



An Assessment of District Project Engineers' Occupational Safety and Health Awareness and Project Management Practices in Road Construction in Region Xi

Ibno Mosbic P. Pacalundo¹, Garry L. Bastida^{2*}

¹Master in Business Administration, Faculty of Advanced and International Studies

²Davao Oriental State University, Mati, Davao Oriental, Philippines

Published Online:

27 May 2026

Article DOI:

[10.55677/CRB/15-04-CRB2026](https://doi.org/10.55677/CRB/15-04-CRB2026)

License:

This is an open access article under the CC BY 4.0 license:

<https://creativecommons.org/licenses/by/4.0/>

ABSTRACT: This study assessed the occupational safety and health (OSH) awareness and project management practices of project engineers in road construction within Region XI. Using a non-experimental quantitative design with a descriptive-correlational approach, data were collected from 150 project engineers via a validated survey. Findings revealed that OSH awareness among respondents was generally high across indicators, including workers' training, safety awareness, and company safety activities. Similarly, project management practices in terms of planning, funding, monitoring, evaluation, and risk management were rated very high. Statistical analysis indicated a significant relationship between OSH awareness and project management practices, suggesting that improved safety awareness contributes to more effective project execution. However, gaps were identified in specialized safety training and technical knowledge. The study concludes that integrating OSH principles into project management enhances both safety performance and project outcomes and recommends strengthening targeted training programs and continuous professional development initiatives.

KEY WORDS: Occupational Safety and Health, Project Management Practices, Road Construction, Safety Awareness, Project Engineers, Risk Management

Cite the Article: Pacalund, I.M.P., Bastida, G.L. (2026) An Assessment of District Project Engineers' Occupational Safety and Health Awareness and Project Management Practices in Road Construction in Region Xi. *Current Research Bulletin*, 3(5), 162-173. <https://doi.org/10.55677/CRB/15-04CRB2026>

INTRODUCTION

Project delays and failures remain a persistent concern in the construction industry despite the increasing adoption of established project management principles and engineering standards. Ineffective project management practices, particularly in risk anticipation, monitoring, and resource allocation, continue to contribute to delays, cost overruns, poor project quality, and weakened stakeholder relationships. According to Onum et al. (2024), when risks and uncertainties are not properly addressed, minor operational issues can rapidly escalate into major disruptions that affect the entire project lifecycle. Likewise, Htet et al. (2023) emphasized that engineers frequently encounter challenges related to leadership, risk management, complex project environments, and inadequate resources, all of which may significantly compromise project outcomes when not effectively managed. These issues are especially critical in road construction projects, where timelines, public safety, and infrastructure quality are closely intertwined.

In addition to project management concerns, occupational safety and health (OSH) issues remain a major challenge in the construction sector. The construction industry is recognized globally as one of the most hazardous work environments due to its high exposure to accidents, injuries, and occupational risks. Zhang (2021) noted that poor safety management practices have resulted in substantial financial and human losses worldwide. Similarly, Ramli et al. (2020) stressed that inadequate safety

An Assessment of District Project Engineers' Occupational Safety and Health Awareness and Project Management Practices in Road Construction in Region Xi

awareness and weak site management are among the leading causes of workplace accidents in construction settings. Beyond physical harm, poor safety practices also affect employee morale, productivity, and organizational performance (Ali et al., 2025). These realities highlight the importance of integrating occupational safety and health awareness into engineering and project management practices to ensure both worker protection and project success.

Although numerous studies have separately explored occupational safety and health awareness and project management practices, limited research has examined their relationship in the context of engineering practice, particularly among project engineers on government road construction projects. Existing literature commonly focuses on construction workers, students, or project managers, leaving a research gap regarding how project engineers apply project management practices while maintaining safety awareness in actual construction operations. This gap is significant because project engineers play a critical role in planning, supervising, monitoring, and implementing road construction projects where safety and management functions overlap. Understanding the relationship between OSH awareness and project management practices may provide valuable insights into improving project performance, reducing workplace accidents, and strengthening safety culture within public infrastructure projects.

Anchored in Heinrich's Domino Theory (1931) and Bertalanffy's General Systems Theory (1968), this study recognizes that workplace accidents and project inefficiencies are often the result of interconnected human, organizational, and environmental factors. Heinrich's theory explains that unsafe acts and unsafe conditions contribute to accidents and injuries, emphasizing the importance of preventive measures and safety awareness in the workplace. Meanwhile, General Systems Theory supports the idea that project management and occupational safety function as interconnected systems, in which changes in one component can significantly affect overall project performance. Guided by these theories, the study investigates whether occupational safety and health awareness influences the project management practices of project engineers in road construction, particularly in project planning, project funding, monitoring and evaluation, and project risk management.

Therefore, this study aims to determine the relationship between occupational safety and health awareness and project management practices among project engineers of the Department of Public Works and Highways Region XI involved in road construction projects. Specifically, it seeks to assess the levels of OSH awareness and project management practices, determine whether significant relationships and differences exist between these variables when grouped by demographic profile, and identify which indicators of OSH awareness best influence project management practices. Using a descriptive-correlational quantitative approach, the study aims to contribute to the growing body of knowledge on engineering management and occupational safety by providing empirical evidence to guide policymakers, engineering professionals, and construction organizations in developing safer, more effective project management frameworks.

MATERIAL AND METHODS

This study employed a non-experimental quantitative research design using a descriptive-correlational approach to determine the relationship between occupational safety and health (OSH) awareness and project management practices among project engineers of the Department of Public Works and Highways–Region XI (DPWH-XI). The descriptive-correlational design was appropriate because the study aimed to examine naturally occurring relationships between variables without manipulating them. Quantitative research involves the systematic collection and statistical analysis of numerical data to identify patterns, relationships, and trends among variables (Sreekumar, 2023). Likewise, Miksza et al. (2023) emphasized that descriptive-correlational research is suitable for investigating associations between variables through surveys and observational methods. The study was conducted in Region XI, which covers the provinces of Davao de Oro, Davao del Norte, Davao del Sur, Davao Oriental, and Davao Occidental. A total of 150 project engineers directly involved in road construction projects served as respondents using universal sampling, as they possessed the professional qualifications and technical expertise necessary to provide reliable information regarding OSH awareness and project management practices. Prior to data collection, a pilot test involving 30 project engineers was conducted to assess the reliability and validity of the survey instruments. The research instrument was adapted and modified from the studies of Elssayed et al. (2012) on occupational safety and health awareness and Mongina and Moronge (2021) on project management practices, yielding Cronbach's alpha values of .945 and .909, respectively, indicating high reliability. A 5-point Likert scale ranging from Strongly Disagree to Strongly Agree was utilized to measure respondents' perceptions and practices.

