

Effectiveness of Health and Safety Management in Cabanatuan City Government Infrastructure Projects

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Abstract: - Construction of infrastructure includes great complexities and danger because of the nature of its process. In this light, the health and safety management of infrastructure projects should be carefully and strictly implemented to avoid accidents, etc. that hinder the success of the project implementation. Given so, this study determined the effectiveness of health and safety management in the infrastructure projects of both the local and national government of Cabanatuan City in terms of safety policy and objectives, safety risk management and safety promotion, and safety during project implementation. Using a self-made questionnaire answered by 55 respondents comprising of key individuals in a construction site, the researcher was able to gather data and apply measures of central tendency as statistical treatment. The findings of this study revealed that the effectiveness of health and safety management of infrastructure projects in Cabanatuan City, Nueva Ecija is at overall- good. Recommendations included providing up-to-date training on how to handle emergency situations at work and other subjects related to health and safety management in construction, requiring strict implementation of wearing PPEs in construction site, and strict implementation of health and safety management policies and procedures for construction projects.

Key Words: — *Health and Safety Management, Construction Projects, Project Implementation.*

I. INTRODUCTION

In developing provinces, construction is one of the most important sectors that contribute greatly to economic growth. Building infrastructures like roads, bridges, educational buildings, water supply and resources, and telecommunications are all examples of government projects which aim to attract investors for further development. This, in turn, will benefit all its citizens.

Nueva Ecija, located in Central Luzon, offers limitless potential when it comes to urbanization. The province is composed of 5 cities and 27 municipalities that are not just rich when it comes to agriculture but are also persistent in developing infrastructure that will sprawl opportunities, especially in construction. Moreover, Cabanatuan City which is a 1st class component city in the said province is known for its strategic location along the Cagayan Valley Road which has made the city a major economic, educational, medical, entertainment shopping and transportation center in Nueva Ecija and nearby provinces in the region such as Aurora and Bulacan. It has also earned the moniker "Gateway to the North".

However, to be able to add value to the economy, both private and public sectors when it comes to construction must join hands to prevent possible losses which are caused by various factors including incorrect implementation of safety and health policies. According to Occupational Safety and Health Standard Administration, 1 in 5 workplace fatalities occur in

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construction which is the highest rate for all industries. Thus, the Department of Labor and Employment released Occupational Safety and Health Standards to be followed by the government agencies, subcontractors, and other private entities. The chief aim of practicing engineering safety at any construction project is to reduce accidents and prevent harm to the workers and should never be undermined as responsibilities like this play a critical role in all areas of the project. Providing guidelines to the agencies involved concerning the nature of work is of importance. Because of this, the prime example of enforcing the law when it comes to implementation of safety and health standards in the government infrastructure projects safety and health programs or policies are reviewed by the researchers.

II. LITERATURE REVIEW

2.1 Construction Industry in the Philippines

Wood emphasized in the Philippines Construction Market Trends and Opportunities Report 2021-2025 that the country's construction industry continues to be significantly affected by the Coronavirus (COVID-19) epidemic. Prior to the pandemic, the industry had been the fastest growing in Asia-Pacific, rising by 9.1% in real terms in 2019, after growing by 14.9 percent in 2018. Construction output declined by 27.2 percent in Q1 2021, following a steep loss of 30.3 percent in 2020, due to the impact of containment measures on the completion of construction projects across much of the country. [1]

Despite these findings, the Department of Trade and Industry announced that the Philippine gross domestic product (GDP) increased by 11.8 percent in the second quarter of 2021, according to the Philippine Statistics Authority (PSA). Manufacturing, wholesale and retail trade, as well as motor vehicle and motorcycle repair, are all major contributions to growth. Similarly, the construction industry provided 69.6% of total capital investments or gross capital formation (GCF) in the country. Construction accounts for 16.6% of GDP in terms of expenditure. [2]

2.2 Health and Safety Management of Construction Projects

Given the great contribution of the construction industry in the country's economy and growth, health and safety management are an essential in this sector because of

how it remains to be one of the top employers in different countries around the world.

