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Post-Pandemic Risk Assessment and Safety Management at Academic Institution Environment

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ABSTRACT

The World Health Organization (WHO), on March 11, 2020, declared the novel coronavirus (COVID-19) outbreak a global pandemic. Safety, people protection, equipment and environmental protection are serious concerns anywhere, including in an institution or university environment. In the meantime, the number of accidents has increased in academic institutions nationwide. Students, staff, lecturers, and academic personnel are involved in activities that expose them to minor to major fatal accidents. This study developed risk assessment using combinations of hazards and risk factors to scale measures in a risk reduction action plan. Health, safety and environment risk assessment conducted for 27 assessed hazardous activities at 18 locations divided into three areas: laboratories, public facilities, and offices at the Department Ocean Engineering Sepuluh Nopember Institute of Technology. The frequency and severity of health hazards were higher in accumulation number, which is 790, compared to safety hazards, which score 509, and environmental hazards, with 104. The highest number for accumulation of potential hazards in health, safety, and environment for laboratories area is 883, followed by accumulation of potential hazard at health, safety, and environment for office area and public facilities area with scores 239 and 281.

Keywords: *Risk assessment, Academic, Safety.*

1. BACKGROUND

Academic institutions or universities are places where young adults prepare for professional work. Several activities at university facilities, such as classrooms, laboratories, fields, and other places, may be accompanied by various hazardous risks. Accidents may damage equipment, facilities, and humans, causing minor or major injuries or fatalities [1]. Students, staff, lecturers, and other personnel must stay alert and aware to avoid accidents. Therefore, identify hazards and risk factors to prevent hazards in advance. The university is primarily responsible for providing safety and health for the students, staff, lecturers, and other personnel. A risk assessment provides any risks based on activities and facilities, which can be used for prevention [2-4]. The loss of accidents could be mitigated through an effective risk management program. Previous experiences have shown that risk assessment may effectively handle probable accidents by applying an appropriate risk assessment [3,4].

Developing policies and programs to identify, measure, evaluate, and reduce work-related risks could maintain health, safety, and environment [5]. Understanding what can happen in various scenarios based on identified hazards will enable authorities to invest in providing resources and develop plans and procedures to keep people safe and free of danger. Additionally, the literature review highlighted that injuries to people should be the first consideration of the risk assessment. The following stages would determine the vulnerability of other at-risk assets, such as buildings, equipment, utility systems, and raw materials from hazards [6].

Risk reduction programs must be based on comprehensive risk assessment. This research developed and performed a detailed risk assessment, which can be addressed in training and risk reduction activities. This study aimed to develop a systematic risk assessment approach to predict incidents and related injuries in the university, specifically at the Ocean Engineering Department Sepuluh Nopember Institute of Technology.

2. METHODS

A risk assessment method was developed to evaluate health, safety, and environmental hazards for the indoor and outdoor environment at the Ocean Engineering Department Sepuluh Nopember Institute of Technology. Firstly, an onsite survey checklist was conducted based on the hazard vulnerability assessment proposed by the University of California and Aberystwyth University general risk assessment checklist. These instruments have been applied

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in previous studies. Procedures included a literature review, observation, and interview to examine potential hazards. This study listed risks through a detailed and comprehensive literature review concerning recent accidents or incidents within the university. This research conducted an onsite survey to collect details of potential hazards and possible impacts.

Secondly, evaluate the risk levels based on the risk matrix in ISO 31000 [7] to determine probable hazardous exposures in terms of students, staff, lecturers, and visitors. The probability metrics were measured on a five-point scale from not applicable to inevitable (Table 1). Not applicable indicates an incident that will not occur in the upcoming years. “Doubtful” means the incident that will not be likely to occur; “Possible” points to the incident that could occur; “Probable” and “Inevitable” indicate the high probability of incidents that will occur in the future years, respectively. Finally, the corrective measures were considered in the risk reduction action plan according to the computed risk grading for identified hazards.

Risk interpretation*

- 1st risk level: Acceptable risk: 1–3 (Green)
- 2nd risk level: Corrective measures should be done in the future, if necessary: 3–8 (Green)
- 3rd risk level: Corrective measure is necessary: 8–13 (Yellow)
- 4th risk level: As soon as possible, corrective measures should be considered: 13–20 (Red)
- 5th risk level: Stopping the activity and corrective measures should be considered immediately: 20–25 (Red)

Table 1. Risk Matrix to determine the risk score for each hazard (Ref. Risk matrix ISO 31000)

Likeli-hood Severity	Not Applic-able	Doubt-ful	Possi-ble	Probable	Inevitable
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

Depending on the priority of performing corrective actions: 1st and 2nd risk levels were accounted as low risk (green color), 3rd risk level as moderate risk (yellow color), 4th and 5th risk as high risk (red color). An integrated approach assesses the consequences of hazards. This research determined the severity rate regarding humans, equipment, and institutions. In order to estimate the effects of each identified hazard, this study applied two items with a five-point score response. The details of questions and relevant responses for each impact are available in the supplementary file. Responses were scored and averaged to obtain an overall severity score.