The researcher followed a systematic data collection procedure beginning with the validation of the survey questionnaire by appointed experts. Upon approval, permission letters endorsed by the Graduate School were submitted to the DPWH-XI Regional Director and respective District Engineering Offices before the administration of the survey questionnaires. Respondents were informed about the purpose of the study and were encouraged to provide honest and accurate responses. Primary data were collected through structured surveys, while secondary data from government publications, policies, and related literature supported the development of the research instrument and interpretation of findings. Data were presented in tabular form, showing frequency counts, mean scores, correlations, and significant differences among variables. Statistical tools such as the Mean,

An Assessment of District Project Engineers' Occupational Safety and Health Awareness and Project Management Practices in Road Construction in Region Xi

Pearson's *r*, and Regression Analysis were employed to analyze the data and test the hypotheses at the 0.05 level of significance. Ethical considerations were strictly observed throughout the study. The research underwent review by the Davao Oriental State University Ethics Board to ensure compliance with ethical standards and academic integrity. Participation was voluntary, and respondents were informed of their rights, including the right to withdraw from the study at any time without penalty. Confidentiality and privacy of data were safeguarded in accordance with the Data Privacy Act of 2012 (Republic Act No. 10173). The researcher also ensured honesty and transparency by avoiding plagiarism, fabrication, falsification, deceit, and conflicts of interest, thereby maintaining the study's credibility, authenticity, and ethical integrity.

RESULTS

Socio-Demographic Profile of the Respondents

Table 1. Demographic Profiles of the Respondents

Profile		Frequency (<i>n</i> =150)	Percentage
Project Designation	Junior Project Engineer	26	17.30%
	Project Engineer 1	84	56.00%
	Project Engineer 2	23	15.30%
	Project Engineer 3	17	11.30%
Years of Experience	1-5 Years	47	31.30%
	6-10 Years	65	43.30%
	11-15 Years	21	14.00%
	16 Years and above	17	11.30%
Gender	Female	23	15.30%
	Male	126	84.00%
	LGBTQIA+	1	0.70%

Table 1 presents the demographic profile of the respondents. The majority of the respondents were Project Engineer 1 (56.00%), followed by Junior Project Engineers (17.30%), Project Engineer 2 (15.30%), and Project Engineer 3 (11.30%). In terms of years of experience, most respondents had 6–10 years (43.30%), followed by 1–5 years (31.30%), 11–15 years (14.00%), and 16 years or more (11.30%). In terms of gender, male respondents comprised the majority (84.00%), while females accounted for 15.30%, and LGBTQIA+ respondents accounted for 0.70%.

Level of Occupational Safety and Health Awareness among Project Engineers

Table 2. Summary on the Level of Occupational Safety and Health Awareness among Project Engineers

<i>Indicators</i>	Mean	SD	Descriptive Interpretation
Workers' Training on Health and Safety Activities	3.88	0.81	High
Workers' Health and Safety Awareness	3.95	0.69	High
Company's Health and Safety Activities	3.96	0.67	High
<i>Overall Level of Occupational Safety and Health Awareness</i>	3.93	0.67	High

An Assessment of District Project Engineers' Occupational Safety and Health Awareness and Project Management Practices in Road Construction in Region Xi

Table 2 summarizes the level of occupational safety and health awareness among project engineers. The overall mean of 3.93, interpreted as High, indicates that the respondents demonstrated a high level of awareness regarding occupational safety and health. Among the indicators, the Company's Health and Safety Activities obtained the highest mean of 3.96, followed by Workers' Health and Safety Awareness with a mean of 3.95, while Workers' Training on Health and Safety Activities obtained the lowest mean of 3.88. The findings suggest that the organization maintains effective safety systems and promotes strong safety awareness among project engineers.

Level of Project Management Practices

Table 3. Level of Project Management Practices among Project Engineers

<i>Statements</i>	Mean	SD	Descriptive Interpretation
<i>Project Planning</i>	4.28	0.63	Very High
<i>Project Funding</i>	4.52	0.44	Very High
<i>Project Monitoring and Evaluation</i>	3.98	0.73	High
<i>Project Risk Management</i>	4.53	0.64	Very High
<i>Overall Level of Project Management Practices among Project Engineers</i>	4.33	0.52	Very High

Table 3 summarizes the level of project management practices among project engineers. The overall mean of 4.33, interpreted as Very High, indicates that the respondents demonstrated very high project management practices. Among the indicators, Project Risk Management had the highest mean of 4.53, followed closely by Project Funding at 4.52, while Project Monitoring and Evaluation had the lowest mean of 3.98. The results imply that project engineers possess strong competencies in planning, funding, and managing project risks in road construction projects.

Correlation Between Measures

Table 4. Correlation Analysis Between the Occupational Safety and Health Awareness of Project Engineers and Their Project Management Practices in Road Construction

	Project Planning	Project Funding	Project Monitoring and Evaluation	Project Risk Management	Overall Project Management Practices
Workers' Training on Health and Safety Activities	Pearson's r 0.585	0.617	0.598	0.797	0.767
	p-value <.001	<.001	<.001	<.001	<.001
Workers Health and Safety Awareness	Pearson's r 0.408	0.513	0.316	0.826	0.6
	p-value <.001	<.001	<.001	<.001	<.001
Company's Health and Safety Awareness	Pearson's r 0.711	0.625	0.51	0.702	0.747
	p-value <.001	<.001	<.001	<.001	<.001
Overall Occupational Safety and Health Awareness	Pearson's r 0.612	0.632	0.519	0.836	0.762
	p-value <.001	<.001	<.001	<.001	<.001

Table 4 reveals a strong, significant positive relationship between occupational safety and health awareness and project management practices among project engineers. The overall occupational safety and health awareness significantly correlated with overall project management practices ($r = 0.762$, $p < .001$). Among the dimensions, the strongest relationship was observed between occupational safety and health awareness and project risk management ($r = 0.836$, $p < .001$), while the weakest

An Assessment of District Project Engineers' Occupational Safety and Health Awareness and Project Management Practices in Road Construction in Region Xi

relationship was found between workers' health and safety awareness and project monitoring and evaluation ($r = 0.316, p < .001$). The findings indicate that higher occupational safety and health awareness is associated with better project management practices.