Different studies were made that tackles and measures the effectiveness of health and safety management in this area, one of which is the study of Eze, Sofolahan, & Siunoje wherein they have indicated that the construction environment has become unpleasant and risky for construction tradespeople due to the intricate networks of operations of construction projects. Tradespeople play an important part in the delivery of construction projects and are the most common victims of accidents that have a negative impact on project performance. The perceptions of construction tradespeople on site health and safety management were investigated in this study. The study reveals that construction companies have a low degree of adoption of health and safety management procedures on construction sites. Construction site management should implement rewards for safety compliance and punishments for HS deviant workers. [3] Similarly, the study of Saeed identified and evaluated the safety management in construction projects in order to reduce and control construction worker health and safety. According to the findings of this study, the construction sector has a high rate of fatalities and long-term injuries. In modern culture, this is unacceptable, and it also makes the sector inefficient, as days are missed due to injury. Poor construction planning, lack of safety in design, inadequate safety training, worker behavior, intrinsic safety H&S risk of construction, and lack of understanding of site laws are all variables that contribute to high accident rates, according to this study. [4]

In the local setting, the study of Toyado aims to raise construction safety awareness in Catanduanes. The study focuses on workers in the Catanduanes construction industry's Occupational Safety and Health awareness. Following a series of interviews and interactions with construction employees on the job site, the researcher came to the conclusion that while construction workers are aware of the importance of safety and health in the workplace, they do not adhere to or follow it. Workers admit that discomfort, attitudes, and bad habits are the reasons they are complacent about following safety and health practices. [5]

Moreover, the study of Reyes-Garcia et al. intends to provide a standard for measuring construction safety using a proposed safety management evaluation framework. A questionnaire survey done in Dingalan looked into the factors that affect

construction safety performance. The findings imply that a construction safety benchmark should take into account six major factors: management commitment, management measures, implementation, project characteristics, individual involvement, and economic investment. The most important aspect affecting construction safety is management commitment, which includes enacting organizational safety policies, assigning safety responsibilities at all levels, and so on. The proposed management framework will aid in benchmarking and activities aimed at improving construction safety in developing communities. [6]

2.3 Conceptual Framework of the Study

This study, with the general aim of determining the effectiveness of health and safety management in the infrastructure projects of the local and national government within Cabanatuan City used the framework shown (See Figure 1) in its measurement.

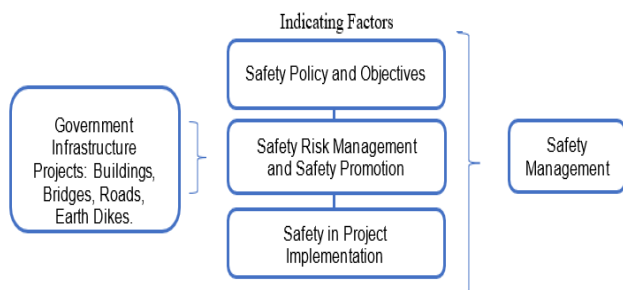


Fig.1. Diagram of Construction Safety Management's Indicating Factors

The indicating factors include the following:

- Safety Policy and Objectives – this pertains to the management responsibility, safety accountability, and rules and regulations on safety that are being implemented in the construction site.
- Safety Risk Management and Safety Promotion – this pertains to the risk assessment, prevention, and mitigation, safety training and education and/or seminars that are being conducted by the management concerned in the construction project.
- Safety in Project Implementation – This pertains to the workplace safety and personnel safety that are being implemented.

Given that the study aims to only measure the current effectiveness of health and safety management of infrastructure projects, no causal relationships are indicated in the framework

of the study. Thus, all variables are independent variables which were provided by the respondents in terms of their perception.

