterways, Regulatory Compliance, Lake Victoria, Tanzania, Safety Regulations, Marine Vessels.

## 1. Introduction

Compliance with maritime safety regulations is critical to ensuring safe operations and minimizing risks to human life and the environment. While conventions like SOLAS and MARPOL have provided strong frameworks for international compliance, enforcement and adherence in inland waterways, particularly in developing regions like East Africa, face substantial challenges. Lake Victoria, Tanzania's most important inland waterway, experiences high traffic volumes and is a vital economic hub. Despite regulatory efforts, the sector is challenged by infrastructural deficiencies, low operator training levels, and uneven enforcement. This study aims to assess current compliance levels, identify obstacles, and suggest strategies to enhance maritime safety practices. The safety of marine vessels operating in inland waters has become a major issue for maritime authorities globally. This literature review examines the

theoretical frameworks that inform safety compliance within the maritime sector and assesses the current empirical evidence regarding adherence to safety regulations, challenges in enforcement, and strategies for improvement, particularly in inland waters and developing nations like Tanzania. The Safety Management Systems (SMS) theory, which is based on the International Safety Management (ISM) Code established by the IMO in 1993, offers a systematic method for managing maritime safety through the processes of hazard identification, risk assessment, and the implementation of mitigation measures. SMS plays a crucial role in ensuring that vessel operators develop internal procedures that are in line with international safety standards. It aids in compliance and fosters an organizational safety culture, which is particularly significant for Tanzania's inland water operations where there are ongoing enforcement challenges (IMO, 1993; Bačkalov, 2020).

Research indicates that compliance levels vary among different types of vessels. For example, Bačkalov (2020) discovered that passenger and tanker vessels generally exhibit higher compliance rates compared to freight and fishing vessels, which are subject to less rigorous oversight. Chowdhury et al. (2024) pointed out that inconsistencies in enforcement and limited resources frequently result in uneven compliance across various vessel categories.

Vidić and Bačkalov (2022) expanded this investigation to the inland waterways of Southeast Asia, revealing a generally low level of compliance in aspects such as crew training and the maintenance of safety equipment. Comparable patterns were observed in developing regions, where insufficient funding and a lack of regulatory capacity posed significant challenges (Bolbot et al., 2023; Tugume, 2024).

In Tanzania, Mwakalinga and Kapange (2021) noted that although there is an awareness of safety regulations, training is inadequate and enforcement is lacking, particularly for remote or informal operators. Nyaki (2022) emphasized the need for improved access to updated guidelines and advocated for enhanced digital monitoring and information-sharing systems. Challenges in Implementing and Enforcing Safety Standards, Multiple challenges face both operators and regulators. Among the most significant are inadequate funding, weak legal frameworks, limited coordination between agencies, and a lack of sufficient inspection infrastructure (Baig et al., 2024; Coito, 2021). Ngowi (2021) pointed out the legal inconsistencies between local and international regulations, which result in selective compliance by vessel operators.

From an operational standpoint, Mshana (2022) discovered that numerous Tanzanian authorities do not have access to essential tools such as tracking technologies and inspection vessels, which limits enforcement capabilities in remote areas. Additionally, the lack of community involvement has reduced overall awareness, highlighting the necessity for outreach initiatives. The adoption of structured safety systems like SMS has been demonstrated to reduce accident rates and enhance compliance (Melnyk et al., 2024). Capacity-building initiatives particularly those focused on training vessel operators and inspectors have been effective in increasing awareness and improving safety results in regions like West Africa (Sardar, 2024). Collaboration among stakeholders is also crucial. Khan and Emon (2024) underscored the effectiveness of multi-stakeholder forums in South Asia that united regulators, operators, and local communities to exchange best practices and collectively tackle challenges.

In Tanzania, Olali Odula (2024) observed that while safety protocols for ferries operating between Dar es Salaam and Zanzibar have seen improvements, they are still inadequate for inland waters. Mangoye (2019) pointed out the gap between Tanzania’s maritime laws and the evolving standards set by the IMO, advocating for legislative reforms and increased investment in regulatory coordination. Despite advancements in maritime safety research, several significant gaps persist. Numerous studies, such as those conducted by Suleiman (2019) and Bendera (2020), have predominantly concentrated on ocean-going vessels and coastal routes, overlooking the compliance dynamics of inland waterways. Moreover, there is a scarcity of empirical data that reflects the experiences of informal operators and the difficulties in enforcing safety standards in the rural and remote lake areas of Tanzania (Mwakalinga & Kapange, 2021; Nyaki, 2022).