Table 5. Analysis on the Difference in the Level of Occupational Safety and Health Awareness of Project Engineers across Their Demographic Profiles

Profile	Mean	F-value	p-value	Remarks	
Junior Project Engineer	3.20				
Project Designation	Project Engineer 1	4.06	11.70	<.001	Significant
	Project Engineer 2	4.08			
	Project Engineer 3	4.20			
	Project Engineer 3	4.20			
Years of Experience	1-5 Years	3.52	8.64	<.001	Significant
	6-10 Years	4.08			
	11-15 Years	4.18			
	16 Years and above	4.20			
Gender	Female	3.77	1.502	.23	Not Significant
	Male	3.96			
	*LGBTQIA+	-			

* Cannot be included in the analysis since there is only one respondent on this profile

Table 5 presents an analysis of differences in the level of project management practices across demographic profiles. Significant differences were observed for project designation ($F = 4.51, p = .008$) and years of experience ($F = 4.08, p = .011$). Project Engineer 3 recorded the highest mean (4.53), while Junior Project Engineers obtained the lowest mean (3.93). Similarly, respondents with 16 years or more of experience had the highest mean (4.53), while those with 1–5 years of experience had the lowest mean (4.10). In contrast, no significant difference was found in terms of gender ($F = 0.192, p = .664$).

DISCUSSIONS

The study found that the respondents were predominantly mid-level and experienced project engineers, indicating that they had adequate technical exposure and supervisory responsibilities relevant to road construction projects. The dominance of male respondents also reflects the continuing gender imbalance in the engineering and construction industry. These findings support the study of Pereira, Delgoulet, and Santos (2023), which emphasized that experienced mid-level professionals play a critical role in implementing safety policies and ensuring operational efficiency in engineering environments.

The study further revealed that occupational safety and health awareness among project engineers was generally high. Company safety activities ranked highest, indicating that the organization strongly supports safety compliance through structured policies, availability of personal protective equipment, and workplace safety measures. However, workers' training on specialized technical safety concerns obtained the lowest rating, suggesting that organizations still need to strengthen technical and task-specific safety training. These findings support the study of Bes and Strzalkowski (2024), who emphasized that continuous safety training enhances workers' compliance, hazard recognition, and safety performance. The results imply that while project engineers possess strong general safety awareness, there is still a need to improve their technical competencies in specialized safety risks.

In terms of project management practices, the findings demonstrated a very high level of competency among project engineers, particularly in project funding and project risk management. The respondents exhibited strong capabilities in budgeting, resource allocation, financial accountability, and risk mitigation. However, project monitoring and evaluation received comparatively lower ratings, indicating opportunities for improvement in performance tracking, evaluation systems, and feedback mechanisms. These findings are consistent with the framework of the Project Management Institute, which emphasizes that

An Assessment of District Project Engineers' Occupational Safety and Health Awareness and Project Management Practices in Road Construction in Region Xi

effective planning, funding, and risk management are essential drivers of project success and organizational performance. The findings also suggest that mature project organizations tend to prioritize risk control and financial stewardship because of their direct influence on project sustainability and stakeholder confidence.

The correlation analysis revealed a strong, significant positive relationship between occupational safety and health awareness and project management practices. This indicates that project engineers with higher levels of safety awareness also tend to demonstrate better project planning, funding management, monitoring, and risk management practices. In particular, occupational safety and health awareness showed the strongest relationship with project risk management, highlighting the critical role of safety awareness in minimizing project uncertainties and operational risks. The findings support the view that safety and operational performance are closely interconnected in construction environments. Moreover, significant differences were observed according to project designation and years of experience, indicating that senior and more experienced engineers demonstrated higher levels of safety awareness and stronger project management practices. This confirms that professional exposure and accumulated experience contribute significantly to the development of managerial and safety competencies. Conversely, the absence of significant gender differences suggests that occupational safety and project management capabilities are not gender-dependent but are influenced by competence, training, and professional experience.

Finally, the findings strongly support General Systems Theory, which explains that organizational effectiveness results from the interaction of interconnected systems and processes. The significant relationship between occupational safety and health awareness and project management practices confirms that safety systems and management functions operate as mutually reinforcing components within construction projects. Improvements in safety awareness contribute to better planning, monitoring, and risk management, thereby enhancing overall project performance. However, the comparatively lower ratings in monitoring and evaluation and specialized safety training suggest that weaknesses in one subsystem may affect the effectiveness of the entire organizational system. Therefore, organizations should adopt a more integrated, holistic approach to strengthen all components of occupational safety and project management to achieve more sustainable, efficient, and resilient project outcomes.

CONCLUSION

The study concluded that project engineers of the Department of Public Works and Highways–Region XI demonstrated high occupational safety and health (OSH) awareness and very high project management practices in road construction projects. Among the dimensions of OSH awareness, company health and safety activities obtained the highest rating, indicating that organizational safety systems and policies are effectively implemented. Similarly, project risk management and project funding emerged as the strongest aspects of project management practices, reflecting the respondents' competence in resource management, risk mitigation, and project continuity. The findings further revealed a strong, significant positive relationship between occupational safety and health awareness and project management practices, confirming that greater safety awareness contributes to improved planning, funding, monitoring, evaluation, and risk management in construction projects. This implies that occupational safety and health awareness are essential to achieving effective, successful project management outcomes in road construction.

Moreover, the study found significant differences in occupational safety and health awareness and project management practices across project designation and years of experience, with senior and more experienced engineers demonstrating higher levels of competence. However, no significant differences were found by gender, suggesting that safety awareness and project management capability are not gender-dependent but are influenced more by professional experience. Overall, the findings support General Systems Theory by demonstrating that occupational safety and project management functions are interconnected systems that collectively influence organizational effectiveness. Therefore, strengthening occupational safety programs, continuous technical training, monitoring systems, and integrated management practices can further enhance the performance, sustainability, and safety of road construction projects.

