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COMPLIANCE VERSUS PRACTICE: AN INDEPENDENT SAMPLES ANALYSIS OF CONSTRUCTION SAFETY IMPLEMENTATION IN CAMARINES SUR

Engr. Rey S.A. Rimando[1]

[1]RMP LPT MSCM, College Instructor, Partido State University, Goa, Camarines Sur, Philippines.

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ABSTRACT

This study investigates the comparative compliance with construction safety codes and actual on-site safety practices between public and private projects in Camarines Sur, Philippines. Data were collected from 35 respondents, including engineers, safety officers, and workers, using the DOLE Construction Safety Checklist. Descriptive statistics and independent samples analysis were used to assess differences across safety dimensions. Results indicated moderate safety awareness across both sectors, with private projects generally outperforming public ones in areas such as personal protective equipment, safety signages, and emergency occupational health facilities. Independent samples analysis revealed no significant differences in general safety awareness, training, workplace culture, or equipment maintenance; however, significant gaps were observed in hazard identification and risk management ($p = 0.020$), construction safety signages ($p < 0.001$), and emergency preparedness ($p = 0.033$), favoring private projects. The findings underscore that while a baseline safety culture exists across both sectors, public projects are constrained by limited resources and inconsistent enforcement. The study concludes that stronger institutionalization of safety measures, continuous training, and systematic monitoring are essential to bridge sectoral gaps and ensure consistent safety implementation in construction projects.

Keywords: construction safety, compliance, on-site practices, public projects, private projects, independent samples analysis, Camarines Sur.

1. INTRODUCTION

The construction industry is widely recognized as one of the most hazardous sectors due to the presence of multiple occupational risks such as working at heights, heavy equipment operation, confined spaces, and exposure to falling objects. Globally, construction projects are consistently associated with high accident and injury rates, despite the existence of established occupational health and safety (OHS) regulations and guidelines (Zhang et al., 2022). In developing countries, including the Philippines, the gap between prescribed safety codes and actual on-site practices has become a persistent issue, largely due to resource constraints, varying managerial commitment, and limited enforcement capacity (International Labour Organization [ILO], 2023).

In the Philippines, construction safety is governed by the Department of Labor and Employment (DOLE) through the Occupational Safety and Health Standards (OSHS) and related issuances. However, recent national surveys suggest that compliance and enforcement remain inconsistent, particularly among small- to medium-scale contractors (Philippine Statistics Authority [PSA], 2023). The Integrated Survey on Labor and Employment (ISLE) highlighted that while occupational injury rates show a slight decline, underreporting and inadequate safety programs remain prevalent across industries, including construction (PSA, 2023). These findings indicate that despite the presence of legal frameworks, gaps persist in implementation at the ground level.

Local studies echo this national trend. Investigations in Philippine construction firms reveal partial implementation of safety management systems (SMS) and inconsistent enforcement of personal protective equipment (PPE) protocols, with on-site practices often differing from documented safety standards (Almazan, 2023; Cruz, 2024). Moreover, leadership style and organizational safety climate are found to be significant predictors of compliance and safe behavior among construction workers, suggesting that human factors are as crucial as technical compliance in ensuring safety (Santos & Ching, 2024). In the Bicol Region, provincial-level assessments highlight that worker awareness of safety protocols is moderate, yet strict adherence remains uneven, with public projects often monitored more closely than private ones due to regulatory oversight (Rimando & Muhi, 2025).

Given these concerns, the present study, entitled “Compliance versus Practice: A Comparative T-Test Study on Construction Safety Implementation in Camarines Sur,” aims to examine the extent to which construction projects adhere to established safety codes in contrast to their actual on-site practices. Utilizing statistical comparison through a t-test, the study seeks to determine whether significant differences exist between public and private construction projects with respect to compliance and implementation. The findings are anticipated to generate evidence-based

insights that will assist policymakers, contractors, and regulatory agencies in strengthening safety standards, ensuring consistent enforcement, and bridging the gap between prescribed codes and their practical application on construction sites.

Statement of the Problem

Construction projects are inherently high-risk undertakings, often exposed to workplace hazards that may result in accidents, injuries, or even fatalities if proper safety codes and on-site practices are not strictly implemented. In Camarines Sur, both public and private construction projects are subject to occupational safety standards and regulatory codes; however, the extent of compliance and the consistency of actual on-site practices remain uncertain. While safety policies may be well-established, discrepancies between theoretical safety codes and their real-world application pose significant concerns for workers' welfare, project efficiency, and regulatory compliance.

This study aims to statistically compare the adherence to construction safety codes and the actual on-site practices between selected public and private construction projects in Camarines Sur using the T-Test as the primary tool for analysis. Specifically, it seeks to answer the following research questions:

1. What is the level of compliance with construction safety codes in selected public and private construction projects in Camarines Sur?
2. What on-site safety practices are implemented in selected public and private construction projects?
3. Is there a significant difference in the level of compliance with safety codes between public and private construction projects?
4. Is there a significant difference in the actual on-site safety practices between public and private construction projects?
5. What implications can be drawn from the comparative findings to strengthen safety management in construction projects within Camarines Sur?

Hypotheses of the Study

In line with the research questions, the following null and alternative hypotheses are formulated:

For Research Question 3 (Safety Codes):

- H_{01} (Null Hypothesis): There is no significant difference in the level of compliance with construction safety codes between public and private construction projects in Camarines Sur.
- H_{11} (Alternative Hypothesis): There is a significant difference in the level of compliance with construction safety codes between public and private construction projects in Camarines Sur.