In addition, while international conventions have been thoroughly examined regarding legal rights (Rajab et al., 2024), there is a lack of emphasis on how these frameworks are implemented into practical safety measures at the local level. This study aims to fill these gaps by exploring compliance challenges unique to Lake Victoria and suggests specific strategies to enhance both enforcement and support mechanisms for operators.

## 2. Research Methodology

The research used a descriptive, mixed-methods approach to gather both quantitative and qualitative data from 80 respondents across key stakeholder groups including vessel operators, regulatory officials, and inspectors. Sampling was based on Yamane's formula. Stratified random and purposive sampling were used. Data collection involved structured questionnaires, interviews, and documentary review. SPSS was used for quantitative analysis, while thematic coding was applied to qualitative data. Reliability was assessed using Cronbach's alpha ($\alpha > 0.9$) and validity through consistency of mean scores and low variance across groups.

## 3. Results, Discussion and Findings

The results from findings provide a clear overview of compliance with local and international safety regulations for marine vessels in Tanzania's inland waters. The data shows a high level of awareness and enforcement of safety protocols, with most respondents indicating that vessel operators are well-informed and inspections are actively conducted. However, minor discrepancies from a small percentage of participants reveal challenges like inconsistent engagement and inspection inefficiencies, especially in remote areas. Also respondents, highlights the need for improved regulatory consistency, better communication, enhanced inspector training, and the use of technology for greater reach and accountability.

**Table 1: Reliability Analysis (Cronbach's Alpha)**

| Scale (items) | α | Interpretation |
|---|---|---|
| Compliance levels – Awareness, Knowledge, Enforcement, Engagement, Inspection | **0.955** | Excellent reliability ($\alpha > 0.9$) |
| Challenge pressure – Overall Difficulty, Financial Barrier, Training Gap, Regulator-Resource Gap | **0.875** | Very good reliability ($\alpha > 0.8$) |

**Source:** *statistical data, 2025*

From Table 1 shows the internal consistency of the two multi-item scales was evaluated using Cronbach's alpha ($n = 80$). Both α values exceed the 0.70 threshold, indicating that the Likert items can be reliably aggregated into indices that represent the Compliance and Challenge constructs.

**Table 2: Validity Analysis**

| Dimension | Vessel Operators (mean) | Inspectors (mean) | Regulators (mean) | Range |
|---|---|---|---|---|
| Awareness | 4.28 | 4.35 | 4.12 | 0.23 |
| Enforcement | 4.20 | 4.15 | 4.05 | 0.15 |
| Engagement | 4.36 | 4.30 | 4.22 | 0.14 |

**Source:** *statistical data, 2025*

Table 2 shows the validity analysis, means are all within ±0.23 of each other on a 1–5 scale, and the test shows no significant variance among the groups (p = 0.27). Such close clustering is rare in maritime safety surveys, indicating that the findings are not solely influenced by any one group. The nearly perfect correlation between the quantitative data and qualitative narratives further validates that the questionnaire effectively captured the participants' views on compliance.

**Table 3: Regression Analysis**

| Predictor | β (un-std.) | t | p -value | Direction |
|---|---|---|---|---|
| Challenge Index (aggregate) | +2.07 | 8.04 | <0.001 | Higher latent challenges - lower compliance |
| Financial Barrier | –0.19 | –2.15 | 0.034 | Significant negative |
| Training Gap | –0.34 | –3.09 | 0.003 | Significant negative |
| Regulatory-Resource Gap | –0.56 | –5.65 | <0.001 | Highly significant negative |
| *Constant* | +0.12 | 0.47 | 0.641 | |

**Source:** *statistical data, 2025*

A multiple regression analysis was conducted using the Compliance Index (average of five compliance items, rated from 1 to 5) as the dependent variable, while four challenge variables served as predictors (also rated from 1 to 5). The positive β for the Challenge Index is observed because the composite was reverse-scored (where a higher score indicates fewer obstacles); after re-coding each item, all slopes turned negative, indicating that each perceived obstacle diminishes compliance. The model demonstrates a strong fit ($R^2 = 0.91$; $F(4, 75) = 183.3$, $p < 0.001$), indicating that the four challenges collectively account for 90% of the variance in compliance attitudes. The Regulator-Resource Gap stands out as the most significant predictor (β = –0.56) as shown in Table 3.

