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Potential Hazard Identification and Risk Assessment of Traveller Safety and Health on Malioboro Street, Yogyakarta, Indonesia

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Abstract—The purpose of the study is to identify the potential hazards and to get an overview of controls that have been applied in the Malioboro area. The research was qualitative research. The data were collected by observation and in-depth interviews. The object of the research was the surrounding environment that was risky to safety and health of travellers. Informants were selected by purposive sampling from managers and staff of Malioboro technical implementation unit, four travellers and three cadgers. Hazard Identification, Risk Assessment, and Risk Control (HIRARC) method were used to observe potential hazards. The results indicated that there were seven activities and one environmental factor. Assessed by AS/ NZS 4360 standard in 20041, 36 types of risk were found, consisting of five very high risks, nine high risks, fifteen moderate risks and eight low risks. The control efforts that had been carried out by Malioboro authorities were the eliminate control by waste management, the engineering control by the provision of crossing aids and trash bins, and the administration control by structuring street vendors, establishing security officers with empowerment principles and providing information and warnings about hazards through loudspeakers or information technology systems because Yogyakarta is prone to volcanic eruptions and earthquakes.

Keywords: travellers, potential hazard, hazard control, risk

I. INTRODUCTION

The city of Yogyakarta is the Capital of the Province of Special Region of Yogyakarta, Indonesia. Yogyakarta has strategic location. The cultural and historical tourism destinations and the hospitality of Javanese always encourage tourists to return to Yogyakarta. It increases the number of tourist visits to Yogyakarta. The total number of tourist visits to Yogyakarta reached 4,103,240 in 2018[1]. Yogyakarta was awarded the Best Gold at the Travel Club Tourism Award (TCTA) in 2014 and the Golden category in the Indonesia Attractiveness Award (IAA) 2018[1]

The iconic destinations and the main destination of tourists visiting Yogyakarta is Malioboro Street. The Malioboro street is an imaginary axis that connects Mount Merapi in the North, Tugu, Yogyakarta Palace and the South coast of Java. Historically, this area became a trading area built by Hamengkubawana I, the king of Mataram Kingdom, far before the colonial era (1790-1945). The Netherlands also

built the Dutch Club (1822), the Dutch Governor's Residence (1830), Java Bank and the Post office to maintain the dominance of the Dutch in Malioboro street area[2].

Nowadays, after 248 years, Malioboro street is very crowded and busy because there are many street vendors, artists, tourists and locals shopping and enjoying the city. They walk, sit and watch angklung art performances, culinary hunting or doing cultural and historical tours.



Figure 1: Plan of the Pedestrian Area of Malioboro Street

Malioboro area is managed by the Technical Implementation Unit of the Malioboro that is responsible to Yogyakarta City Tourism and Culture Office. This unit is formed to be responsible and to support the form of development in every aspect of Malioboro. Preliminary studies at Malioboro street indicated that some safety and health issues had not been controlled yet: (1) the density of vehicles passing on the Malioboro road that raised the risk of traffic accidents (2) air pollution (3) the street vendors who used pedestrian lane, consequently reducing walking area for pedestrians (4) low hygiene levels for the lack of public awareness (5) horse drawn carriage that trashed the street with faeces and urine (6) stink due to bad waste water disposal of the food vendors, (7) security disturbances (pickpocket, loss, fraud and potential terrorism), (8) history of disaster in Yogyakarta. Those problems describe that implementation of "Sapta Pesona", a pillar for the development and

management of tourism in Indonesia is still weak among tourism managers and communities on Malioboro street.

The tourist area manager of Malioboro, needs to consider the aspects of safety and health for travellers to realize the aspects of the Sapta Pesona, whose seven pillars include security, order, cleanliness, coolness, beauty, friendliness and memories. Safety (security) is the main factor that needs to be considered even before the tourists come in order to ensure that the area to be visited is a safe zone. Security should be guaranteed by the country and should also be supported by the surrounding community that determine the growth and development of a tourist destination. In addition, security includes the value of excellence that will determine the quality of a tourist destination. Without guaranteed safety, tourist destinations will not be able to compete in the tourist market. Travel safety management will always be related to efforts to minimize risks and accidents. Travel safety and health aspects are oriented towards reducing or eliminating the risks faced by tourists when walking, shopping, enjoying culinary delights, watching art shows, or sitting on a park bench. Managers of tourist destinations with a high risk must pay attention to visitor safety with planning and risk control, as mandated in the Law of the Republic of Indonesia number 10 of 2009 Article 26[8].

Actually, accidents can be predicted and prevented. Recognition of potential hazards is expected to result in efforts to control the planned effective measures to improve the safety of the pedestrians.

II. METHOD

This research is a qualitative research with a case study design. The data collection techniques used were: observation on objects (potential hazard) surrounding the environment at Malioboro street and in-depth interviews as a confirmation of the results of observations. Informants were selected by purposive sampling. The key informant was the Head of Malioboro Administration Sub-division of the government tourism office who was responsible for managing the Malioboro area and his staff. Triangulation informants were 4 tourists and three traders on Malioboro Street. Risk analysis was carried out with the AS/ NZS 4360 standard in 2004[4].