REFERENCES

1. Abd Rahman, N. H., & Kamil, N. L. M. (2022). Strengthening occupational safety and health policy in Malaysia: Exploring the awareness of civil servants. *Public Policy and Administration*, 21(1), 38-54.
2. Abukhashabah, E., Summan, A., & Balkhyour, M. (2020). Occupational accidents and injuries in construction industry in Jeddah City. *Saudi Journal of Biological Sciences*, 27(8), 1993-1998. <https://doi.org/10.1016/j.sjbs.2020.06.033>
3. Adams, K.M. (2011). Systems principles: Foundation for the SoSE methodology. *International Journal of System of Systems Engineering*, 2(2/3), 120–155.
4. Adams, K. M., Hester, P. T., Bradley, J. M., Meyers, T. J., & Keating, C. B. (2013). Systems theory: The foundation for understanding systems. *Systems Engineering*.
5. Adekunle, P., Aigbavboa, C., Akinradewo, O., Oke, A., & Aghimien, D. (2022). Construction information management: Benefits to the construction industry. *Sustainability*, 14(18). <https://doi.org/10.3390/su141811366>

An Assessment of District Project Engineers' Occupational Safety and Health Awareness and Project Management Practices in Road Construction in Region Xi

6. Afshari, A. R., & Sobhanifard, F. (2023). Assessment of project procurement planning. In *XIII International Symposium Engineering Management and Competitiveness 2023 (EMC 2023)*.
7. https://www.researchgate.net/publication/373947050_ASSESSMENT_OF_PROJECT_PROCUREMENT_PLANNING
8. Ahmadzai, M. B., & Ye, K. (2025). A mixed-method investigation of the root causes of construction project delays in Afghanistan. *Heliyon*, *11*(2), 1-23. DOI: <https://doi.org/10.1016/j.heliyon.2025.e41923>.
9. Ahsun, A., & Elly, B. (2024). Optimizing resource allocation for enhanced project efficiency. *ResearchGate*. link.
10. Alameri, A., Alhammedi, A. S. A. M., Memon, A. H., Rahman, I. A., & Nasaruddin, N. A. N. (2021). Assessing the risk level of the challenges faced in construction projects. *Engineering, Technology & Applied Science Research*, *11*(3), 7152–7157. <https://doi.org/10.48084/etasr.4020>
11. Al-Naser, N. K., & Al-Tabtabai, H. (2024). The impact of safety violations on construction project performance: A case study of the ADFA project. *Journal of Engineering Research*. DOI: <https://doi.org/10.1016/j.jer.2024.12.017>
12. Ali, A. H., Kineber, A. F., Arashpour, M., Hassan, A., Alhusban, M., & Zamil, A. M. (2024). A hybrid model for assessing safety implementation and project success in the construction industry. *Alexandria Engineering Journal*, *105*, 626-639. DOI: <https://doi.org/10.1016/j.aej.2024.08.040>
13. Ali, B. J., & Anwar, G. (2021). *An empirical study of employees' motivation and its influence job satisfaction*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3822723
14. Ali, M. Y. M., Basir, M. N. A. M., & Ilias, S. (2025). Occupational Safety and Health (OSH) Awareness Level: A survey study among staff of Sungai Petani
15. Community College. *Borneo Engineering & Advanced Multidisciplinary International Journal (BEAM)*, *4*(1), 1-6. <https://beam.pmu.edu.my/index.php/beam/article/view/196/130>.
16. Aliangan, J. R. (2025). Infrastructure project management problems encountered and solutions of DPWH engineers. *International Journal for Multidisciplinary Research*, *7*(1), 1-28. <https://www.ijfmr.com/papers/2025/1/35416.pdf>
17. Al Salaheen, M., Alaloul, W. S., Musarat, M. A., Johari, M. A. B., Alzubi, K. M., & Alawag, A. M. (2024). Women career in construction industry after industrial revolution 4.0 norm. *Journal of Open Innovation: Technology, Market, and Complexity*, *10*(2), 100277.
18. Ammar, A., & Dadi, G. (2023). Roadmap for redesigning specialized safety training and tracking for highway construction and maintenance personnel. In *International Conference on Transportation and Development 2023*. https://ascelibrary.org/doi/10.1061/9780784484883.059?utm_source=chatgpt.com
19. Ampratwum, G., Osei-Kyei, R., & Tam, V. W. (2022). Exploring the concept of public-private partnership in building critical infrastructure resilience against unexpected events: A systematic review. *International journal of critical infrastructure protection*, *39*, 100556.
20. Amoah, A., & Marimon, F. (2021). Project managers as knowledge workers: Competencies for effective project management in developing countries. *Administrative Sciences*, *11*(4). DOI: <https://doi.org/10.3390/admsci11040131>
21. Baral, P., & Koirala, M. P. (2022). Assessment of Safety and Health Practices in Road Construction. *Open Journal of Safety Science and Technology*, *12*(4), 85-95. DOI: 10.4236/ojsst.2022.124008.
22. Berube, M., Chatigny, C., & Laberge, M. (2025). Gender differences in occupational health and safety perceptions: Insights from youth in dual vocational training. *Safety Science*, *186*, 106797.
23. Beś, P., & Strzałkowski, P. (2024). Analysis of the effectiveness of safety training methods. *Sustainability*, *16*(7), 2732.
24. Boccoli, G., Gastaldi, L., & Corso, M. (2022). The evolution of employee engagement: Towards a social and contextual construct for balancing individual performance and wellbeing dynamically. *International Journal of Management Reviews*, *25*(1), 75–98. <https://doi.org/10.1111/ijmr.12304>
25. Bourahla, A., Fernandes, G., & Ferreira, L. M. (2024). Managing occupational health and safety risks in construction projects to achieve social sustainability – A review of literature. *Procedia Computer Science*, *239*, 1053-1061. DOI: <https://doi.org/10.1016/j.procs.2024.06.269>
26. Buniya, M. K., Othman, I., Sunindi-jo, R. Y., Kineber, A. F., Mussi, E., & Ahmad, H. (2021). Barriers to safety program implementation in the construction industry. *Ain Shams Engineering Journal*, *12*(1), 65-72
27. Celik, E., & Gul, M. (2021). Hazard identification, risk assessment and control for dam construction safety using an integrated BWM and MARCOS approach under interval type-2 fuzzy sets environment. *Automation in Construction*, *127*. DOI: <https://doi.org/10.1016/j.autcon.2021.103699>
28. Chan, D. W. M., Cristofaro, M., Nassereddine, H., Yiu, N. S. N., & Sarvari, H. (2021). Perceptions of safety climate in construction projects between workers and managers/supervisors in the developing country of Iran. *Sustainability*, *13*(18), 10398. <https://doi.org/10.3390/su131810398>
29. Chaswa, E. N., Kosamu, I. B. M., Kumwenda, S., & Utembe, W. (2020). Risk perception and its influencing factors among construction workers in Malawi. *Safety*, *6*(2), 33. <https://doi.org/10.3390/safety6020033>