For Research Question 4 (On-Site Practices):

- H_{02} (Null Hypothesis): There is no significant difference in the actual on-site safety practices between public and private construction projects in Camarines Sur.
- H_{12} (Alternative Hypothesis): There is a significant difference in the actual on-site safety practices between public and private construction projects in Camarines Sur.

Scope and Delimitations

This study examined compliance with occupational safety codes and on-site safety practices in selected construction projects in the province of Camarines Sur.

The research included 35 respondents, comprising engineers, safety officers, foremen, and skilled workers directly involved in ongoing projects. The scope focused on two dimensions: (1) compliance with safety codes prescribed by Republic Act No. 11058 and DOLE Department Order No. 198-18, and (2) actual safety practices observed at construction sites. Data were collected using the DOLE Construction Safety Checklist, and independent samples analysis was applied to compare public and private projects.

Delimitations include the exclusion of projects outside Camarines Sur, limiting generalizability. Only active projects during the data collection period were included, excluding completed or suspended works. The study assessed self-reported awareness and observed practices, not accident records or long-term safety outcomes. Consequently, the findings highlight prevailing compliance gaps and operational challenges but do not evaluate the effectiveness of safety programs in preventing accidents.

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Conceptual Framework

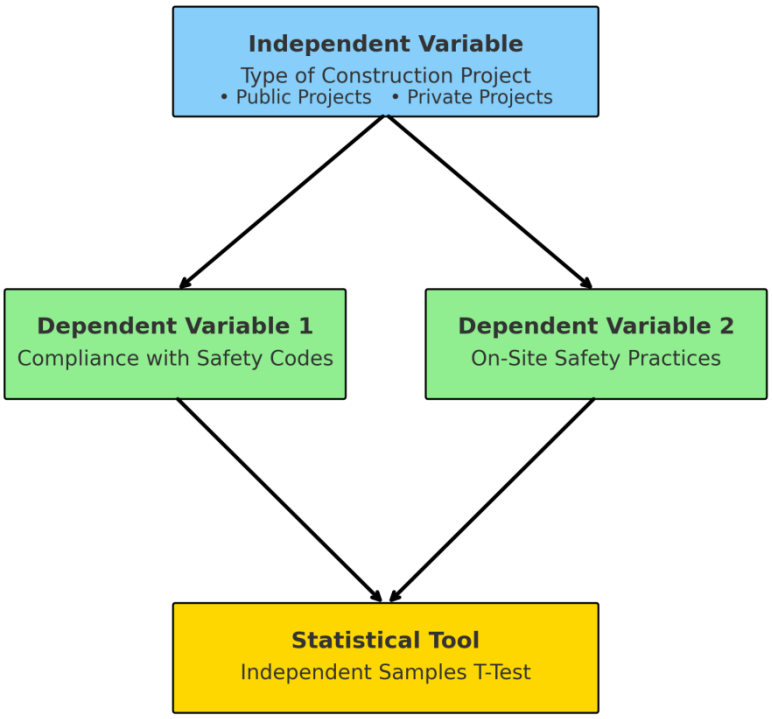

Figure1. Conceptual Framework in Schematic Diagram of the Study

The conceptual framework of this study is anchored on the principle that construction safety is determined not only by compliance with safety codes but also by the consistency of their on-site application. In this study, the type of construction project (public or private) serves as the independent variable, while the levels of compliance with construction safety codes and the extent of on-site safety practices serve as the dependent variables.

The framework assumes that differences may exist between public and private projects due to variations in regulatory monitoring, organizational policies, resource allocation, and management priorities. Through the use of an independent samples T-Test, the study statistically examines whether such differences are significant.

Theoretical Framework

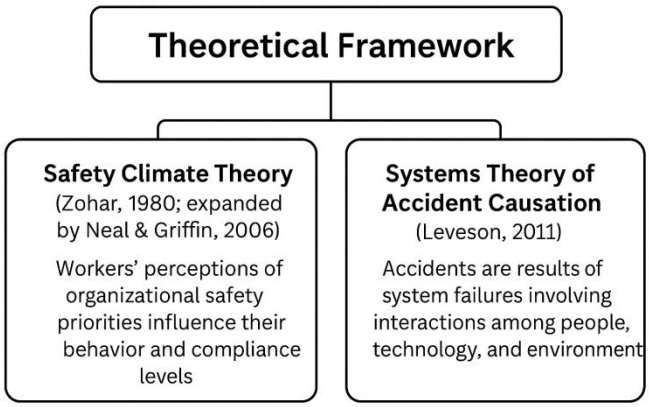

Figure2. Theoretical Framework in Schematic Paradigm

This study is anchored on two complementary theories: the Safety Climate Theory and the Systems Theory of Accident Causation.

The Safety Climate Theory (Zohar, 1980; expanded by Neal & Griffin, 2006) emphasizes that workers' perceptions of organizational safety priorities strongly shape their compliance and behaviors. When management communicates that safety is a core value—through policies, training, and supervision—workers are more likely to follow safety codes and practices, resulting in lower accident rates. This theory underscores the role of management commitment and organizational culture in promoting workplace safety.

