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Disaster Risk in Underground Utility Development: A Matter of Perception

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Abstract

The risk of development (or disaster) depends on the nature of the development itself and the potential disaster in the development area. However, the risk of disasters is a matter of perception. It depends on how an individual or group of individuals see or assess the characteristics of a phenomenon. Even it is subjective; it is vital to understand what risks people consider to be acceptable, especially the local players involved in the development works. Therefore, this paper presents how the local players perceive disaster risk in underground utility development. These local players were the authorities at the federal and state level, industry players, and academicians. Series of focus group discussions were conducted for data collection purposes, and the data was analyzed narratively. One aspect is the perception of disaster risk occurrence; either the disaster affects the development or otherwise. In turn, this evidence-based information could be one of the essential feeders to policymakers and disaster managers on what disaster risk reduction programmes have a better chance of being accepted by the local players. The success of this kind of programme is essential for sustainable underground utility functions for the future.

Keywords: disaster risk reduction, underground utilities, critical service, risk perception, disaster resilience

1.0 INTRODUCTION

The relationship between disaster and infrastructure development has long been discussed globally and nationally in two contexts. First, disasters can cause damage to existing infrastructure development. In the second context, the infrastructure development that is not well managed may create disaster risk either while the development is in progress or has been completed. Verily it can happen to any national physical development project, one of it is the underground utility development.

However, there is a similarity between these two contexts. Disasters that damage underground utilities and underground utility development that trigger disasters can affect socio-economic development sustainability. This situation is not impossible if the above interrupt utility services. For example, today's social and economic life is heavily dependent on fiber optic internet services for communication purposes, especially when the world is facing Covid-19 pandemic. In this condition, the internet service is often interrupted, social activities such as working from home, teaching and learning from home, and economic activities such as e-commerce will most likely be affected.

Aware of the above, the Sendai Framework for Disaster Risk Reduction 2015 - 2030 outlines the importance of integrating disaster risk reduction (hereinafter is referred to DRR) into physical development measures. This integration means that physical development projects, including the underground utilities, must consider implementing action plans that can reduce disaster risk to such physical development, or vice versa. The goal is to make the nation and communities resilient to disasters.

This integration is, however, complex and challenging because the physical development projects involve many stakeholders. As th basis of this integration, all stakeholders must have a similar perception of disaster risk related to the project. Dissimilarities will only create integration by sectoral agencies but not at the center of the development process.

2.0 PAST EXPERIENCE AND RISK PERCEPTION

People reaction towards particular risk is generally influenced by their perception (Bubeck et al., 2012). For instance, when a worker believes that underground utility work's potential risk existed, he will complete his job more appropriately. Otherwise, he might not prepare himself to reduce the potential risk with relevant knowledge, skills, and attitudes, but full of ignorance, narcissism, and non-conformance. From this point of view, awareness and understanding the risk and disaster preparedness are important for managing risk at all levels (Cutter, 2008; Alcántara-Ayala and Moreno, 2016).

According to Linden (2014), the risk is something that cannot be sensed but perceived and subjective. Risk perception involves judging a person on the probability of threat or hazard concerning their environment and the consequences of a negative outcome (Oghenetega et al., 2020). Several studies on different types of disaster such as climate change (Linden, 2014), landslides (Alcántara-Ayala and Moreno, 2016), natural disasters (Odiase et al., 2020), COVID-19 epidemic (Dryhurst et al., 2020), and earthquake (Xu et al., 2020) have indicated that pass or personal experience with disaster event is a significant predictor of disaster risk perceptions.

The Psychometric Approach of Slovic et al. (1986) and the Basic Risk Perception Model of Sjöberg (1993) are in line with these findings, where personal experience is identified as one of the critical factors of risk perception. According to Alcántara-Ayala and Moreno (2016), the population living at that risk is usually the most knowledgeable about the existence of risk around them. Their incorporation of experience on disaster risk is expected to improve awareness, preparedness, response, and recovery.

3.0 RESEARCH OBJECTIVE AND METHODOLOGY

This research is conducted to examine stakeholders' perceptions of disaster risk in physical development projects in Malaysia. The focus will be on underground utility development projects only, where the chain of management of the installation and maintenance project is complex. The study involved stakeholders of underground utility development that share the same interest and goal: providing good utility services to consumers. They are the government agencies at the federal, state, and local level, utility providers, contractors, and surveyors. Data collection here, executed using focus group discussion (hereinafter is referred to as FGD) techniques. FGD questions are self-developed, and pilot tested. The data obtained are then analyzed narratively. As part of the research ethics, the respondents' actual identity will not be disclosed but replaced with a specific code.