An Assessment of District Project Engineers' Occupational Safety and Health Awareness and Project Management Practices in Road Construction in Region Xi

30. Chance, E. A., Florence, D., & Abdoul, I. S. (2024). The effectiveness of checklists and error reporting systems in enhancing patient safety and reducing medical errors in hospital settings: A narrative review. *International journal of nursing sciences*, 11(3), 387-398.
31. Christian, A. D., & Christian, D. S. (2021). The pandemic and its impact on occupational health and safety among mechanical engineering industries in India. *The Journal of Community Health Management*, 8(4), 202-204. DOI: 10.18231/j.jchm.2021.043
32. Cooperative Development Authority (2021). *Profile of the region*. https://cda.gov.ph/region-11/about/?utm_source=chatgpt.com
33. Dacanay, J. P. T., Torio-Kaimo, L. V., & Bronuela, L. (2023). An assessment of road condition monitoring practice and technologies in the Philippines. In *Proceedings of the 7th International Conference on Civil Engineering*, 355-364. DOI:10.1007/978-981-99-4045-5_30
34. Dağgöl, E. (2024). Project managers' understanding of continuous improvement in project management. *Revista de Gestão e Projetos*, 15(1), 36-68.
35. Damayanti, F., Suhudi, & Febrianto, R. S. (2025). Occupational safety, health, and awareness as determinants of productivity: A PLS-SEM study of construction workers in Malang. *Asian Journal Science and Engineering*, 4(1), 18-24. DOI: <https://doi.org/10.51278/ajse.v4i1.1855>
36. Das, D. K. (2020). Exploring the factors and measures to improve safety in road construction in India. *Journal of Construction in Developing Countries*, 27(1), 139–152. DOI: <https://doi.org/10.21315/jcdc2022.27.1.8>
37. Das, D. K., Aiyetan, A. O., & Mostafa, M. M. H. (2024). A systemic archetype for enhancing occupational safety in road construction projects through worker behavior. *Transportation Research Interdisciplinary Perspectives*, 26.
38. Department of Environment and Natural Resources (2023). *Regional state of brown environment report CY 2023*. <https://r11.emb.gov.ph/wpcontent/uploads/2024/06/REGION-11-RSOBER.pdf>
39. Dina, D. M., & Purba, A. (2022). Occupational health and safety risk analysis in construction projects: A systematic literature review. *Indonesian Journal of Industrial Engineering and Management*, 3(1), 35-46. DOI: 10.22441/ijiem.v3i1.13790
40. dos Reis Cardillo, M. A., & Basso, L. F. C. (2025). Revisiting knowledge on ESG/CSR and financial performance: A bibliometric and systematic review of moderating variables. *Journal of Innovation & Knowledge*, 10(1), 100648.
41. Elssayed, M. Y., Hassan, H. M., & Hosny, G. (2012). Assessment of occupational level of awareness for health and safety in Sidi Kerir Petrochemical Company. *Egyptian Journal of Occupational Medicine*, 36(2), 191-203.
42. Etikan, I., & Bala, K. (2020). Sampling and sampling methods. *Biometrics & Biostatistics International Journal*, 5(6), 215–217. DOI:10.15406/bbij.2017.05.00149
43. Estudillo, B., Forteza, F. J., & Carretero-Gómez, J. M. (2025). Effectiveness of training in reducing accidents in construction companies. *Journal of Safety Research*, 92, 283-291.
44. Ezenwa, S., Talpade, A. D., Ghanekar, P., Joshi, R., Devaraj, J., Ribeiro, F. H., & Mentzer, R. (2022). Toward improved safety culture in academic and industrial chemical laboratories: an assessment and recommendation of best practices. *ACS Chemical Health & Safety*, 29(2), 202-213.
45. Farago, F., Benitez, F. R. F., & Szabo, G. (2025). Improving workplace safety: A Delphi study on OSH monitoring and management. *Engineering, Innovation and Research*, 8(2), 107-114. <https://doi.org/10.29166/ingenio.v8i2.8253>
46. Fu, H., Tan, Y., Xia, Z., Feng, K., & Guo, X. (2024). Effects of construction workers' safety knowledge on hazard-identification performance via eye-movement modeling examples training. *Safety Science*, 180, 106653.
47. Gain, H., & Mishra, A. K. (2021). Impact of risk management practice on success of road construction project. *International Social Mentality and Researcher Thinkers Journal*, 7(54), 3467-3475. DOI:10.31576/smryj.1272
48. Ghaleh, R. M. B., Pourroostam, T., Sharifloo, N. M., Sardroud, J. M., & Safa, E. (2021). Delays in the road construction projects from risk management perspective. *Infrastructures*, 6(9). <https://doi.org/10.3390/infrastructures6090135>
49. Ghanbari, M., & Hasani, Z. K. (2024). Key success factors in road maintenance management projects (A case study of Maysan Province, Iraq). *IJUM Engineering Journal*, 25(1), 102-114
50. Ghanbari, M., Zolfaghari, D., & Yadegari, Z. (2023). Mitigating construction delays in Iran: An empirical evaluation of building information modeling and integrated project delivery. *Journal of Engineering Management and Systems Engineering*, 2(3), 170-179
51. Hameed, S., Chethana, K., Sunu, Z., & Kiran, K. G. (2021). Awareness and usage of personal protective equipment among construction workers and their hearing assessment by pure tone audiometry; A cross-sectional study in South India. *Journal of Family Medicine and Primary Care*, 10(11), 4072–4076. DOI: 10.4103/jfmpc.jfmpc_858_21