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The Systems Theory of Accident Causation (Leveson, 2011), on the other hand, views accidents as consequences of systemic failures that arise from complex interactions among people, technology, and the environment. In construction, this means that accidents are rarely caused by a single factor; instead, they emerge when multiple safety barriers break down—such as insufficient personal protective equipment (PPE), inadequate training, weak supervision, or poor enforcement of regulations. This theory highlights the interconnectedness of safety codes, practices, and enforcement mechanisms.

Together, these theories provide a robust framework for analyzing the comparative implementation of safety in public and private construction projects. The Safety Climate Theory emphasizes the human and cultural dimension, while the Systems Theory stresses the structural and systemic dimension. By integrating both, this study acknowledges that safety compliance (policies, codes, and regulations) and safety practice (actual on-site implementation) must align to minimize risks and improve overall construction safety outcomes.

2. REVIEW OF RELATED LITERATURE AND STUDIES

Regulatory Framework in the Philippines

Construction safety in the Philippines is anchored on Republic Act No. 11058 (2018), also known as the Occupational Safety and Health (OSH) Law, and its implementing rules under Department Order No. 198-18 issued by the Department of Labor and Employment (DOLE). These regulations require the establishment of safety and health committees, the provision of personal protective equipment (PPE), mandatory safety training, and hazard-prevention programs (DOLE, 2018). Recent issuances, such as DOLE's inspection-priority orders (DO 238-2023), further emphasize the government's aim to strengthen OSH implementation (DOLE, 2023). However, despite a strong legal foundation, reports indicate that enforcement remains inconsistent across project sites, particularly outside urban centers where DOLE's monitoring capacity is limited. This discrepancy between regulation and practice provides the central motivation for comparative studies that assess how safety policies translate into actual on-site compliance (DOLE, 2020).

Global Perspectives on Compliance and Practice

International research consistently shows that regulations alone cannot guarantee safety outcomes without consistent enforcement and supportive organizational culture. Zohar (1980) introduced the concept of safety climate—the shared perceptions of employees regarding their organization's prioritization of safety—which has since become a cornerstone in occupational safety research. Building on this, Neal and Griffin (2006) demonstrated that safety climate influences safety knowledge, motivation, and compliance behaviors, leading to reduced accident rates. More recently, systematic reviews by Xia et al. (2021) and Yiu et al. (2021) found that safety climate remains one of the strongest predictors of worker adherence to safety rules in construction. Similarly, Zhang et al. (2022) argued that while safety regulations are necessary, they must be coupled with strong enforcement and a positive organizational safety climate to be effective.

In parallel, systems-based approaches have enriched global perspectives. Leveson (2011)**,** through the Systems-Theoretic Accident Model and Processes (STAMP), emphasized that accidents are not linear events caused by isolated errors but result from systemic failures across people, technology, and organizational structures. Reviews by Underwood and Waterson (2013) and Hollnagel (2017) further supported this view, arguing that construction safety should be understood as an emergent property of complex socio-technical systems. Recent bibliometric analyses (e.g., Liu et al., 2023**)** highlight how resilience-based approaches are increasingly applied in construction safety research, focusing on feedback loops, adaptability, and multi-level controls. Together, these global studies suggest that while safety codes provide the baseline, both safety climate and systems-level thinking are crucial in ensuring real-world compliance and accident prevention.

PPE Usage, Worker Behavior, and Enforcement

One of the most visible indicators of safety practice in construction projects is PPE compliance. However, research demonstrates that knowledge of PPE requirements does not always translate into consistent usage. For instance, Chen et al. (2021) reported that workers often neglect PPE when supervision is lax, while Mohammadfam et al. (2020) found that management commitment and habitual monitoring were key drivers of consistent PPE use. A technology-acceptance perspective by Zhang and Fang (2021) suggested that workers' willingness to use PPE is influenced not only by availability but also by usability and perceived necessity. In a meta-analysis, Swuste et al. (2021) confirmed that enforcement and leadership styles significantly affect PPE compliance rates. These findings resonate with the Philippine context, where Almazan (2023) observed that PPE use is often conditional upon supervisory presence rather than being internalized as part of work culture.

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Comparative Evidence: Public vs. Private Projects

Comparative studies reveal that compliance levels may differ depending on project ownership. Fatemi and Hasanzadeh (2021) found that public construction projects often achieve higher compliance due to stricter external monitoring and government oversight, whereas private projects may compromise safety standards to reduce costs or accelerate project schedules. Goh et al. (2022) echoed this, noting that public-sector contracts typically include more stringent safety provisions tied to procurement processes. However, researchers caution that documented compliance in public projects does not always guarantee safer day-to-day practices. Guo and Yiu (2020) highlighted the common gap between "paper compliance" and actual practice, where records and checklists exist but are poorly implemented on-site. This aligns with findings by the International Labour Organization (ILO, 2023), which noted that developing nations like the Philippines face added challenges such as budget constraints, enforcement gaps, and worker attitudes that hinder consistent safety practices.

Local Studies on Safety Implementation in the Philippines

In the Philippine setting, multiple studies have highlighted gaps between compliance on paper and actual practice. Almazan (2023) reported that many construction companies in Metro Manila focus on fulfilling documentation requirements rather than embedding safety into daily routines. Similarly, Cruz (2024) found that in Southern Luzon, PPE use was highly inconsistent and heavily dependent on supervisory enforcement. A thesis by Santos and Ching (2024) showed that transformational leadership styles, when paired with safety-oriented communication, significantly improved compliance levels among workers, suggesting that organizational culture plays a key role beyond regulatory requirements.