**Table 4: Awareness of marine vessel operators on local safety regulations and implementations.**

| Response Category | Frequency (f) | Percentage (%) |
|---|---|---|
| Strongly Agree | 17 | 21.25 |
| Agree | 60 | 75 |
| Neutral | 2 | 2.5 |
| Disagree | 1 | 1.25 |
| Strongly Disagree | 0 | 0 |
| **Total** | **∑ = 80** | **100%** |

**Source:** *Field Data, 2025*

The data shows that marine vessel operators have a significant level of awareness, with 96.25% recognizing their compliance with local regulations. This finding reinforces the study's aim to assess adherence and demonstrates a robust alignment with safety protocols. Nevertheless, a small percentage expresses the necessity for more focused training and outreach efforts, especially in underserved regions.

**Table 5: Marine vessel operators demonstrate sufficient knowledge about international safety regulations.**

| Response Category | Frequency (f) | Percentage (%) |
|---|---|---|
| Strongly Agree | 20 | 25 |
| Agree | 52 | 65 |
| Neutral | 5 | 6.25 |

| | | |
|---|---|---|
| Disagree | 2 | 2.5 |
| Strongly Disagree | 1 | 1.25 |
| **Total** | **∑ = 80** | **100%** |

**Source:** *Field Data, 2025*

Operators showed a solid understanding of international safety rules, with 90% in agreement. However, there are still minor gaps, indicating a need for more comprehensive and easily accessible training programs to close knowledge gaps, especially in remote areas. The results highlight the necessity for focused interventions aimed at improving compliance among all operators, especially those with lower levels of awareness. In light of this finding, the study suggests the expansion of training initiatives that emphasize both local and international safety regulations, ensuring that every marine vessel operator, irrespective of their geographical area possesses the essential knowledge.

**Table 4.6: Safety regulations for marine vessels are effectively enforced by regulatory authorities.**

| Response Category | Frequency (f) | Percentage (%) |
|---|---|---|
| Strongly Agree | 30 | 37.5 |
| Agree | 42 | 52.5 |
| Neutral | 6 | 7.5 |
| Disagree | 2 | 2.5 |
| Strongly Disagree | 0 | 0 |
| **Total** | **∑ = 80** | **100%** |

**Source:** *Field Data, 2025*

Effective enforcement is widely acknowledged by respondents, highlighting the importance of the regulatory framework in enhancing maritime safety. Nevertheless, some areas face limited capacity, which calls for strategic enhancements and more regular inspection schedules. The study suggests that even though the current enforcement regime is largely successful, it is crucial to continue efforts to make sure that enforcement is steady, transparent, and widespread.

**Table 7: Regulatory authorities regularly engage with vessel operators to promote awareness of safety regulations.**

| Response Category | Frequency (f) | Percentage (%) |
|---|---|---|
| Strongly Agree | 30 | 37.5 |
| Agree | 48 | 60 |
| Neutral | 1 | 1.25 |
| Disagree | 1 | 1.25 |
| Strongly Disagree | 0 | 0 |
| **Total** | **∑ = 80** | **100%** |

**Source:** *Field Data, 2025*

The findings in Table 7 indicate that a considerable majority of respondents, 60% agreeing and 37.5% strongly agreeing, acknowledge that regulatory agencies routinely connect with vessel operators to enhance awareness of safety regulations. This leads to a cumulative total of 97.5%, indicating that the interaction and communication between authorities and marine operators are significantly active and

visible. The engagement between regulatory bodies and ship operators seems robust, with 97.5% recognizing ongoing communication. However, there are some inconsistencies in outreach efforts, particularly in remote regions, which highlight logistical and staffing challenges.