2.4. Statement of the Problem

This study entitled “Effectiveness of Health and Safety Management in Cabanatuan City Government Infrastructure Projects” determined how key individuals within a construction project view the health and safety management of infrastructure projects that are implemented by the national and local government within Cabanatuan City. In this light, the study sought to answer the following specific question:

What is the effectiveness of the health and safety management in Cabanatuan City government infrastructure projects in terms of?

- Safety Policy and Objectives*
- Safety Risk Management, and Safety Promotion, and*
- Safety in Project Implementation?*

2.5. Scope and Limitations

This study is primarily focused on the assessment of the effectiveness of the safety and health standards implementation in the government infrastructure projects of Cabanatuan City, Nueva Ecija. The researcher evaluated the compliance of the subcontractors and government agencies in handling safety and health standards according to the policies and protocol released by the Department of Labor and Employment in terms of safety in construction. This study was conducted in Cabanatuan City, Nueva Ecija during the A.Y. 2021-2022. This included participants from the construction industry such as site engineers, safety officers, project inspectors and other persons responsible in safety protocol of the government infrastructure projects both from the subcontractors and government agencies involved. Moreover, the limitations of this study include:

- Since this study concerns a specific sector, its results could be changed if applied in any other sector.
(The study is limited to the infrastructure projects implemented by the national and local government within Cabanatuan City, Nueva Ecija)
- This research work has been carried out in the year 2021-2022 and it may not be similar for the other years as there are lots of factors that affect the health and safety management of infrastructure projects.

2.6. Significance of the Study

This study was undertaken to find out the effectiveness of the safety and health standards implementation in the government infrastructure projects in Cabanatuan, Nueva Ecija. Benefiting the study are the various sectors as follows:

The students. This study may serve as a reference for all students, especially in the engineering degree for the proper implementation of safety and health standards. This will give awareness to students on the safety management in government infrastructure projects.

The Local Government Unit/National Government Offices. This will help them reassess the implementation of the safety and health standards on the on-going and future infrastructure projects that will benefit both their reputation and the citizens. This will serve as a reference to determine the factors that affect the safety practice in a project.

The Contractors. This study will help the contractors determine the factors which cause accidents in a project. It will serve as a precaution and provide them with a reference to determine the areas that need improvement.

Site Engineers, Safety Officers, Project Managers etc. This study will serve as an assessment of the management they apply in a project which will further help them determine areas of the projects that need attention.

2.7. Definition of Terms

The following terms are defined to further aid the reader of this study:

- Accident – an unfortunate incident that happens unexpectedly and unintentionally, typically resulting in damage or injury.
- Effectiveness – the degree to which something is successful in producing a desired result.
- Infrastructure – the basic physical and organizational structures and facilities (e.g. buildings, roads, power supplies) needed for the operation of a society or enterprise.
- Risk – is the possibility of something bad happening. Risk involves uncertainty about the effects/implications of an activity with respect to something that human's value (such as health, well-being, wealth, property or the environment), often focusing on negative, undesirable consequences.

- Safety Management – managing business activities and applying principles, framework, processes to help prevent accidents, injuries and to minimize other risk.

III. METHODS AND PROCEDURES

3.1. Research Design

Since this study generally aims to determine the effectiveness of health and safety management in the infrastructure projects of the national and local government within Cabanatuan City, the study incorporated the use of descriptive research design which is quantitative in nature. The goal of descriptive research is to describe people, events, or things in their natural environment. The researcher will not modify any variables in this method, instead describing the sample and/or variables. Although descriptive research can look at numerous factors, it is the only one that can look at just one, which in this case is infrastructure project health and safety management. [7]

Moreover, the study uses a quantitative research method to describe the effectiveness of health and safety management of construction projects. This is defined as a systematic investigation of phenomena by gathering quantifiable data and performing statistical, mathematical, or computational techniques. Quantitative research collects information from existing and potential customers using sampling methods and sending out online surveys, online polls, questionnaires, etc., the results of which can be depicted in the form of numerical.

Given that the goal of this study is to measure the effectiveness of health and safety management in the infrastructure projects of the government of Cabanatuan City, the use of descriptive research design under quantitative method of research is most suitable for this study.