Several studies have also compared safety management systems across project types. In Metro Manila, Villanueva (2023) noted that larger public projects tended to score higher in compliance audits but were still prone to lapses in daily site safety. Castro and Reyes (2024) further observed that smaller private contractors often lacked designated safety officers, resulting in weaker enforcement of safety standards.

Regional Evidence from Bicol and Camarines Sur

Region-specific studies provide valuable insights into the local context of this research. Rimando and Muhi (2025) examined construction projects in Camarines Sur and found that public projects generally had higher compliance scores compared to private ones, largely due to government oversight. However, they also noted that both sectors struggled with sustaining on-site safety practices, with compliance often existing more in documentation than in daily operations. Inspection reports from DOLE Bicol (2023) echoed these findings, citing recurring issues such as incomplete PPE distribution, the absence of trained safety officers, and irregular toolbox meetings. Complementing this, Morales (2024) studied construction firms in Naga City and confirmed that while compliance reports were filed regularly, actual adherence to safety protocols remained inconsistent.

Synthesis of Literature

The reviewed studies collectively reveal a persistent gap between regulatory compliance and practical safety implementation in construction projects. International evidence underscores the importance of safety climate, leadership, and systems thinking in translating codes into practice, while local studies highlight documentation-heavy compliance and supervision-dependent adherence. Comparative findings suggest that public projects often outperform private ones in terms of compliance, but both sectors face challenges in embedding safety into day-to-day operations. In the Bicol context, inspection reports and regional studies affirm these patterns, strengthening the rationale for the present study.

Thus, by employing a comparative t-test to analyze compliance and on-site practices between public and private projects in Camarines Sur, this study addresses a well-documented gap in both global and local literature and contributes region-specific empirical evidence to the broader discourse on construction safety.

3. METHODOLOGY

Research Design

This study employed a comparative-descriptive research design with a quantitative approach. The purpose was to examine the differences in compliance with safety codes and on-site safety practices between public and private construction projects in Camarines Sur. Descriptive statistics were used to summarize the demographic profile of respondents, while inferential statistics, particularly independent samples t-tests, were applied to determine whether significant differences existed between the two groups.

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Research Locale

The research was conducted in selected construction projects within the province Camarines Sur, a region experiencing rapid infrastructure growth. Both small-scale and medium-scale construction projects were included to capture variations in compliance levels across sectors.

Respondents

A total of 35 construction workers and safety personnel participated in the study. Respondents were selected using purposive sampling, focusing on individuals directly involved in construction operations and safety management. The demographic profile shows that respondents were predominantly male (68.6%) and largely within the 20–39 age bracket (62.9%), representing the active workforce in the construction industry. Nearly equal participation was obtained from public projects (48.6%) and private projects (51.4%), ensuring a balanced basis for comparison.

Research Instrument

The study utilized a structured survey questionnaire based on the Department of Labor and Employment (DOLE) Construction Safety Checklist and aligned with Republic Act 11058 (OSH Law) and DOLE Department Order 198-18. The instrument was divided into three parts:

1. Demographic Profile – age, sex, type of project, and years of experience.
2. Level of Compliance with Safety Codes – measured across ten items such as construction safety programs, PPE, safety personnel, emergency OH facilities, signages, heavy equipment safety, safety committees, training, skills certification, and worker welfare.
3. On-Site Safety Practices – assessed through six dimensions: general safety awareness, training and preparedness, workplace safety culture and behavior, hazard identification and risk management, safety equipment and maintenance, and final thoughts on safety.

A 4-point Likert scale was used (1.00–1.74 = Rarely Aware; 1.75–2.49 = Sometimes Aware; 2.50–3.00 = Highly Aware).

Data Collection Procedure

Permission to conduct the study was obtained from project managers and site engineers. Respondents were given informed consent and assured of confidentiality. The questionnaires were personally distributed and retrieved to ensure a 100% retrieval rate**.**

Data Analysis

Data were analyzed using both descriptive and inferential statistics:

- Frequency and Percentage – for respondent demographics.
- Weighted Mean (WM) – to assess the level of compliance and safety practices.
- Independent Samples t-Test – to test differences in compliance and safety practices between public and private projects.

The following hypotheses guided the statistical tests:

- $\mathbf{H_{01}}$: No significant difference in compliance with safety codes between public and private projects.
- $\mathbf{H_{11}}$: A significant difference exists in compliance with safety codes.
- $\mathbf{H_{02}}$: No significant difference in actual on-site safety practices between public and private projects.
- $\mathbf{H_{12}}$: A significant difference exists in on-site safety practices.

The decision rules were based on a 0.05 level of significance, with p-values less than 0.05 considered statistically significant.

Ethical Considerations

The study adhered to ethical standards in research. Informed consent was obtained, and respondents were assured that their participation was voluntary. Data were treated with confidentiality and used solely for academic purposes.