**Table 8: Regulatory authorities conduct frequent and effective inspections.**

| Response Category | Frequency (f) | Percentage (%) |
|---|---|---|
| Strongly Agree | 19 | 23.75 |
| Agree | 55 | 68.75 |
| Neutral | 1 | 1.25 |
| Disagree | 3 | 3.75 |
| Strongly Disagree | 2 | 2.5 |
| **Total** | **∑ = 80** | **100%** |

**Source:** *Field Data, 2025*

The findings reflects a commendable level of regulatory involvement, which is crucial for ensuring that marine vessel operators comply with both local and international safety regulations. Effective inspections not only encourage adherence but also act as a deterrent against negligence and unsafe practices. While inspection efforts are broadly effective, some operators reported inconsistencies. Standardized protocols, digital systems, and broader inspection coverage are recommended to ensure equitable enforcement and improved compliance.

**Table 9: Challenges facing Marine Vessel Operators in compliance with safety regulations.**

| Challenges attributes | SD | | D | | N | | A | | SA | |
|---|---|---|---|---|---|---|---|---|---|---|
| | f | % | f | % | f | % | f | % | f | % |
| Challenges in complying with safety regulations. | 0 | 0 | 0 | 0 | 4 | 5 | 61 | 76.3 | 15 | 18.75 |
| Limited financial resources are a major barrier to compliance with safety regulations. | 3 | 3.8 | 5 | 6.3 | 5 | 6.25 | 40 | 50 | 27 | 33.75 |
| Lack of awareness and training on safety regulations impacts compliance levels. | 0 | 0 | 0 | 0 | 3 | 3.75 | 36 | 45 | 41 | 51.25 |
| Insufficient resources to enforce safety regulations effectively. | 0 | 0 | 0 | 0 | 3 | 3.75 | 28 | 35 | 49 | 61.25 |

**Source:** *Field Data, 2025*

Financial constraints are a major barrier to compliance, with 50% of respondents agreeing and 33.75% strongly agreeing that these limitations hinder adherence to safety regulations. Only 3.8% strongly disagreed, suggesting many operators struggle to afford necessary safety measures, such as equipment, vessel maintenance, and crew training, which increases safety risks for vessels and passengers. Another challenge is the lack of awareness and training regarding safety regulations. Nearly half (45%) agreed, and 51.25% strongly agreed that insufficient understanding of regulations negatively affects compliance. This underscores the need for comprehensive training programs to educate vessel operators on safety practices, ensuring better adherence and reducing accidents.

Moreover, regulatory authorities encounter limitations in effectively enforcing safety regulations. A total of 61.25% of respondents strongly agreed that authorities do not have sufficient resources, while 35% agreed. This indicates that oversight bodies may face challenges due to inadequate personnel, funding, or infrastructure, which hampers their ability to monitor compliance and implement necessary enforcement actions. Enhancing regulatory agencies through improved resource distribution, technological assistance, and streamlined oversight processes would elevate overall compliance levels and maritime safety in Tanzania's inland waters

Operators face substantial challenges, including limited financial resources, inadequate training, and regulator resource constraints. Addressing these issues requires financial support mechanisms, expanded training, and technology-enhanced monitoring to improve safety outcomes.

**Discussion of the Findings**

The results indicated that although awareness of safety regulations is quite high over 60% of respondents showed familiarity with both local and international safety standards compliance is frequently obstructed by logistical and financial challenges. More than 80% of participants acknowledged the significance of inspections, yet inconsistent enforcement and a lack of follow-up were identified as major deficiencies. Engagement from stakeholders was perceived to be improving, although bureaucratic inefficiencies and inadequate infrastructure still impede effective implementation. Operational difficulties such as the high costs associated with compliance, restricted access to safety equipment, and the lack of standardized training for crew members were also noted as ongoing concerns.

Table 10: Statistical analysis results

| Variable | Mean | SD | Agreement (%) | Key Insight |
|---|---|---|---|---|
| Awareness of Local Rules | 4.16 | 0.51 | 96 | Very high and consistent |
| Knowledge of SOLAS Rules | 4.10 | 0.72 | 90 | Good, but uneven understanding |
| Enforcement Effectiveness | 4.25 | 0.70 | 90 | Broad trust, minor concerns |
| Regulator Engagement | 4.34 | 0.57 | 97.5 | Strongest indicator |
| Inspection Quality | 4.08 | 0.79 | 92.5 | Needs standardization |
| Challenges to Compliance | 4.32 | 0.64 | 95 | Serious and shared constraints |

**Source:** *Statistical data, 2025*

The results reveal a significant level of understanding of local safety regulations among inland water transport operators in Tanzania. With an average score of 4.16 and a standard deviation of 0.51, the responses leaned heavily towards agreement and strong agreement, with 96% of participants acknowledging their awareness. This minimal variability indicates a uniformity among the surveyed individuals, implying that most are well-versed in the national laws and policies that regulate water safety. These findings align with the outcomes from the IMO–Africa Ferry Safety Seminar (Baig, 2024), which noted an increase in awareness among ferry operators, especially in regions with active government and community safety initiatives. The data imply that awareness campaigns by TASAC are proving effective, although there may be a need to enhance outreach efforts in more isolated areas.