3.2. Locale of the Study

The study was conducted in Cabanatuan City, Nueva Ecija during the Academic Year 2021-2022. Cabanatuan City is located in the rolling central plains of Luzon drained by the Pampanga River. The city stands 14 kilometres (8.7 mi) southwest of the provincial capital Palayan City and 120 kilometers (75 mi) north of Manila. The geographic coordinates of Cabanatuan City are 15° 29' 22 N, 120° 58' 14 E. The city is administratively subdivided into 89 barangays and is considered to be the economic heart of Nueva Ecija.



Fig.2. Location Map of Cabanatuan City, Nueva Ecija

3.3. Respondents of the Study

The researcher considered the employees under the Government Agencies and Construction Firms who are involved in infrastructure projects in government. Consisting of 12 contractor respondents, 23 Local Government Units (LGU's) respondents, 12 respondents under National Irrigation Administration and 8 respondents under DPWH 2nd District of Nueva Ecija for a total of 55 respondents from various government agencies and construction firms in Cabanatuan City.

They are chosen as respondents to determine how effective the safety management in infrastructure projects under the government at Cabanatuan City, Nueva Ecija. The researcher would have accurate evidence for this study based on their responses to the survey.

Respondents from the survey range from ages 22 to 69 where majority are aged 24 and 26 years old. 58.1% are male and 41.9% are female.

3.4. Samples and Sampling Procedure

A non-probability sampling, namely volunteer sampling method was used in selecting the participants or respondents for the survey. Volunteer sampling is a form of purposive/non-random sampling where data is obtained from those who are willing to participate in the study, who are persons working under or for government infrastructure projects. A purposive sample by definition is a non-probability sample that is selected based on characteristics of a population and the objective of the study. This type of sampling can be very useful in situations when you need to reach a targeted sample quickly, and where sampling for proportionality is not the main concern. It was chosen by the

researcher as the sampling procedure to easily gather the needed respondents and data from a single purpose which is the measurement of health and safety management of infrastructure projects in Cabanatuan City.

3.5. Research Instrument

The primary data gathered in the study are from the respondents of the survey while the secondary data were gathered from books, journals, and other online references.

Through intensive analysis, the researchers have come up to form a survey questionnaire, consisting of fifteen (15) questions which are then divided into three categories. The three categories' goals are to obtain full coverage of details regarding safety management of the projects. The researchers believed that the questions provided were enough to analyze and predict the current situation of the effectiveness of safety management in government infrastructure projects in Cabanatuan City, Nueva Ecija.

The research instrument underwent validity and reliability testing. For validation, this instrument was subject for critiquing and validation of a group of professionals from the City Engineer's Office of Cabanatuan City, Nueva Ecija. Upon validation, reliability testing was performed through pilot-testing of 10 samples to determine the internal consistency of the survey questionnaire, using Cronbach alpha.

On the other hand, open questions were not included in the calculation of the Cronbach's Alpha and were considered to be support to the data gathered in this study.

Table.1. Cronbach's Alpha Results

Factors	No. of Items	Cronbach's Alpha	Interpretation
Safety Risk Management and Safety Promotion	3	.865	Good
Safety Policy and Objectives	4	.832	Good
Safety During Project Implementation-Part A	2	.768	Acceptable
Safety During Project Implementation-Part B	3	.860	Good

3.6. Data Gathering Procedure

The procedure for data gathering consisted of development of the questionnaire, survey distribution, and retrieval and collation. The researchers made use of advanced online technology to create an online survey, using Google Forms. The researchers also used different online platforms such as Facebook, Messenger, and Emails to spread the online survey to the target respondents, to obtain the necessary data needed to conduct this research. The researchers also made use of other research, both published and unpublished, to gather more information. The data obtained was then checked, tallied, interpreted, and analyzed to come up with the research conclusion.