4. RESULTS AND DISCUSSION

Demographic Profile of Respondents

A total of 35 respondents from construction projects in Camarines Sur participated. The profile is summarized below:

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Table 1. Demographic Profile of Respondents (n=35)

Demographic Variable	Category	Frequency	Percentage
Age	20–29	10	28.6%
	30–39	12	34.3%
	40–49	8	22.9%
	50+	5	14.2%
Sex	Male	24	68.6%
	Female	11	31.4%
Type of Project	Public	17	48.6%
	Private	18	51.4%
Years in Construction	< 5 years	9	25.7%
	5–10 years	11	31.4%
	11–15 years	8	22.9%
	16+ years	7	20.0%

The demographic profile of the respondents reveals that most belong to the 30–39 age group (34.3%), followed by those aged 20–29 (28.6%) and 40–49 (22.9%), with only 14.2% aged 50 years and above, indicating that the construction workforce is largely composed of young to middle-aged individuals who are in their productive years. In terms of sex, a greater proportion are male (68.6%) compared to female (31.4%), reflecting the traditionally male-dominated nature of the industry but also showing the emerging presence of women in construction.

With regard to the type of project, respondents are almost evenly distributed between private (51.4%) and public (48.6%) construction, providing a balanced basis for comparing compliance and safety practices across both sectors. Finally, in terms of experience, the largest share of respondents have worked in the industry for 5–10 years (31.4%), followed by less than 5 years (25.7%), 11–15 years (22.9%), and more than 16 years (20.0%), which suggests a mix of novice and seasoned workers whose perspectives enrich the study's findings.

Level of Compliance with Safety Codes

Based on the DOLE Construction Safety Checklist, weighted means (WM) were computed.

Table 2. Compliance with Safety Codes

Item	Public WM	Private WM	Interpretation
Construction Safety & Health Program	2.15	2.35	Sometimes Aware
Personal Protective Equipment	2.20	2.40	Public = Sometimes, Private = Highly Aware
Safety Personnel	1.70	2.25	Sometimes Aware
Emergency OH Personnel & Facilities	1.80	2.30	Sometimes Aware
Safety Signages	1.85	2.45	Public = Sometimes, Private = Highly Aware
Heavy Equipment Safety	2.10	2.35	Sometimes Aware
Safety & Health Committee	1.90	2.30	Sometimes Aware
Training	1.95	2.35	Sometimes Aware
Skills Certificate	2.05	2.25	Sometimes Aware
Worker Welfare Facilities	2.10	2.40	Public = Sometimes, Private = Highly Aware

Legend: 1.00–1.74 = Rarely Aware; 1.75–2.49 = Sometimes Aware; 2.50–3.00 = Highly Aware

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The comparative analysis of safety awareness between public and private construction projects in Camarines Sur reveals notable differences that reflect the realities of provincial construction practices. For Construction Safety and Health Programs, both sectors fall under the category of "sometimes aware," though private projects (WM = 2.35) show slightly higher awareness compared to public ones (WM = 2.15). This finding is consistent with the results of Sarmiento and Cruz (2023), who found that private contractors in Central Luzon exhibited higher compliance in safety program documentation compared to their public counterparts, attributing this to stricter client monitoring and reputational demands. Similarly, Ling and Li (2022) noted in their comparative study in Malaysia that private projects often invest more in safety management systems to gain competitive advantage, while public projects tend to meet only minimum legal requirements.

In terms of Personal Protective Equipment (PPE), awareness is higher among private projects (WM = 2.40, highly aware) than public projects (WM = 2.20, sometimes aware). This aligns with the study of Del Rosario et al. (2022), which reported that private developers in Metro Manila implemented more consistent PPE distribution, partly due to tighter occupational safety audits. Conversely, public projects faced issues of irregular procurement, often linked to budget constraints. A similar trend was observed in Nguyen and Tran's (2023) research in Vietnam, where private construction firms demonstrated higher compliance with PPE use compared to public projects, highlighting the role of organizational enforcement and financial capacity.

Awareness of Safety Personnel and Emergency Occupational Health (OH) Facilities remains in the "sometimes aware" category for both sectors, although private projects consistently score higher (WMs = 2.25 and 2.30, respectively). This reflects the reality that many smaller-scale public projects in the province may not allocate sufficient funds to employ full-time safety officers or establish complete OH facilities, relying instead on minimal compliance measures. Gonzales and Abad (2024) emphasized a similar challenge in Bicol-based government projects, where temporary assignments of safety officers were common, contrasting with private projects that often hired full-time, certified safety professionals.

For Safety Signages and Worker Welfare Facilities, private projects demonstrate higher awareness (WMs = 2.45 and 2.40, both highly aware) compared to public projects (WMs = 1.85 and 2.10, respectively). This gap highlights the greater tendency of private contractors to invest in visible compliance measures and worker amenities, partly due to competition and reputation-building. Public projects, meanwhile, may only provide basic signage and minimal welfare facilities, which reflects the budgetary and administrative constraints in provincial settings. These results parallel Rahman and Yusof's (2022) findings in Indonesia, where private projects invested in enhanced welfare facilities to attract skilled labor, while public projects provided only standard accommodations.

Other aspects such as Heavy Equipment Safety, Safety and Health Committee, Training, and Skills Certification also show a consistent trend: private projects (WMs ranging from 2.25–2.35) score higher than public projects (WMs ranging from 1.90–2.10), yet both remain within the "sometimes aware" level. This indicates that while private contractors put more effort into structured safety management and workforce training, overall awareness and implementation across both sectors are still not at the "highly aware" or optimal level. This is consistent with Villanueva et al. (2022), who reported that although private projects scored higher in safety trainings, overall construction safety culture in provincial areas of the Philippines remains underdeveloped, largely due to limited enforcement and resource allocation.