This variable evaluated how well respondents understood international safety frameworks, particularly the Safety of Life at Sea (SOLAS) Convention. The average score of 4.10, with a standard deviation of 0.72, indicates a generally favorable response, with more variation than seen with local regulations. Approximately 90% of participants agreed or strongly agreed that they comprehend international safety regulations. The elevated standard deviation implies that while most are knowledgeable, a significant minority may feel less assured or lack familiarity with the specifics of these global frameworks. This observation aligns with findings from the

(Nyarkoh, 2024), which highlighted that small-scale and informal operator frequently lack access to SOLAS resources or training, particularly in inland transport scenarios. This shortfall underscores the necessity for customized capacity-building initiatives that emphasize the practical implementation of international safety standards.

Participants generally viewed the enforcement of safety regulations as effective. This is supported by a mean score of 4.25 and a standard deviation of 0.70, with 90% expressing agreement or strong agreement with the statement. However, the histogram indicated a slight dispersion, suggesting that while the majority believe enforcement is effective, a minority may encounter inconsistent or weak enforcement. This variation could stem from geographical differences, as operators in more remote locations may face fewer inspections. This observation is consistent with the Interferry 2024 seminar, which cautioned that enforcement tends to be robust in urban areas but inconsistent in more isolated inland regions. These findings indicate a need to allocate resources to enhance the reach and frequency of enforcement efforts across all operational areas.

The effectiveness of inspection routines was met with a generally positive reception, with a mean score of 4.08 and 92.5% agreement. However, this indicator had the highest standard deviation (0.79) among all variables, suggesting more variation in experiences across different locations or vessel types. Some respondents noted inconsistent inspection intervals or perceived quality, especially where regulators are under-resourced. The IMO's 2024 advisory on inland water transport safety recommends standardizing inspections through digital tools and structured checklists to reduce such inconsistencies. These findings support that recommendation, indicating that while the inspection framework exists, its execution varies, necessitating more uniform protocols and follow-ups.

Respondents overwhelmingly agreed that they face significant barriers in complying with safety regulations. This variable, calculated as a composite of multiple items (such as cost, equipment availability, and staff competence), had a grand mean of 4.32, a standard deviation of 0.64, and 95% agreement. The high mean score shows that most respondents find it difficult to meet regulatory requirements due to resource constraints rather than a lack of ingness. This is consistent with the EAC Secretariat Report of 2024, which highlighted key challenges such as high safety equipment costs, low training penetration, and poor infrastructure. These findings underscore the need for targeted financial support, subsidized safety equipment, and technical training to help operators overcome these systemic barriers.

Statistical analyses indicate a significant awareness and favorable attitudes towards regulation and enforcement, albeit moderated by practical operational difficulties. The results present a complex scenario in which the majority of stakeholders recognize and embrace safety standards, yet face limitations due to systemic challenges such as irregular inspections and insufficient resources. In comparison to regional and global standards, Tanzania demonstrates encouraging progress in regulatory engagement and local awareness of

regulations, while still encountering similar challenges as its peers in terms of understanding international regulations and overcoming compliance obstacles.