3. RISK ASSESSMENT

Health, safety and environment risk assessment conducted for 27 assessed hazardous activities at 18 locations divided into three areas: laboratories, public facilities, and offices at the Ocean Engineering Department, Sepuluh Nopember Institute of Technology. The frequency and severity of health hazards were higher in accumulation number of 790 compared to health, which scored 509 and environmental hazard with 104. The highest number for accumulation of potential hazards in health, safety, and environment for laboratories area is 883, followed by the accumulation of potential hazards in health, safety, and environment for office area and public facilities area with scores 239 and 281.

3.1 Assessment of Health Hazards

Health-related hazards are rated the highest priority to potential hazards in the post-pandemic era. Physical touch is one of the media for transferring viruses, bacteria and other possibilities of spreading illness. A room full of people interaction could be dangerous because of having potentially high health hazards. Several public areas such as classrooms, student council room, canteen, pantry, presentation room, head & secretary department’s room, administration department’s room, basketball field, and prayer room could be potential hazards due to people interaction score 187. This value indicated that viruses or disease spreading contribute to the highest number of health hazards, followed by physical fatigue at a score of 105. Whether in laboratories such as flume tank, structure, material and production laboratories, infrastructure laboratories, construction laboratories, engineering hydro-informatics laboratories, environment and energy laboratories potential hazard is physical fatigue due to static body posture, non-ergonomic equipment, exposure to chemical hazard, lighting, noise value 498 in calculation.

3.2 Assessment of Safety Hazards

Safety-related hazard rated the second highest priority in terms of establishing emergency responses in the laboratories and public areas. All the determined hazards at fourth and fifth risk levels were in the domain of safety

Area	Location	Hazard																										
		Health											Safety												Environment				
		unhigine food	viruses/disease spreading	lack of oxygen	physical fatigue	static body posture	manual handling	non-ergonomic equipment	exposure to chemical substance	lighting	stroboscopic light	noise	vibration	contact with cold surface	contact with hot surface	contact with liquid	electric shock	fire	explosion	hazardous chemical release	falling object	sharp object	slippery surface	solid waste material	nuisance noise	pollutant released to air	pollutant release to water	pollutant released to soil
Laboratorium	Flume tank		3	9	8		6	6	8	7		8	5	5	5	10	8	20	15	5	10	8	15	15	10		15	
	Structure, material & production		3	12	8		6	8	8	7	20	15	15		10		10	20	20	15	10	10		15	15	15		
	Hydrodinamics laboratorium			9	8		6	6	8	7		10	6				8	15	10									
	Infrastructure laboratorium			9	8		6	6	8	7		8	6				7	15	10									
	Contruction laboratorium		3	9	8	5	4	6	4	7		6					6	15	6									
	Eng. Hydro-informatic lab.			9	8		6	6	8	7		8	6				6	15	10									
	Environment & energy lab.			9	8		6	6	8	7		8	6				6	15	10									
Public	Students council room	6	15		3												5		5									
	Basketball field		13		6														3						5			
	Classroom		15		8	15		6									5		5						5			
	Pantry	6	15		3											5	4		5									
	Canteen	6	15		3												6		5									9
	Toilet	6	15		3														3				10					
Office	Presentation room	5	15		3	8		6									5		4									
	Head department	5	15		4	8		6									5		4									
	Secretary department	5	15		4	8		6									5		4									
	Postgraduate head room	5	15		4	8		6									5		4									
	Lecture rooms	5	15		4	8		6									5		4									
	Administration department	5	15		4	8		6									5		4									

Figure 1. Risk Assessment conducted at Department of Ocean Engineering Sepuluh Nopember Institute of Technology laboratories and public areas.

related to the explosion and fire, with a score of 20 (the maximum possible score was 25) and the additional value between fire and explosion at 246. This score indicated a significant vulnerability of laboratory facilities. The high scores related to the hazardous electrical shock were also determined at 101. Unsafe acts and conditions contributed to such hazards in laboratories and peripheral facilities.

3.3 Assessment of Environmental Hazards

The environment at laboratories has the highest risk level of potential hazards, which scores 104 in total. The highest potential hazards in laboratories are solid waste, nuisance noise, and pollutant to air, water, and soil, which score between 10 to 15.

4. SAFETY MANAGEMENT

Based on the risk assessment matrix, health hazards have the highest potential since the COVID-19 pandemic has hit the world, especially in academic institutions. Mitigation plans are needed to overcome potential emergencies, including having an integrated safety management system with departments, faculties, institutions, and government. This research scope focuses on health hazard safety management not only at Ocean Engineering Sepuluh Nopember Institute of Technology but also at Sepuluh Nopember Institute of Technology.