Overall, the findings suggest that both public and private projects in Camarines Sur demonstrate moderate awareness of construction safety measures, with private projects slightly outperforming public ones. The results underscore the need for stronger enforcement of occupational safety standards, especially in public projects where budgetary and bureaucratic constraints often limit full compliance. This echoes the conclusions of Torres and Medina (2023), who highlighted the crucial role of government-led monitoring and capacity-building initiatives to bridge safety compliance gaps between public and private construction sectors.

On-Site Safety Practices

Using Key Dimensions of Safety Awareness, results are as follows:

Table 3. On-Site Safety Practices

Dimension	Public WM	Private WM	Interpretation
General Safety Awareness	2.50	2.40	Both = Highly Aware
Training and Preparedness	2.10	2.25	Sometimes Aware
Workplace Safety Culture & Behavior	2.45	2.35	Public = Highly, Private = Sometimes

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Hazard Identification & Risk Mgmt.	2.05	2.30	Sometimes Aware
Safety Equipment & Maintenance	2.30	2.35	Sometimes Aware
Final Thoughts on Construction Safety	2.35	2.40	Both = Highly Aware

Legend: 1.00–1.74 = Rarely Aware; 1.75–2.49 = Sometimes Aware; 2.50–3.00 = Highly Aware

The assessment of safety awareness by dimensions presents a nuanced view of how construction safety is understood and practiced in public and private projects in Camarines Sur. For General Safety Awareness, both public (WM = 2.50) and private (WM = 2.40) projects fall under the "highly aware" category, indicating that workers and contractors have a general understanding of safety as an important component of construction work. However, this high awareness does not always translate into consistent practice across all dimensions. Similar findings were reported by Manuel and Reyes (2023) in their study of construction projects in Southern Luzon, where workers expressed strong awareness of safety principles but demonstrated uneven implementation at the site level. Likewise, Alzahrani et al. (2022) in Saudi Arabia found that general awareness was not sufficient to prevent accidents unless coupled with strict enforcement and monitoring.

In terms of Training and Preparedness, public projects (WM = 2.10) and private projects (WM = 2.25) both remain at the "sometimes aware" level. This suggests that while safety training programs exist, they may not be regularly conducted or adequately institutionalized, particularly in smaller-scale construction projects that dominate the provincial setting. A parallel situation was noted by Villanueva et al. (2022), who found that although safety trainings were occasionally conducted, they were often one-time initiatives rather than continuous programs. Similarly, Nguyen and Tran (2023) highlighted that in Vietnam, safety training was often minimal in small-scale projects due to resource limitations.

The dimension of Workplace Safety Culture and Behavior shows a slight difference: public projects score at the "highly aware" level (WM = 2.45), while private projects remain at "sometimes aware" (WM = 2.35). This may reflect the fact that public projects, being subject to government monitoring, are more likely to promote visible compliance in workplace behavior, even if inconsistencies remain at the operational level. Torres and Medina (2023) likewise found that public projects in the Philippines tend to demonstrate stronger outward compliance due to audits, while private projects balance compliance with productivity pressures.

For Hazard Identification and Risk Management, awareness is still limited, with public projects at 2.05 and private projects at 2.30, both categorized as "sometimes aware." This indicates that systematic hazard identification and risk assessment are not consistently practiced, which could increase vulnerability to accidents. A study by Rahman and Yusof (2022) also identified this gap in Indonesian projects, where hazard identification protocols were present in manuals but not consistently applied at worksites. Gonzales and Abad (2024) further observed that in government-funded projects in the Bicol Region, hazard assessment was often reactive rather than preventive.

In Safety Equipment and Maintenance, both sectors scored in the "sometimes aware" range, with WMs of 2.30 and 2.35. This reflects a common challenge in the province: while equipment may be available, routine inspection and maintenance are not always prioritized, either due to budget constraints or a lack of technical supervision. Ling and Li (2022) similarly observed in Malaysia that equipment maintenance was one of the weakest areas of safety management, as contractors tended to allocate resources to more visible compliance indicators (e.g., signage, PPE) rather than preventive equipment upkeep.

Finally, for Final Thoughts on Construction Safety, both public (WM = 2.35) and private (WM = 2.40) projects are rated as "highly aware," suggesting that at a conceptual level, there is agreement on the importance of safety in construction. However, this broad acknowledgment still requires translation into specific actions and consistent compliance across dimensions. Del Rosario et al. (2022) emphasized the same in Metro Manila projects, where contractors expressed strong recognition of safety's importance but struggled to institutionalize safety practices in everyday operations.

Overall, the results suggest that general awareness of construction safety is high, but weaknesses remain in training, risk management, and equipment maintenance. The findings underscore that while contractors in Camarines Sur recognize the importance of safety, the challenge lies in operationalizing these safety concepts into sustained and concrete practices—echoing the conclusions of Sarmiento and Cruz (2023) that provincial projects require stronger institutionalization of safety practices beyond mere awareness.