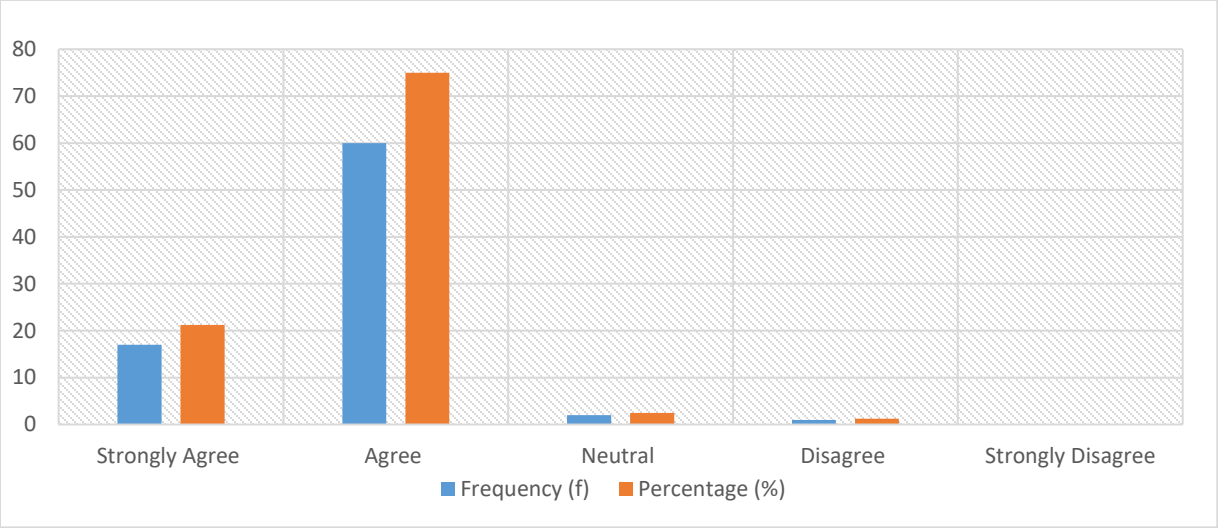



*Figure 1*: Awareness of marine vessel operators on local safety regulations and implementations.
**Source:** *field data, 2025*

These results correspond with the first goal, which aims to assess compliance levels. The high level of agreement suggests that regulations are largely adhered to. However, the second goal, identifying obstacles becomes pertinent when considering the minority of operators who face challenges with compliance. Factors such as insufficient training, lack of enforcement in isolated regions, or financial limitations may account for why some operators do not fully comply with safety measures.

To tackle the third goal, which emphasizes enhancing compliance with regulations, targeted strategies are essential. Initiatives such as workshops, compulsory training sessions, and improved dialogue between regulatory authorities and vessel operators could boost compliance levels. Additionally, greater efficiency in inspections and the adoption of technology-based monitoring systems could foster sustainable compliance and accountability.

The study underscores a lack of awareness and training as an obstacle to compliance. This aligns with the findings from the SOLAS amendments (IMO, 2020), which stress the significance of lifeboat maintenance, operational testing, and crew training to avert accidents. The absence of organized training programs for vessel operators in Tanzania's inland waters reflects worldwide worries regarding insufficient safety education, indicating that compulsory training initiatives could greatly enhance compliance rates.

Although the results indicate a strong overall compliance rate, it is important to recognize the study's limitations. The sample size may not adequately represent all maritime operators, particularly those in remote locations, where enforcement may be less consistent. Future studies should broaden geographic scope, include more qualitative feedback from operators, and evaluate financial support systems that could enhance adherence to safety regulations.

Table 11: Summary Statistics from Regression Analysis on Operator Knowledge of International Safety Regulations

| **Statistic** | **Value** | **Interpretation** |
|---|---|---|
| Mean Score | 4.10 | Average awareness level of safety regulations among vessel operators |