An Assessment of District Project Engineers' Occupational Safety and Health Awareness and Project Management Practices in Road Construction in Region Xi

52. Handoko, F., Wijayaningtyas, M., Kusuma, I. H. A., Hidayat, S., Ismail, A., & Abdullah, Z. (2020). The occupational health and safety effect on road construction worker performance. *Civil Engineering and Architecture*, 8(5), 750-759. DOI:10.13189/cea.2020.080502
53. Htet, A., Liana, S. R., Aung, T., & Bhaumik, A. (2023). Engineering management: A comprehensive review of challenges, trends, and best practices. *Journal of Engineering Education and Pedagogy*, 1(1), 1-7. DOI: 10.56855/jeep.v1i1.262
54. International Labour Organization (2022). *Safety and health in construction: ILO code of practice*. Geneva: International Labour Office
55. Issifu, R., & Agyapong, D. (2023). Monitoring and evaluation practices and project outcome of tech start-ups in Ghana: The moderating role of the Business environment. *Cogent Business & Management*, 10(3), 2279793.
56. Janes, G., Mills, T., Budworth, L., Johnson, J., & Lawton, R. (2021). The Association Between Health Care Staff Engagement and Patient Safety Outcomes: A Systematic Review and Meta-Analysis. *Journal of Patient Safety*, 17(3), 207– 216. <https://doi.org/10.1097/pts.0000000000000807>
57. Juba, O. O. (2024). Impact of Workplace Safety, Health, and Wellness Programs on Employee Engagement and Productivity. *International Journal of Health, Medicine and Nursing Practice*, 6(4), 12-27. DOI: 10.47941/ijhmp.1819
58. Kabanda, P. (2020). *Health and safety management plan (HSMP) for the construction of medium voltage lines in Karongi and Rutsiro districts*. <https://documents1.worldbank.org/curated/en/307241583747326498/pdf/Health-and-Safety-Management-Plan-for-the-Construction-of-Medium-Voltage-Lines-in-Karongi-and-Rutsiro-Districts.pdf>
59. Khanzode, V. V., Maiti, J., & Ray, P. K. (2012). Occupational injury and accident research: A comprehensive review. *Safety Science*, 50(5), 1355-1367. DOI: <https://doi.org/10.1016/j.ssci.2011.12.015>
60. Kising'u, T. (2024). Project planning practices and performance of road construction projects in Kwale County, Kenya. *Strategic Journal of Business & Change Management*, 11(1), 823-845. DOI: 10.61426/sjbc.v11i1.2887.
61. Lamola, M. S. (2023). *Gender Diversity and Organisational Innovation in the Civil Engineering Industry*. University of Johannesburg (South Africa).
62. Levovnik, D., Aleksić, D., & Gerbec, M. (2025). Examining the relationship between managers' commitment to safety, leadership style, and employees' perception of managers' commitment. *Journal of safety research*, 92, 230-244.
63. Liang, Q., Leing, M., & Ahmed, K. (2021). How adoption of coping behaviors determines construction workers' safety: A quantitative and qualitative investigation. *Safety Science*, 133. <https://www.sciencedirect.com/science/article/abs/pii/S092575352030432X>.
64. Liu, B. (2024). Strategic planning and resource allocation in higher education institutions. *The Educational Review, USA*, 8(11).
65. Lotfi, R., Vaseei, M., Ali, S. S., Davoodi, S. M. R., Bazregar, M., & Sadeghi, S. (2024). Budget allocation problem for projects with considering risks, robustness, resiliency, and sustainability requirements. *Results in engineering*, 24, 102828.
66. Mahamid, I. (2024). The effect of conflicts on the contracting business failure in the construction industry. *Journal of King Saud University-Engineering Sciences*, 30(40), 1-6
67. Malaia, A. (2021). *Types of finance for construction companies in EU: Access, risks and return on investment*. [Master thesis, University of Applied Sciences]. https://www.theseus.fi/bitstream/handle/10024/780416/Malaia_Anna.pdf;jsessionid=95CC1885445FCA8DA3FB69DE3F95D5B0?sequence=2
68. Malsam, W. (2024). *Construction risk management: An introduction*. <https://www.projectmanager.com/blog/construction-risk-management>
69. Matisi, M. N., & Marani, V. N. (2023). Roads projects in Kanduyi Sub-County: Strategic formulation and sustainability. *Iconic Research & Engineering Journals*, 6(11), 34-38
70. McNeil Engineering (2023). *The importance of effective project management in civil engineering projects*. <https://www.mcneilengineering.com/the-importance-of-effective-project-management-in-civil-engineering-projects/>
71. Miksza, P., Shaw, J. T., Richerme, L. K., Hash, P. M., Hodges, D. A., & Parker, E. C. (2023). Quantitative descriptive and correlational research. *Music Education Research*, 241-262. DOI: 10.1093/oso/9780197639757.003.0012
72. Mongina, C., & Moronge, M. (2021). Project management practices and performance of road construction projects in Nairobi City County, Kenya. *The Strategic Journal of Business & Change Management*, 8(1), 544-562.
73. Moussa, H., & Akims, M. (2024). Effect of monitoring and evaluation practices on performance of construction projects in Gasabo District- Rwanda. *International Journal of Entrepreneurship and Project Management*, 9(3), 16-35. DOI: 10.47604/ijepm.3024

An Assessment of District Project Engineers' Occupational Safety and Health Awareness and Project Management Practices in Road Construction in Region Xi