3.7. Statistical Treatment

In order to describe the gathered data, the researcher used selected descriptive statistics under the measures of central tendency. A measure of central tendency is a single value that attempts to describe a set of data by identifying the central position within that set of data. Given so, the researcher used the following measures of central tendency:

Mean (Arithmetic). The mean (or average) is the most popular and well-known measure of central tendency. It can be used with both discrete and continuous data, although its use is most often with continuous data. The mean is equal to the sum of all the values in the data set divided by the number of values in the data set.

The data are described as follows:

4.50 – 5.00	Strongly Agree/ Excellent
3.50 – 4.49	Agree/ Good
2.50 – 3.49	Neutral/ Average
1.50 – 2.49	Disagree/ Fair
1.00 – 1.49	Strongly Disagree/ Poor

For dichotomous questions, mode is considered. Mode is the most frequent score in our data set. On a histogram it represents the highest bar in a bar chart or histogram. You can, therefore, sometimes consider the mode as being the most popular option.

This chapter presents the gathered, analyzed, and interpreted data. Tables and figures are presented, and their weight is tabulated. This also includes the analysis and interpretation of the statistical results computed by the researchers. All data included in this chapter are based from the answers of the

respondents in the questionnaire that the researchers had provided.

IV. HEALTH AND SAFETY MANAGEMENT

4.1 Health and Safety Management: Safety Risk Management and Safety Promotion

Table.2. Safety Risk Management and Safety Promotion

Indicators	Weighted Mean	Interpretation
We have a safety officer who oversees the safety of all workers on the ongoing infrastructure project.	3.73	Agree/ Good
I have enough knowledge regarding the safety in the construction.	3.93	Agree/ Good
There is an appropriate signage for the hazards present during the construction of infrastructure project.	3.80	Agree/ Good
What other means and methods does your agency implement to support safety management in construction projects?	Use clear signage throughout the site, entry and exit points, first aid kits must be placed in an easily accessible area on site	
If you would be able to give suggestions and recommendations to help and improve your current safety policies, what would it be?	Proper implementation of safety policies, strict implementation and regular inspection, mandatory osh training, dedicated position for safety officers, regular conduct inspections,	
Overall Weighted Mean	3.82	Agree/ Good

As shown in Table 2, the researcher determined the perception of the respondent in terms of the Safety Risk Management and Safety Promotion of different infrastructure projects in Cabanatuan City, Nueva Ecija.

The results revealed that an overall 3.82 rating was given to this indicating factor which can be interpreted as Agree/Good. The highest rating was given to the belief of the respondents that

they have enough knowledge regarding the safety in the construction at 3.93.

More so, statements were made by the respondents with regards to other means and methods that their agency implement to support safety management in construction projects, most of the respondents indicated that they use clear signage throughout the site, entry and exit points, first aid kits must be placed in an easily accessible area on site. On the other hand, in terms of giving suggestions and recommendations to help and improve the current safety policies, most of the respondents answered proper implementation of safety policies, strict implementation and regular inspection, mandatory osh training, dedicated position for safety officers, regular conduct inspections, etc. Overall, the effectiveness of Health and Safety Management: Safety Risk Management and Safety Promotion of infrastructure projects in Cabanatuan City is good/average.

4.2 Health and Safety Management: Safety Policy and Objectives

Table.3. Safety Policy and Objectives

Indicators	Weighted Mean	Interpretation
I have up-to-date training on how to handle emergency situations at work.	3.13	Neutral/ Average
All the worker in the construction site wears the appropriate PPEs.	3.40	Agree/ Good
I am regularly reminded to practice safe work habits by my managers.	4.00	Agree/ Good
I am made aware of safety issues or violations as they affect me and my job.	4.11	Agree/ Good
Overall Weighted Mean	3.66	Agree/ Good

Moreover, Table 3 shows the perception of the respondents with regards to their implementation of Safety Policy and Objectives of different infrastructure projects in Cabanatuan City, Nueva Ecija.

The results indicated that the respondents have a good rating when it comes to wearing appropriate PPEs, reminders practice safe work habits by my managers, and giving aware of safety

issues or violations. On the other hand, they rated having up-to-date training on how to handle emergency situations at work an average rating.