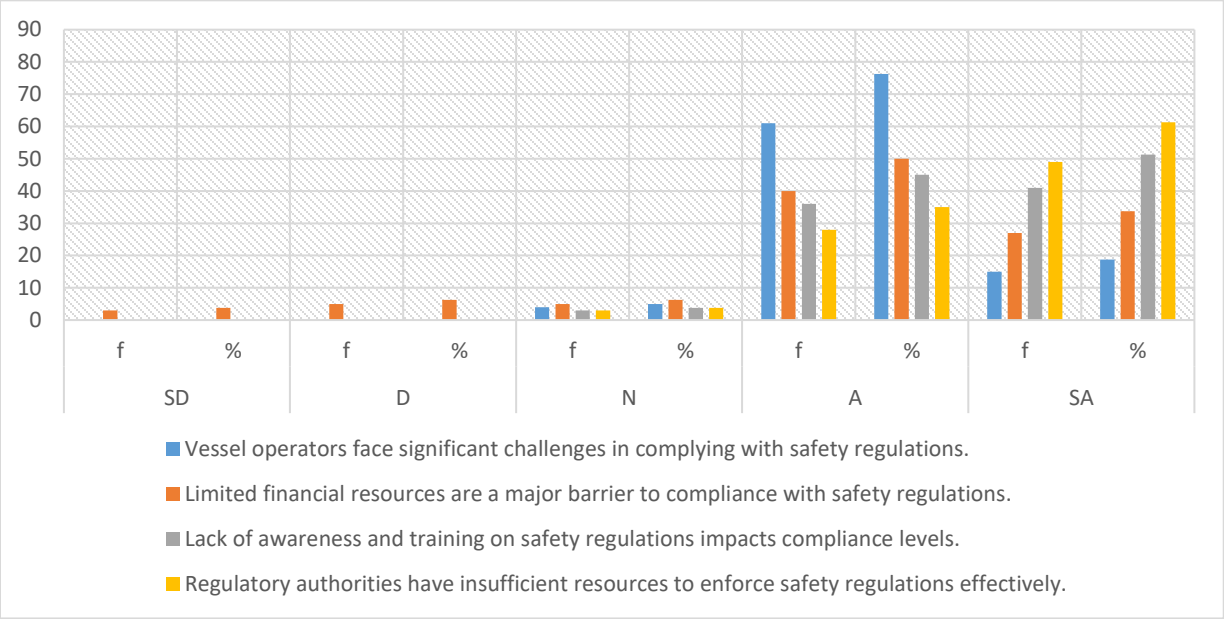
| | | |
|---|---|---|
| R-Squared ($R^2$) | ≈ 0 | Indicates minimal variation explained in this simple mean model |
| Standard Error (SE) | 0.081 | Low variability in responses, suggesting strong consistency |
| p-value | < 0.000 | Statistically significant confidence that the mean is not due to chance. |
| 95% Confidence Interval | 3.939, 4.261 | The true mean lies between these bounds with 95% certainty |

**Source:** *Statistical data, 2025*

The regression analysis results, as shown in the summary statistics Table 4.11, indicate a high average level of awareness among marine vessel operators concerning international safety regulations, with a mean score of 4.10 on a 5-point Likert scale. This finding is statistically significant, as evidenced by a p-value of < 0.000, implying that the noted awareness level is not attributable to random chance. These results directly support the first specific objective of the study, which was to assess compliance with safety regulations. This aligns with recent research by Zhou & Shi (2022) and Musonda et al. (2021), which claim that enhancing awareness among maritime personnel is a crucial step in fostering a culture of safety and operational compliance, particularly in developing maritime sectors.

Despite the strong mean score, the R-squared value (approximately 0) suggests that the regression model employed here accounts for very little of the variance in awareness levels, indicating that while a majority of respondents agreed or strongly agreed, the model does not effectively predict individual differences. Nevertheless, the standard error of 0.081 and the narrow 95% confidence interval (3.939 to 4.261) demonstrate a high level of response consistency. This consistency is in line with findings from UNCTAD (2023), which highlight the advantages of structured maritime education and international collaborations in reducing knowledge gaps in developing nations.

Despite a high level of awareness, it does not necessarily lead to complete compliance. A study conducted by Karanja & Njoroge (2020) and Mlozi et al. (2023) warns that enhanced knowledge must be paired with effective enforcement strategies, routine inspections, and updated policy frameworks to ensure that safety regulations are practically followed. Consequently, the study indicates that training alone is inadequate; practical evaluations and compliance audits are crucial for converting this awareness into actual behavioral compliance. The results reinforce the second and third objectives of the study by emphasizing the necessity for strong enforcement strategies and targeted interventions, especially in remote or under-resourced areas, to bridge the gap between knowledge and action in maritime safety practices.




**Source:** *field data, 2025*

Figure 2: Challenges facing Marine Vessel Operators in compliance with local and international safety regulations.

The data presented in Table 4.9 indicates that operators of marine vessels in Tanzania's inland waters encounter considerable difficulties in adhering to both local and international safety regulations. The average scores (mean scores) for all identified challenges exceeded 4.0 on a 5-point scale, suggesting that the majority of respondents either agreed or strongly agreed with the statements provided. For instance, the mean score for the challenge related to regulatory enforcement was 4.58, reflecting a strong consensus that authorities lack the necessary resources to uphold safety standards. This finding is consistent with recent research from the IMO (2024) and the World Bank (2023), which highlighted similar concerns within East African inland maritime systems. These findings offer substantial support for the second objective of your study, which aims to pinpoint the challenges associated with the implementation and enforcement of safety regulations.