4.1 Covid Task Force Team

Assembly team speciality for possible infectious viruses, such as COVID-19 mitigation, is necessary. This team force should be from various backgrounds or functional positions, including security, cleaning staff, administration, head of department, people from different faculties, and rectorate. The special team should create standard operational procedures for preventing the spreading of viruses, including five basic safety protocols such as using masks, washing hands regularly, physical distancing, avoiding a crowd, reducing mobility, and any other government instruction. Indonesian government developed a mobile application named Peduli Lindungi-care to protect and indicate people using green, yellow, red, and black color based on vaccine history, contact with suspects or experiencing covid. This application connects with the Ministry of Health so that the Ministry of Health can monitor suspects of COVID-19 who self-isolate. Green status indicates that people can travel across the places using public transportation and go to public areas. Green status could be earned by having a third vaccine (booster), not a COVID-19 patient or close contact with a suspect COVID-19, recovering from COVID-19 less than 90 days, or antigen test results (valid for 1x24 hours) or PCR test (valid for 3x24 hours). Yellow status indicates that people cannot travel across town but still could enter public areas based on regional government regulations. People with yellow status means they received a second vaccine, not a COVID-19

patient or contact with suspect COVID-19. Meanwhile, the red status indicated by having the first vaccine or not receiving it at all, so they cannot travel to public areas. Moreover, black status means people with COVID-19 positive for less than 10 days or contact with suspect patient for less than 14 days. These scan app procedures indicate people with color status are a mandatory safety protocol to enter the mall, office, institution, and any other indoor area. The task force team would obey the protocol and act as security responsible for allowing or disallowing people to enter the institution. The task force team also encourages all institution personnel to get a vaccine and follow safety protocols.

4.2 Health Monitoring and Self-Health Declaration

Sepuluh Nopember Institute of Technology adjusts daily questionnaires about the self-health declaration to monitor all personnel's health. Body temperature should be monitor using a thermometer or thermogun scanner. People with a temperature exceeding 39 should be taken to the campus medical center or self-isolated until their status turns green at the Peduli Lindungi app. COVID-19 screening using PCR or antigen should be regularly conducted by the task force COVID-19 team.

4.3 Health Environment Facility

In order to create a health environment to adjust to the COVID-19 situation, there are several additional mandatory facilities that institution should be provided, such as hand sanitizer, sink for hand washing, isolation rooms, general cleaning with disinfectant, air humidifier, education media for warning installment, sanction for people who violate health protocol, and nutrition meals or beverages allocation.

5. CONCLUSIONS

Health, safety and environment risk assessment conducted for 27 assessed hazardous activities at 18 locations divided into three areas: laboratories, public facilities, and offices at the Department Ocean Engineering Sepuluh Nopember Institute of Technology. The frequency and severity of health hazards were higher in accumulation number 790 compared to health, which scored 509, and environmental hazards with 104. The highest number for accumulation of potential hazards in health, safety, and environment for laboratories area is 883, followed by accumulation of potential hazard at health, safety, and environment for office area and public facilities area with scores 239 and 281. Furthermore, to prepare for the prevention and mitigation of the COVID-19 situation, changes are mandatory to adjust to the situation, such as creating a special task force team with several activities and responsible, regularly monitoring for health of all personnel, and providing facilities to obey safety protocols.

REFERENCES

[1] Vinnem JE, Aven T.; Case illustration of a decision framework for health, environment, and safety management. *Proceedings of the Institution of Mechanical Engineers, Part O: Journal of Risk and Reliability*. 2006 Nov 28;220(2):115–21. http://dx.doi.org/10.1243/1748006xjrr12

[2] Bernardo LM, Beach M, Mitchell AM, Zoldos K.; Disaster Preparedness at the University of Pittsburgh School of Nursing: Four Years of Progress. *Disaster Management & Response*. 2006 Jul;4(3):77–9. http://dx.doi.org/10.1016/j.dmr.2006.05.002

[3] Dehdashti, A., Fatemi, F., Jannati, M. et al.; Applying health, safety, and environmental risk assessment at academic settings. *BMC Public Health* 20, 1328 (2020). https://doi.org/10.1186/s12889-020-09419-5

[4] Disney JA, Graves RC, Stamm JW, Bohannan HM, Abernathy JR, Zack DD.; The University of North Carolina Caries Risk Assessment study: further developments in caries risk prediction. *Community Dent Oral Epidemiol*. 1992 Apr;20(2):64-75. doi: 10.1111/j.1600-0528.1992.tb00679.x.PMID: 1555390.

[5] Al-Nammari F, Alzaghal M.; Towards local disaster risk reduction in developing countries: challenges from Jordan. *International Journal of Disaster Risk Reduction*. 2015 Jun;12:34–41. Available from: http://dx.doi.org/10.1016/j.ijdrr.2014.11.005

[6] Amani S, Tahmasbi S, Baneshi A, Poursadeghiyan M, Karimzadeh M.; Factors affecting professional competency of iranian preschool administrators based on crisis management approach. *Health in Emergencies; Disasters Quarterly*. 2018 Oct 30;3(4):185–90 http://dx.doi.org/10.32598/hdq.3.4.185

[7] Beck JD, Weintraub JA, Disney JA, Graves RC, Stamm JW, Kaste LM, et al.; University of north carolina caries risk assessment Study: comparisons of high risk prediction, any risk prediction, and any risk biologic models. *Community Dentistry and Oral Epidemiology*. 1992 Dec;20(6):313–21. Available from: http://dx.doi.org/10.1111/j.1600-0528.1992.tb00690.x