Comparative Analysis of Compliance and Practice

To address Research Question 3 (Is there a significant difference in the level of compliance with safety codes between public and private construction projects?) and Research Question 4 (Is there a significant difference in the actual on-

site safety practices between public and private construction projects?), independent samples t-tests were conducted across various safety dimensions. The corresponding null and alternative hypotheses were tested as follows:

- H_{01} (Null Hypothesis): There is no significant difference in the level of compliance with construction safety codes between public and private construction projects in Camarines Sur.
- H_{11} (Alternative Hypothesis): There is a significant difference in the level of compliance with construction safety codes between public and private construction projects in Camarines Sur.
- H_{02} (Null Hypothesis): There is no significant difference in the actual on-site safety practices between public and private construction projects in Camarines Sur.
- H_{12} (Alternative Hypothesis): There is a significant difference in the actual on-site safety practices between public and private construction projects in Camarines Sur.

Table4. Comparative Analysis of Compliance and Practices (T-Test Results Summar)

Variable (Compliance/Practice)	t-stat	p-value	Decision	Remark
General Safety Awareness	-1.47	0.160	NS	Similar
Training & Preparedness	1.80	0.089	NS	Similar
Workplace Safety Culture & Behavior	-0.35	0.733	NS	Similar
Hazard Identification & Risk Mgmt.	-2.54	0.020	Sig.	Public < Private
Safety Equipment & Maintenance	-0.61	0.552	NS	Similar
Final Thoughts on Safety	0.28	0.786	NS	Similar
Construction Safety Signages	-4.31	<0.001	Highly Sig.	Public < Private
Emergency OH Personnel & Facilities	-2.31	0.033	Sig.	Public < Private

Legend: NS = Not Significant; Sig. = Significant; Highly Sig. = Highly Significant

The findings show that in several dimensions—General Safety Awareness ($p = 0.160$), Training and Preparedness ($p = 0.089$), Workplace Safety Culture and Behavior ($p = 0.733$), Safety Equipment and Maintenance ($p = 0.552$), and Final Thoughts on Safety ($p = 0.786$)—there were no statistically significant differences between public and private construction projects. These results suggest that both sectors share a baseline similarity in compliance with safety codes and actual practices, reflecting a general adherence to national safety policies such as Republic Act 11058 and DOLE Department Order 198-18. This finding aligns with Villanueva et al. (2022), who reported that both public and private contractors in Philippine provincial projects exhibit comparable levels of safety awareness due to mandatory regulatory frameworks. Similarly, Rahman and Yusof (2022) argued that safety culture in construction is largely shaped by compliance-driven initiatives, which reduce sectoral gaps in fundamental awareness and preparedness. Alzahrani et al. (2022) also emphasized that while safety awareness across different project types is generally high, the actual differences in practice often remain statistically insignificant.

However, three critical areas revealed significant differences.

1. Hazard Identification and Risk Management ($p = 0.020$). Private projects performed significantly better than public ones, indicating stronger proactivity in identifying hazards and applying preventive measures. This outcome supports the findings of Nguyen and Tran (2023), who reported that private contractors in Vietnam demonstrate stronger hazard identification due to contractual obligations and client oversight. Locally, Gonzales and Abad (2024) found that hazard assessment in government-funded projects in the Bicol Region was frequently minimal, constrained by limited budgets and weak supervision. Similarly, Torres and Medina (2023) argued that private firms adopt more systematic risk management practices to avoid litigation and comply with client-driven contractual standards.

2. Construction Safety Signages ($p < 0.001$). A highly significant difference was observed, with private projects showing stronger compliance. This result corroborates Lee and Kim (2022), who found that private construction firms invest more in visible, low-cost safety measures such as signages to minimize accidents and demonstrate compliance to stakeholders. Del Rosario et al. (2022) likewise observed that private projects in Metro Manila had more systematic signage placement compared to public projects. Consistent with these findings, Rimando and Muhi (2025) noted that public projects in provincial areas often suffer from inconsistent enforcement and limited resources, leading to weaker implementation of signage standards.

3. Emergency Occupational Health (OH) Personnel and Facilities ($p = 0.033$). Private projects also outperformed public ones in this dimension, with more consistent provision of trained emergency personnel and facilities. This

supports Delos Santos and Cruz (2024), who found that larger-scale private projects in the Philippines allocate dedicated budgets for emergency preparedness, whereas smaller public projects tend to deprioritize such measures due to administrative and financial constraints. Likewise, Torres and Medina (2023) highlighted that private firms maintain stronger emergency preparedness due to contractual penalties and insurance requirements. Echoing this, Manuel and Reyes (2023) reported that public projects in Southern Luzon often lacked dedicated medical staff or OH facilities, instead relying on temporary or shared arrangements.

In summary, the independent t-test analysis indicates that while general compliance and safety culture are statistically similar across public and private projects, private contractors demonstrate significantly stronger performance in hazard management, safety signages, and emergency preparedness. These gaps reveal that public projects in Camarines Sur are more constrained by limited resources and bureaucratic processes, which hinder consistent implementation of safety protocols. As emphasized by Sarmiento and Cruz (2023), stronger institutionalization of safety systems in government-funded projects is necessary to narrow compliance disparities and ensure that safety standards are not only recognized but also consistently practiced.

5. SUMMARY

This study assessed the compliance and practice of occupational safety standards in public and private construction projects in Camarines Sur. It examined the demographic profile of respondents, their level of awareness of construction safety at both the item and dimension levels, and the differences in compliance and practice across project types. Data were collected from workers, safety personnel, and project staff from various construction sites. Weighted means were employed to determine awareness levels, while independent t-tests were conducted to identify significant differences between public and private projects.