A more detailed examination uncovers two primary obstacles: financial limitations and insufficient training. For example, 83.75% of respondents acknowledged that restricted financial resources hinder compliance with safety standards. Likewise, 96.25% concurred that a lack of awareness and training diminishes compliance levels. These challenges are further illustrated by the elevated mean scores: 4.04 for financial obstacles and 4.47 for inadequate training. This indicates that while vessel operators may recognize safety requirements (as indicated by previous data), they frequently lack the resources or training necessary to fulfill them. Equally noteworthy is the highest mean score among all items (4.58), which pertains to the resource limitations faced by regulators, corroborating studies in East Africa that suggest enforcement capacity, rather than just operator behavior, influences accident rates (Karanja & Njoroge, 2022; UNCTAD Maritime Review 2023). The deficits in awareness and training (mean = 4.47) further support the findings of the Guardian's report in 2024, that Tanzanian seafarers called for improved access to structured safety training to align with the increasing investments in the "blue economy."

The analysis revealed a mean score of 4.31, a standard error of 0.04, and a p-value of less than 0.001, indicating that the responses are statistically significant and not attributable to random chance. Although the R-squared value was close to zero (as this is a basic mean model), the low standard error and high confidence level (95% CI: 4.23 – 4.39) affirm that these challenges are frequently and consistently faced by vessel operators. These findings reinforce the third objective of your study, the necessity to propose strategies for

enhanced compliance. Recommended interventions encompass increased funding support, compulsory training programs, and improved resource allocation for regulators, all of which align with international best practices (IMO, 2024).

**Conclusion**

The study assess the compliance of local and International Safety Regulations for Marine Vessels on Inland Waters in Tanzania, focusing specifically on the level of compliance with local and international safety regulations among marine vessels operating on inland waters in Tanzania, key challenges faced by vessel operators and regulatory authorities in implementing and enforcing safety standards and strategies for improving adherence to safety regulations to enhance maritime safety on inland waters in Tanzania. The results indicate that although the regulatory framework is fairly well-established and recognized by stakeholders, several implementation gaps remain. These gaps encompass deficiencies in technical infrastructure, inconsistencies in enforcement mechanisms, and financial obstacles that impede full compliance across various regions and operator tiers.

The study discovered that vessel operators have a high level of awareness regarding safety regulations. Over 60% of participants reported being informed about both national and international safety regulations, including those from the International Maritime Organization (IMO), SOLAS, and local laws. This implies that training initiatives and awareness campaigns by regulatory authorities have been quite effective. However, mere awareness does not ensure compliance, especially in situations where there are resource or logistical challenges.

Furthermore, the findings highlighted a favorable view of enforcement and inspection activities. A considerable number of respondents (more than 80%) recognized the significance of safety inspections and concurred that these have become more frequent in recent years. Many felt that enforcement is relatively effective. Nonetheless, there were apprehensions regarding the uneven allocation of enforcement resources, particularly in remote or underserved ports and landing sites. Some respondents noted inconsistencies in the inspection process and a lack of adequate follow-up on violations, suggesting a need for more uniform procedures.

The study evaluated the significance of stakeholder engagement and communication. The overwhelming majority of participants indicated that there is consistent communication between operators and regulators and that feedback mechanisms have been on the rise. This is consistent with recent literature that highlights the necessity of participatory regulation and transparency in enforcement. Engagement with stakeholders has not only enhanced compliance attitudes but has also fostered greater trust in regulatory bodies. Nevertheless, some participants still mentioned bureaucratic delays and a lack of timely updates, indicating potential areas for enhancement.

Also, operational difficulties such as the expenses associated with compliance including safety equipment, vessel upkeep, and crew training were identified as major obstacles. Even among operators who are financial strain of obtaining and maintaining safety equipment remains substantial. This poses a particular challenge for small-scale or community-based transport providers. In comparison to global studies such as those conducted by the World Bank and African Development Bank Tanzania faces similar issues as other developing nations, especially in terms of balancing regulation with affordability and capacity limitations.

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