Overall, the implementation of Safety Policy and Objectives of different infrastructure projects in Cabanatuan City, Nueva Ecija is Good at 3.66 rating.

4.3 Health and Safety Management: Safety During Project Implementation

Table.4. Safety During Project Implementation- Part A

Indicators	Weighted Mean	Interpretation
I am aware of our building emergency evacuation plan.	3.91	Agree/ Good
As a project engineer/engineer that monitors the project I strictly implement the wearing of PPEs during the construction of the infrastructure project.	4.15	Agree/ Good
Overall Weighted Mean	4.03	Agree/ Good

Table 4 shows the Part A of the perception of the respondents with regards to their implementation of safety during project implementation. The results indicated that the respondents were aware of their building emergency evacuation plan and that they monitor the projects strictly and implement the wearing of PPEs during the construction of the infrastructure project. Both are rated good and has an overall rating of 4.03.

Table.5. Safety During Project Implementation- Part B

Indicators	YES	NO
Do you think the safety rules and regulations for the infrastructure projects is effective?	83.64%	16.36%
Have you experienced any accident on the project you are currently handling?	14.55%	85.45%
Does your agency provide monetary support for PPE's and other safety equipment?	63.64%	20%

On the other hand, most of the respondents think the safety rules and regulations for infrastructure projects are effective. Most of them also haven't experienced any accident on the project they are currently handling. Lastly, most of them agree that their agency provides monetary support for PPE's and other safety equipment.

4.4 Health and Safety Management

Table.5. Summary of Ratings of Health and Safety Management

Indicators	Weighted Mean	Interpretation
Safety Risk Management and Safety Promotion	3.82	Agree/ Good
Safety Policy and Objectives	3.66	Agree/ Good
Safety During Project Implementation	4.03	Agree/ Good
Overall Weighted Mean	3.84	Agree/ Good

Overall, the health and safety management of infrastructure projects in Cabanatuan City, Nueva Ecija received a rating of 3.84 which is interpreted as good.

V. CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the conclusions inferred from the findings and the recommendations based on the findings and conclusions. In order to arrive at a thematic synthesis of the study at hand, the researcher will summarize its findings alongside with the problems sought.

5.1 Conclusion

After having presented the findings of this undertaking, the research concluded the following:

- The effectiveness of health and safety management of infrastructure projects of the government of Cabanatuan City is good. Specifically:
 - a. The effectiveness of health and safety management of infrastructure projects in terms of safety during project implementation is good and was able to receive the highest rating.
 - b. The effectiveness of health and safety management of infrastructure projects in terms of safety risk management and safety promotion is good and is 2nd from the highest rating.

- c. The effectiveness of health and safety management of infrastructure projects in terms of safety policy and objectives is good and is the 3rd with the highest rating.

5.2 Recommendations

Based on the findings of this study, the following are recommended:

- Provide up-to-date training on how to handle emergency situations at work and other subjects related to health and safety management in construction.
- Require strict implementation of wearing PPEs in construction site.
- Construction firms, as well as the implementing agency (national and local government of Cabanatuan City) should be strict with how they implement health and safety management of infrastructure projects in order to prevent accidents, casualties, etc. Being in the construction industry entails danger, and thus, one must be more careful and stricter with safety policy implementation for a successful project construction.

5.3 Suggestions

Suggestions for further studies supported the findings of the study and limitations, some areas are suggested for further study. Here are some of the suggestions to further improve this study:

- Include a higher number of respondents to increase the reliability of the data gathered.
- Use a standardized questionnaire to thoroughly measure the effectiveness of health and safety management of infrastructure projects. This increases the reliability of data gathered as well as the bias of answers of the respondents.
- Aside from the descriptive method of research, the researchers may also use a direct observation method using a checklist/ rating scale to conduct actual observations and measurement of the health and safety management of infrastructure projects.
- Further study is suggested.

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