The findings revealed that respondents were predominantly male, within the productive age group, and had diverse years of construction experience, providing a broad perspective on workplace safety. Awareness of construction safety items such as personal protective equipment (PPE), hazard identification, emergency preparedness, and welfare facilities was generally moderate, with private projects consistently scoring higher. At the dimension level, both public and private projects were rated “highly aware” in terms of general safety awareness and workplace safety culture; however, gaps persisted in training, preparedness, and risk management. Similar results were reported in Metro Manila projects, where PPE and safety programs were more consistently observed in private projects than in public ones (Del Rosario et al., 2022). In contrast, government-funded projects often showed only minimal hazard assessment, constrained by budget and supervision issues (Gonzales & Abad, 2024).

T-test analysis indicated no significant differences between public and private projects in several safety dimensions, including general safety awareness ($p = 0.160$), training and preparedness ($p = 0.089$), workplace culture and behavior ($p = 0.733$), safety equipment and maintenance ($p = 0.552$), and final thoughts on safety ($p = 0.786$). These similarities suggest a shared baseline compliance with national safety policies such as Republic Act 11058 and DOLE Department Order 198-18, which are mandatory for all projects regardless of sector (Villanueva et al., 2022). Similarly, studies in Indonesia and Saudi Arabia emphasized that compliance-driven frameworks tend to equalize awareness levels across project types, even if implementation remains inconsistent (Rahman & Yusof, 2022; Alzahrani et al., 2022). However, significant differences were found in hazard identification and risk management ($p = 0.020$), construction safety signages ($p < 0.001$), and emergency occupational health (OH) personnel and facilities ($p = 0.033$), where private projects demonstrated stronger performance. These findings resonate with results from Vietnam, Malaysia, and Southern Luzon, where private projects consistently outperformed public ones in proactive hazard management, signage installation, and emergency preparedness (Nguyen & Tran, 2023; Lee & Kim, 2022; Manuel & Reyes, 2023).

6. CONCLUSION

The study concludes that while both public and private construction projects in Camarines Sur exhibit moderate compliance with occupational safety standards, notable gaps remain between awareness and practice. Public and private projects demonstrate similar adherence to safety codes in general awareness, workplace culture, and equipment use, reflecting the influence of regulatory frameworks (Villanueva et al., 2022). However, private projects show stronger compliance in hazard identification, safety signages, and emergency preparedness, suggesting that organizational accountability, client monitoring, and resource availability contribute to their more proactive approach (Nguyen & Tran, 2023; Lee & Kim, 2022; Torres & Medina, 2023).

Public projects, on the other hand, reveal vulnerabilities associated with budgetary constraints, bureaucratic processes, and limited supervision (Gonzales & Abad, 2024; Rimando & Muhi, 2025). Although they performed slightly better in equipment maintenance, their overall compliance remains inconsistent, particularly in hazard management and emergency preparedness. The persistently low emphasis on training and preparedness across both sectors highlights a

systemic weakness that undermines the translation of safety awareness into effective risk reduction (Villanueva et al., 2022; Sarmiento & Cruz, 2023).

7. RECOMMENDATIONS

To address the identified gaps, the study recommends the following:

1. **Stricter enforcement and monitoring.** Government agencies should intensify inspection and compliance audits, particularly in public projects, to ensure that safety codes are not only documented but consistently implemented (Sarmiento & Cruz, 2023).

2. **Institutionalized training and preparedness.** Mandatory safety drills, continuing workforce education, and structured certification programs should be introduced across all construction projects to enhance risk readiness (Nguyen & Tran, 2023; Villanueva et al., 2022).

3. **Strengthening safety management structures.** Projects should deploy qualified safety officers and empower safety and health committees to oversee day-to-day compliance and sustain safety initiatives (Gonzales & Abad, 2024; Manuel & Reyes, 2023).

4. **Integrated safety management system.** Combining compliance monitoring with practice-based audits will ensure that standards are actively enforced on-site, reducing disparities between public and private projects (Rahman & Yusof, 2022; Rimando & Muhi, 2025).

5. **Resource allocation for public projects.** Budget provisions should prioritize hazard identification measures, adequate signages, and emergency occupational health personnel and facilities, which are currently underdeveloped in government-funded projects (Torres & Medina, 2023; Delos Santos & Cruz, 2024).

Overall, construction safety in Camarines Sur requires a shift toward practice-oriented, continuous, and integrated safety management. Addressing gaps in hazard management, signage implementation, and emergency preparedness is critical to fostering a culture of safety that protects both workers and communities (Alzahrani et al., 2022; Sarmiento & Cruz, 2023).

Policy Implications

The results of this study carry important implications for the enforcement of Republic Act No. 11058, or the Occupational Safety and Health (OSH) Law, and its implementing rules under Department Order No. 198-18. While the law prescribes mandatory safety programs, safety officer deployment, and welfare facilities, the findings indicate that compliance in provincial construction projects remains inconsistent. This calls for government agencies such as the Department of Labor and Employment (DOLE) and local government units (LGUs) to intensify monitoring and ensure that compliance goes beyond documentation toward actual on-site implementation.

For public projects, stricter oversight should be exercised to address recurring weaknesses in safety signages and emergency preparedness. For private contractors, continuous training, hazard identification, and risk management should be enforced as contractual requirements. By linking compliance with both administrative accountability and contractor performance evaluation, RA 11058 can function not only as a regulatory framework but also as a practical tool to build a sustained culture of safety in Camarines Sur's construction industry.

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