74. Muhsin, I. F. (2020). The impact of financing type of the construction companies in managing of projects under implementation (in Iraq). In *IOP Conference Series: Materials Science and Engineering*. DOI: 10.1088/1757-899X/745/1/012119
75. Mukami, M. T., Were, G., & Simiyu, P. (2021). Influence of funding activities on completion of selected county funded construction projects in Kitale Town, Trans Nzoia County, Kenya. *Saudi Journal of Engineering and Technology*, 6(3), 45-52. DOI: 10.36348/sjet.2021.v06i03.002
76. Mulaney, B., Bromley-Dulfano, R., McShane, E. K., Stepanek, M., & Singer, S. J. (2021). Descriptive study of employee engagement with workplace wellness interventions in the UK. *Journal of Occupational and Environmental Medicine*, 63(9), 719–730. DOI: <https://doi.org/10.1097/jom.0000000000002219>
77. Muniba, S., Muhammad, Z. K., & Asim, R. (2023). The impact of project complexity on project success with the mediating role of team performance. *International Journal of Business and Management Sciences*, 4(1), 181–202.
78. https://www.researchgate.net/publication/369662070_THE_IMPACT_OF_PROJECT_COMPLEXITY_ON_PROJECT_SUCCESS_WITH_THE_MEDIATING_ROLE_OF_TEAM_PERFORMANCE
79. Muñoz-La Rivera, F., Mora-Serrano, J., & Oñate, E. (2021). Factors influencing safety on construction projects (FSCPs): Types and categories. *International Journal of Environmental Research and Public Health*, 18(20). DOI: 10.3390/ijerph182010884
80. Musonda, I., Lusenga, E., & Okoro, C. (2021). Rating and characterization of an organization's safety culture to improve performance. *International Journal of Construction Management*, 21(2), 181-193.
81. Musyimi, C. M., & Ondara, A. (2022). Collaborative monitoring and evaluation practices and performance of county funded projects in Uasin Gishu County, Kenya. *Journal of Information Sciences and Project*, 3(7), 102–119. https://www.iajournals.org/articles/iajispm_v3_i7_102_119.pdf
82. Mutua, M. M., Juma, J., & Owuor, D. (2020). Effect of project monitoring practices on implementation of road construction projects. A case study of Kilifi County. *The Strategic Journal of Business & Change Management*, 7(1), 664685. DOI:10.61426/sjbcm.v7i1.1559
83. Muzulon, N. Z., Resende, L. M., Leal, G. C. L., Ossani, P. C., & Pontes, J. (2025). Engineering in the Digital Age: A Career-Level Competency Framework Validated by the Productive Sector. *Sustainability*, 17(16), 7425.
84. Nfwambi, S. E. (2023). *The impact of project management in engineering: A case study of the roads authority civil engineers, Windhoek – Namibia*. [Doctoral dissertation, Selinus University of Sciences and Literature]. <https://www.uniselinus.education/sites/default/files/2024-03/sibongo%20eustace%20nfwambi.pdf>
85. Ng'eno, C. K., & Makokha, E. N. (2022). Risk Management Practices and Performance of Road Construction Projects in TransNzoia County, Kenya.
86. *International Journal of Recent Research in Social Sciences and Humanities*, (4), 103-118. DOI: <https://doi.org/10.5281/zenodo.7315314>
87. Nkurunziza, D. (2020). Investigation into road construction safety management techniques. *Open Journal of Safety Science and Technology*, 10(3), 81-90. DOI: 10.4236/ojsst.2020.103007
88. Occupational Safety and Health Administration (2023). *Personal Protective Equipment*. <https://www.osha.gov/sites/default/files/publications/osha3151.pdf>
89. Omondi, K., & Kinoti K. (2020). Stakeholder participation and performance of road construction projects in Kilifi County, Kenya. *International Academic Journal of Information Sciences and Project Management*, 3(6), 274-292. http://iajournals.org/articles/iajispm_v3_i6_274_292.pdf
90. Omopariola, E. D., Windapo, A., Edwards, D. J., & Thwala, W. D. (2020). Contractors' perceptions of the effects of cash flow on construction projects. *Journal of Engineering, Design and Technology*, 18(2), 308–325. DOI: <https://doi.org/10.1108/JEDT-04-2019-0099>
91. Onum, F. O., Adikwu, E. O., Otakwu, A., & Ayoola, V. B. (2024). Construction management: Some issues in the construction project. *Engineering Heritage Journal*, 8(1), 42-50. DOI: <http://doi.org/10.26480/gwk.01.2024.42.50>
92. Ozsoy, T., & Sezgili, K. (2024). Exploring the Current Practices and Future Directions in Project Management Education and Training. *Sage Journals*, 14(1). DOI: <https://doi.org/10.1177/21582440241236053>.
93. Pereira, C., Delgoulet, C., & Santos, M. (2023). Fostering workplace safety: An exploration of the priority given to safety knowledge transmission in occupational environments. *Safety science*, 168, 106316.
94. Pilbeam, C., & Karanikas, N. (2023). Safety training in context: technical, cultural and political factors affecting its design, delivery and transfer. *Journal of safety research*, 85, 308-320.
95. Ramasamy, K., & Balasbaneh, A. T. (2023). Safety and Health Management at Highway Construction Site in Malaysia. *Recent Trends in Civil Engineering and Built Environment*, 4(1), 203-212. DOI: <https://doi.org/10.30880/rtcebe.2023.04.01.021>

An Assessment of District Project Engineers' Occupational Safety and Health Awareness and Project Management Practices in Road Construction in Region Xi