III. RESULTS

Observations were made on objects surrounding the research environment which had risks of causing problems on tourist safety and health. In-depth interviews were conducted as a confirmation of the observation results. Informants of In-depth interviews consisted of two government employees in the Malioboro Technical Implementation Unit (TIU). They were the head and the staff of administration sub-division of Malioboro area, three traders and four travellers in Malioboro.

The process of identifying potential hazards begins with determining the type of activity. Potential hazards were identified by observing the environment and behavior according to the type of the activity. The results of observations representing the risk value qualitatively are presented in Table 1.

The results of the study indicated that seven traveller activities on the Malioboro road were walking on foot, crossing the street, culinary tours, shopping, sight-seeing activity around the city with a horse and rickshaw, watching angklung music performances and sitting on a park bench. There were two environmental factors found, namely the natural disasters and human factors. Potential hazards found were 1) physical hazard (e.g. slippery road, hot temperature, narrow and cramped road access, noisy/loud music), 2) chemical hazard (e.g. vehicle fumes, dust, leaked LPG containers, cigarette smoke), 3) mechanical hazard (e.g. being hit by vehicle, uncontrolled horse, rusty wheels and brake failure in rickshaw). 4) Biological hazard (e.g. expired food, lack of cutlery hygiene, mosquito bites), 5) psychological hazard (e.g. crowded street, pickpocket, sexual harassment for female tourists). Environmental factors of natural disaster include Mount Merapi volcanic ash, earthquake and terrorists and riots.

TABLE 1. POTENTIAL HAZARD AND RISK ASSESSMENT AT MALIOBORO STREET

No	Activity	Hazard	Risk	Likelihood	Severity	Risk Level
1	Walking on foot	Slippery road	Slip	C	2	Medium
		Hot temperature	Dehydration, dizziness, fatigue, fainting, skin irritation/ skin cancer	C	2	Medium
		Vehicle fumes, dust	Cough, shortness of breath, nausea, odor, eye irritation	C	2	Medium
2	Crossing the street	Hit by a vehicle	Wounds, fracture, concussions, trauma, death	B	4	Extreme
3	Culinary tour	Expired food	Poisoning, diarrhea	C	2	Medium
		Lack of hygiene of cutlery	Cholera, diarrhea, dysentery, hepatitis A	B	2	High
		Leaked LPG containers	Fire, sunburn, death	C	2	Medium
4	Shopping for clothes/ accessories	Narrow and cramped road access	Falling, hand/ leg injuries, bruises	C	2	Medium
5	Rickshaw tour	Uncontrolled horse, rusty wheels, etc.	Accidents, injuries, fractures, Psychological trauma	C C	2 1	Medium Low
		Vehicle fumes	Dizziness, coughing, shortness of breath	C	2	Medium
6	Watching Angklung music performance	Vehicle fumes, cigarette smoke	Dizziness, coughing, shortness of breath	C	2	Medium
		Load sound	Noise, stress, harassment	C	1	Low7
		Crowded audience, pickpocketing and sexual harassment				
7	Sitting on a park bench	Vehicle fumes, dust, cigarette smoke	Cough, shortness of breath, eye irritation	C	2	Medium
			Stress	C	2	Medium
		Mosquito	Dengue fever, malaria, itching of the skin	C	2	Medium
8	Environmental and human factors	Volcanic ash	Shortness of breath, sneezing, runny nose, sore throat	B	4	Extreme
		Earthquake	Wounds, fractures, concussions, Psychological trauma, death from being hit by building fragments	B C	4 2	Extreme Medium
		Terrorism and riots	Wounds, fractures, bruises, death	B C	4 4	Extreme Extreme

Table 1 shows that some of the risks in the Malioboro region were in the extreme category of 20% (5 risks), high category 4% (1 risk), medium category 68% (13 risks) and low category 8% (2 risks). The percentage level of the risks can be seen in the pie chart in Figure 2:

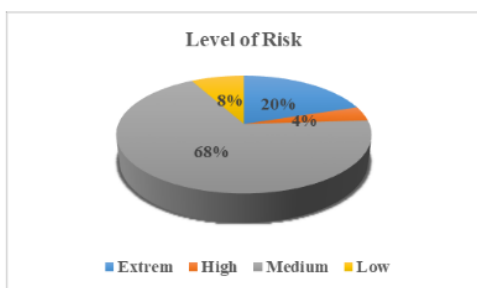


Fig 2: The Percentage Level of Risk in Malioboro Street

The risk level was determined based on tourist activities. There were five extreme-level risks when tourist crossed the road carelessly and because of environmental factors. There were four extreme and one high-level risks, including the activity of crossing the street, and the other three were on environmental factors, namely Mount Merapi disaster, earthquakes and terrorists/ riots. In crossing the street, the potential danger can arise due to the high number of vehicles occupying the road, consisting of private cars, motorbikes, buses, rickshaws and carts. The risk of a vehicle colliding with a pedestrian increase as the number of motorized vehicles interacts with pedestrians increases. Potential hazards also could arise from conflicts with other transportation models, which consequently posed obstacles, traffic congestion and could cause accidents [10]. Malioboro has had pelican crossings, but passing vehicles could still cause obstacles, traffic congestion and the risk of being involved in accidents was high enough. According to Trianingsih, there were 4 pelican crossings and 16 zebra crosses as crossing facilities along Malioboro and Ahmad Yani street, but a lack of pedestrian awareness and appeals from officers caused the pedestrian not to use these facilities properly [11]. Zakiyah found the sidewalks along the Malioboro street had not been designed to be tourist-friendly for people with disabilities. Malioboro already had a guide lane facility for pedestrians with disabilities, but it did not yet have a guiding route for road crossings. Moreover, the guiding route was still not optimum because it was used by street vendors to sell their goods along the Malioboro area [12]. Extreme risk was found in environmental factors of natural disasters or human factors. The tourists were in danger of volcanic ash from Mount Merapi, earthquakes and terrorists/ riots. The security and safety were the most important conditions that need to be fulfilled in tourism. It becomes an important factor because it influences the continuity of visitors' activities in traveling. Security threats for visitors can be caused and influenced by various factors, such as local conflicts, natural disasters, terrorist acts and social behavior because these factors can disrupt visitors' comfort while traveling [7-10].

Medium-level risks from tourist activities were imposed when walking in the pedestrian area, shopping for clothes/accessories, riding pedicabs/ rickshaw tour, enjoying Angklung music performances, sitting on a park bench, and participating in culinary tours. In Putro's research, et al., Malioboro area was found to have road space quality that was not suitable for pedicabs. The pedicab road space in the Malioboro area had a bad score with the total score of 21.64

of the maximum value of 40.00. There needs to be a standard formulation of pedicabs to conduct road spatial planning that is inclusive because pedicabs are included in non-motorized transports that are accommodated in the Malioboro area [11]. Cleanliness is also one of the inhibiting factors for creating the image of a tourism destination. The managers had not done maximum efforts in maintaining the hygiene of cooking utensil and places to eat that were still littered with garbage. There was also liquid waste, such as used dish soap and discarded cooking oil[12].

There were five low-level risks from shopping for clothes/accessories activities, watching angklung music performances and sitting on a park bench. The music performance was carried out at night, and the high number of people who smoke could pose a risk to health. Asriningsih's research also stated that cigarette smoke caused asthma and there were also other things that could cause discomfort, such as cold air resistance, dust or physical activity that could also trigger asthma attacks[12]. Blumenthal's research also stated that carbon monoxide was known as a silent killer because carbon monoxide had no color and smell. Every year, around 50 people die and 200 people are seriously ill because of toxic carbon monoxide in England [13-14]

Risk control carried out on all hazards is found in the process of identifying and considering risk ratings to determine risk control solutions. The first one is extreme (E); the activities may not be carried out or continued until the risk has been reduced. If it is not possible to reduce risk with limited resources, the work cannot be carried out. If the result of the risk assessment is high (T), activities must not be carried out until the risk has been reduced. It is important to consider the resources that will be allocated to reduce risk. If risks are present in carrying out work that is still ongoing, then action must be taken immediately. If the result of the assessment is medium (S) it is necessary to reduce risk, but the necessary preventive costs must be carefully calculated and limited, measurements for risk reduction must be applied within the specified time period. If the level of risk is low (R), the risk is acceptable, additional controls are not needed, monitoring is only needed to ensure that controls have been properly maintained and implemented.

- Elimination is in the form of revitalizing the pedestrian lane (closing/ hoarding holes on the road) to make visitors feel comfortable traveling in Malioboro and better waste management that is carried out by janitors.
- Engineering control is done by giving crossing aids (pelican crossing) and providing trash bins in several points on the pedestrian path.
- Administrative control is carried out by managing food waste properly and issuing the Regulation of Mayor No. 37 of 2010 concerning the arrangement of street vendors in the Malioboro area and the establishment of Jogoboro (Malioboro security officer)[15].

IV. CONCLUSION

The hazards found in the Malioboro region are physical hazards, chemical hazards, biological hazards and psychological hazards. The risks of these dangers are

slipping, hand/ foot injury, tripping, dehydration, fatigue, dizziness, fainting, eye irritation, skin irritation, coughing, shortness of breath, nausea, fractures, brain failure, psychological trauma, diarrhea, Hepatitis A, dysentery, poisoning, sunburn, noise, sexual abuse, skin itching, Dengue Hemorrhagic Fever (DHF), malaria, and death. From the results of the safety and health risk assessment in the Malioboro area, a total of 25 risks were found where there were five extreme risks, one high risk, fourteen medium risks and five low risks. Low-risk, moderate-risk, high-risk and very-high-risk activities can still be tolerated for control efforts, because most of these activities will be at risk in certain conditions and situations. Risk controls carried out by the manager of Malioboro are Elimination, Engineering control and Administrative control.

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