4.0 FINDINGS AND DISCUSSIONS

In Malaysia, accidents related to the underground utility occurred, and fortunately the number is small. Based on the focus group discussion, respondent 3P-3G1 said that his department has been involving in managing an underground utility work accident at a bridge in a state located in the North of Peninsular Malaysia. The accident happened when the site worker accidentally hit cables that were not supposed to be there during excavation work. It is fortunate that the accident did not involve any severe injury or fatality.

Similarly, the second case did not involve any injuries or fatalities too but still affect the consumers. Respondent 4N-8G1 said that the incident happened three days before Ramadan involving the underground communication cables work. During the excavation work, the worker accidentally hit a water pipe located about 1.8 meters underground. The hit ruptured the water pipe and affected more than 11,000 water consumers. Another similar case was also reported by 4N-32G7, caused by the inability to detect underground water pipes. Even with no fatalities or injuries, the incident required a high cost to fix the damages immediately so that the time of water disruption to consumers can be shortened.

According to respondent 1S-36G2, the unknown location of underground utilities is also risking the upper ground development. For instance, many highway projects pass through the underground water pipeline. In case of the water pipe damages, it is damaging the highway structure and endangering the highway users. Therefore, the respondent

highlighted the importance of the accurate as-built drawing plan and data sharing as a reference for future development. Besides accuracy, the underground utility data must come with validity. Respondent 1A-52G4 said that it is difficult to confirm the validity of data. Not synchronized, outdated, and not adequately recorded are the example factors that typically happen and cause the validity of mapping data can be questionable. As a result, when the contractors conduct fieldwork, the accident happened.

Based on these examples, all respondents agreed that accurate and valid mapping and promising technology for detection are essential to ensure future underground utility works safety and reduce the possible damage, affecting the consumers and wasting government money. Respondent 3P-6G1, 3P-6G2, 3P-6G3, 3P-6G4, and 3P-6G5 agreed that so many people unaware of the above. Improper underground utility process could cause inconvenience and disruptions to daily routine and lifestyle. The impact the economy is, in fact, more prominent than imagined.

Respondent 3P-4G5 agreed with this statement. It increases public expenditure for repairing purposes. No matter the size of the damages, the local government has to repair the damages as soon as possible. Otherwise, the public will complain because the disruption affects their quality of life. According to respondent 3P-4G4, they do not have sufficient facilities to repair big-scale damages. Therefore, they have to get assistance from other agencies or state governments, which increases the cost. Responding to this statement, respondent 3P-5G1 said that the annual cost for repairing is enormous and a lot, but no idea about the specific amount and number of repairs conducted. Whatever it is, the public money is wasted.

Respondent 3P-1G5, on the other hand, did not have any experience in accident-related underground utility works. Therefore, he did not become aware of the potential risk related to underground utilities and also the actual extent of potential disruption to daily life and economic activities. He also said that the experiences of the others were an eye-opener. All stakeholders must consider these in decision-making, especially when designing a physical development plan. Responding to this statement, respondent 3P-3G3 said that most of the development plans do not seriously consider the importance of underground utility mapping in their development area. They think about the completion of their project only, which is typically within a short timeframe. Unfortunately, it affects future development. Cancelled projects caused by the unplanned, uncharted, or unmapped utility pipelines are many, for example, MRT project which incurred high costs and delayed actual work in repositioning underground utility pipelines).

Respondent IS-72G4 agreed on the above. Acting as an emergency responder, he said that the availability of a central database on the underground utility location could speed up the decision-making process in emergency or disaster response. Currently, the individual utility providers are keeping the data. In condition the emergency requires them to cut off different underground utilities, they have to contact various utility providers. Even the providers are helpful and willing to share their data, this process delays search and rescue operations. Concerning this issue, respondent 3P-7G1 highlights the importance of underground utility mapping to disaster preparedness plans. According to respondent 3P-7G3, they never discuss this at the management or decision-making level. When a disaster involving underground utilities happened, they only made ad hoc decisions.

5.0 CONCLUSION AND RECOMMENDATION

The underground utility developments carry critical services to support the socio-economic development of any country. To reduce the possibility of service interruption due to disaster-related risks, DRR needs to integrate into the development process. By paying attention to stakeholders' perceptions on disaster and development-related risks and how they might link to their everyday experiences and interests, it is expected that DRR will be put in their perspective. In turn, this initial and evidence-based information could be one of the essential feeders to policymakers and disaster managers on what DRR mechanism has a better chance of being accepted by the local players. Overall, integrating DRR into development should be one of the fundamental national policies for sustainability, and the relevant policy programmes must be conducted during the implementation phase.

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