96. Ramli, F. B., Mokhtar, S. N. B., Jamaluddin, M. H. B., Harun, M. N. B., Salim, M. A. B. M., Lokman, M. N. B., Zailan, A. R. B., Yunus, N. B. M., & Nor, N. H. B. M. (2020). Awareness among students and Staff on Occupational Safety and Health (OSH) in Universiti Teknologi Malaysia. In *Proceedings of the International Conference on Student and Disable Student Development 2019*. <https://www.atlantis-press.com/proceedings/icosd-19/125944658?>
97. Rivera, L., Baguec Jr., H., & Yeom, C. (2020). A study on causes of delay in road construction projects across 25 developing countries. *Infrastructures*, 5(10), 84. DOI: <https://doi.org/10.3390/infrastructures5100084>.
98. Rodrigues, A. M., Oladimeji, O., Guedes, A. L., Chinelli, C. K., Haddad, A. N., & Soares, C. A. (2023). The project manager's core competencies in smart building project management. *Buildings*, 13(8), 1981.
99. Rwechungura, B. A. (2023). *The role of monitoring and evaluation on performance of road construction projects in Tanzania: A case of Tanroads Dar Es Salaam*. [Doctoral dissertation, University of Tanzania]. <https://repository.out.ac.tz/4199/1/DISSERTATION%20BENIGNUS%20ANACRET.pdf>
100. Safapour, E., Kermanshachi, S., & Pamidimukkala, A. (2021). Post-disaster recovery in urban and rural communities: Challenges and strategies. *International Journal of Disaster Risk Reduction*, 64.
101. Sarkar D., Jha K. N., & Patel S. (2021). Critical chain project management for a highway construction project with a focus on theory of constraints. *International Journal of Construction Management*, 21(2), 194–207. DOI: <https://doi.org/10.1080/15623599.2018.1512031>.
102. Shabbir, R., Naveed, S., & Cheema, S. M. (2023). Evaluation of the factors behind the failure of project management practices. *Journal of Development and Social Sciences*, 4(3), 490-501. https://www.researchgate.net/publication/374329295_Evaluation_of_the_Factors_behind_the_Failure_of_Project_Management_Practices
103. Shrivastava, A., & Singla, H. K. (2020). Analysis of interaction among the factors affecting delay in construction projects using interpretive structural modelling approach. *International Journal of Construction Management*, 22(8), 14551463. DOI: <https://doi.org/10.1080/15623599.2020.1728486>
104. Silva, C. S., Pereira, C., & Magano, J. (2023). The value of project management to competitiveness: Key factors from a holistic and practical perspective. *International Journal of Managing Projects in Business*, 16(1), 67-91.
105. Singh, A., Misra, S. C., Kumar, V., & Kumar, U. (2022). Identification and ordering of safety performance indicators using fuzzy TOPSIS: A case study in Indian construction company. *International Journal of Quality & Reliability Management*, 39(1), 77–114. DOI: <https://doi.org/10.1108/IJQRM-02-20200051>
106. Sitienei, V. J. (2023). *Monitoring and evaluation practices and performance of national government road construction projects in Kisumu County*. [Masteral Thesis, University of Nairobi]. https://erepository.uonbi.ac.ke/bitstream/handle/11295/166993/Sitienei_Monitoring%20and%20Evaluation%20Practices%20and%20Performance%20of%20National%20Government%20Road%20Construction%20Projects%20in%20Kisumu%20County.pdf?sequence=1
107. Sreekumar, D. (2023). *What is quantitative research?: Definition, methods, types, and examples*. <https://researcher.life/blog/article/what-is-quantitative-researchtypes-and-examples/>
108. Sulthana, C. R., & Kumar, P. N. (2020). Safety management in construction project management. *Safety Management in Construction Project Management*, 7(12), 698-704. <https://www.irjet.net/archives/V7/i12/IRJET-V7I12122.pdf>
109. Tang, X., Long, B., & Zhou, L. (2025). Real-time monitoring and analysis of track and field athletes based on edge computing and deep reinforcement learning algorithm. *Alexandria Engineering Journal*, 114, 136-146.
110. Tayeh, B. A., Yaghi, R. O., & Abu Aisheh, Y. I. (2020). Project manager interventions in occupational health and safety during the pre-construction phase in the Gaza strip. *The Open Civil Engineering Journal*, 14, 14-20. DOI: 10.2174/1874149502014010020.
111. Tear, M. J., & Reader, T. W. (2023). Understanding safety culture and safety citizenship through the lens of social identity theory. *Safety science*, 158, 105993.
112. Tengan, C., Aigbavboa, C., & Thwala, W. D. (2021). *Construction project monitoring and evaluation: An integrated approach*. https://www.researchgate.net/publication/349817724_Project_management
113. Torres, K., Noguera, M., Castañeda, K., & Sanchez, O. (2025). Causal factors and prevention strategies of accidents in residential construction: perspectives from construction managers. *Safety Science*, 191. DOI: <https://doi.org/10.1016/j.ssci.2025.106972>
114. Tran, S. V. T., Nguyen, T. L., Chi, H. L., Lee, D., & Park, C. (2022). Generative planning for construction safety surveillance camera installation in 4D BIM environment. *Automation in construction*, 134.
115. Tserng, H., Cho, I., Chen, C., & Liu, Y. (2021). Developing a risk management process for infrastructure projects using IDEF0. *Sustainability*, 13(12). DOI: <https://doi.org/10.3390/su13126958>

An Assessment of District Project Engineers' Occupational Safety and Health Awareness and Project Management Practices in Road Construction in Region Xi

116. Tuo, P. (2022). *Effective strategies to improve project planning in the banking industry*. [Doctoral dissertation, Walden University].
117. Voss, J., Yasobant, S., Akridge, A., Tarimo, E., Seloilwe, E., Hausner, D., & Mashalla, Y. (2021). Gaps, challenges, and opportunities for global health leadership training. *Annals of Global Health*, 87(1), 1–14. DOI: <https://doi.org/10.5334/aogh.3219>
118. Wang, M., Chen, J., Ma, J. (2024). Monitoring and evaluating construction workers' status and behaviour with wearable sensing technologies. *Automation in Construction*. DOI: 10.1016/j.autcon.2024.105555
119. Wasike, P. W., Namusonge, G. S., Makokha, E. N., Karamunya, T. (2023). Project monitoring and evaluation on road construction projects performance in Kenya. *European Journal of Business and Management*, 15(18), 60-75. <https://iiste.org/Journals/index.php/EJBM/article/viewFile/61756/63747>
120. Yang, K., Kim, K., & Go, S. (2021). Towards effective safety cost budgeting for apartment construction: A case study of occupational safety and health expenses in South Korea. *Sustainability*, 13(3). DOI: <https://doi.org/10.3390/su13031335>
121. Yankson, I.K., Nsiah-Achampong, N.K., Okyere, P., Afukaar, F., Otupiri, E., Donkor, P., Mock, C., & Owusu-Dabo, E. (2021). On-site personal protective equipment signage and use by road construction workers in Ghana: A comparative study of foreign- and locally-owned companies. *BMC Public Health*, 21. <https://doi.org/10.1186/s12889-021-12376-2>
122. Zhang, Y. (2021). Safety Management of Civil Engineering Construction Based on Artificial Intelligence and Machine Vision Technology. *Advances in Civil Engineering*. <https://doi.org/10.1155/2021/3769634>
123. Zorgle (2024). *Why you need to be aware of health and safety within a project*. <https://zorgle.co.uk/why-you-need-to-be-aware-of-health-and-safety-within-a-project/>