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ORIGINAL ARTICLE

Conceptual Risk Assessment for New Township Infrastructure Expansion at Kuantan

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ABSTRACT – This paper intends to contribute about the risk assessment on New Township located at Kuantan. Researchers found that, it has a lot of risk that will occur at that area. Researchers found that it have 5 possible risk like disease, flooding, traffic risk, soil erosion and the improper drainage system. Then, researchers will choose the top 3 major risk to do the risk assessment. So, researchers choose traffic risk, soil erosion and the improper drainage system as our major risk in this project. Lastly, researchers also have implement the solution to solve the risk.

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INTRODUCTION

This research discusses the risk managemant assessment of targeted area along the road of Sg.Isap. This research discusses the targeted area to assess for the risk management which was located at the road along Sg. Isap. This route is was a major traffic flow at Kuantan, Pahang, Malaysia. It is classified as a main urban road. The major function of this road is to facilitate drivers to go through the Kuantan city and have safe access to residential neighborhoods.The proposed area for this project is located five (5)km from Kuantan city centre and it is also located near to Pahang River and main road heading to Gambang, Pahang. It has also been discovered that the area is near to a river and consists the drainage as the earth surface structure with the height from above sea level is 1.2m to 2.2m. According to its location is nearer to a river, then the earth surface structure is drainage. And the height from above sea level is 1.2m to 2.2m. The proposed area for this study is marked from the junction of the fast-food restaurant to the constructed bridge and does not near the Giant market with a total length is 3.8 km. Our propose area is from junction fast food restaurant's until bridge before giant, so the total length is 3.8 km.

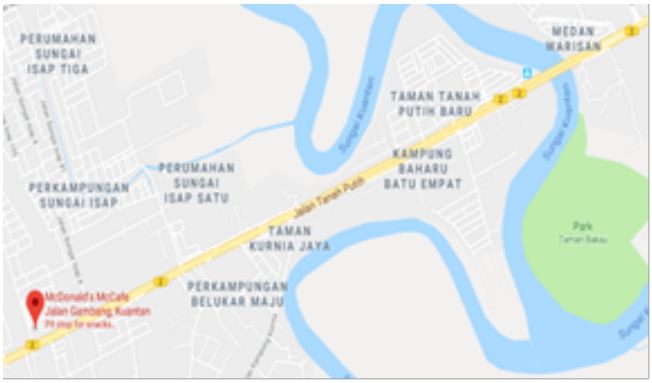

Figure 1. The project layout of Jalan Sg Isap and Tanah Putih.

Figure 1 shows the project layout of Jalan Sg Isap and Tanah Putih. It has been observed that while passing through this road, several risks can be identified, such as diseases, floods, drainage, traffic risk and soil erosion.As noted, the health risks involves with air pollution are extremely serious. Poor air quality increases respiratory ailments like asthma and bronchitis, heightens the risk of life-threatening conditions like cancer, and eventually contributes the burdensome to the health care system with substantial medical costs [1]. In addition, vehicles user are a major pollution contributor, producing significant amounts of nitrogen oxides, carbon monoxide, and other pollution.

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Besides, the commitee there are exposed to the flood risk. Residents in the east coast states of Kuantan, Pahang also had to leave their homes for relief centres as the annual north-east monsoon brought heavy rain and strong wind. The need to considered of effects of local climate change taken into account for the concept design of township. [2].

The increase in the total number of cars at Pahang state reported on 2015 is 19,635 and is expected to increase due to economic advancement [3]. Thus, the user, especially drivers, is exposed to the risk on the road of Sg. Isap. One of the significant problems found there is traffic risk. From the observation, it has been discovered that The current issue is a massive traffic jam taking place due to the heavily loaded lorry to Kuantan road especially on Fridays.

Risk Ranking Comparison

After identify the 5 risks which are disease, flood drainage, traffic risk and soil erosion, top 3 risks was chosen by adapting the risk ranking comparison method. researchers want to choose the top 3 risks by using risk ranking comparison method. From the Table 1, it is clearly stated that the top risks are:

Table 1. Risk Ranking Comparison

1	2	3	4	5	6
Risk & Opportunity	**Probability (P)**	**Impact (I)**	**Risk Score (P X I)**	**Risk ranking**	**Calculation of project risk score**
Disease	6	4	24	5	24
Flood	5	5	25	4	25
Drainage	5	9	45	3	45
Traffic Risk	8	9	72	1	72
Soil Erosion	7	8	56	2	56
TOTAL					=222 / 5 = 22.2 ~ 21

PROBABILITY										
	8	16	24	32	40	48	56	64	72	80
	7	14	21	28	35	42	49	56	63	70
	6	12	18	24	30	36	42	48	54	60
	5	10	15	20	25	30	35	40	45	50
	4	8	12	16	20	24	28	32	36	40
	3	6	9	12	15	18	21	24	27	30
	2	4	6	8	10	12	14	16	18	20
	1	2	3	4	5	6	7	8	9	10
	IMPACT									

Table 2. Level of risk

Risks to simply document (low risk)	1 – 20
Risk you might decide to move to quantitative risk analysis and / risk response planning (medium risk)	21 – 36
Risk you should definitely move to quantitative risk analysis and / risk response planning (high risk)	40 – 80

From the risk identification, traffic risk has higher score compare to the soil erosion and drainage. Consequently, traffic safety seems to be very actual and important issue that takes high importance,. Traffic risk is the risk that involved with pedestrian, environment and vehicles such as traffic congestion, noise pollution and increase rate of accident while soil erosion involved water pollution and poor drainage performance. The total of the project risk score are 21 and it

shows that the score are in medium risk categories. Overall, the risk are been classified in medium risk category because the risk still can be mitigate and can be control by proposed another alternative to reduce the risk from happened in future. From the proposed alternative, the risk might be reduced thus the traffic will working properly without any congestion occur and accident might be reduce. The need to propose a concept of city risk management guidance thus effectively focusing to numerous risk factors that occur in the new city in terms of flexibility and township sustainability[4]. The semi-quantitative risk assessment resulted in a "Moderate" risk, and an indication for concept the components of planning in which "the safety conditions necessity be verified for new township and propose a new mitigation measures consider.[5] [6]. Therefore, a risk management decision making application could be as results of selecting the partial alternatives or ranking the alternatives for a specific risk management outcome [7].

Probablility Impact Matrix

Table 3. Probability Impact Matrix

A	B	C	D
First Selection	Second Selection	Outcome	Probability
Traffic Risk	Traffic congestion, Increase accident	Traffic Risk, Traffic congestion Traffic Risk, Increase accident	7/40 7/40
Soil Erosion	Loss of soil, flooding	Soil Erosion, Loss of soil Soil Erosion, Flooding	1/8 1/8
Drainage	Water pollution, unpleasant smell	Drainage, Water Pollution Drainage, unpleasant smell	1/5 1/5
Total			**1**

The outcome of traffic risk are traffic congestion and increased accident. This is because during the peak hour, the targeted area are packed with vehicles as it was location will full with vehicles because the road are actually the main road that connect from Gambang to Kuantan. Other than that, the road consist of two lanes. The result from the factor will cause traffic congestion and also can cause an accident due to the high-speed driving reported about 16.1 % to contribute to the road accidents[8[..because many vehicle will like to drive in very high speed.

Soil erosion mean the soil collapse due to the problem of slope. So, when happen As the soil erosion occurs near the proposed location, it will cause loss of soil because the soil is passed to the surrounding lake the soil is flow to the lake when raining heavily. At the same time it also will cause flood because the depth of the drainage is becoming more shallow and fails to allocate the excess water, resulting to overflow and natural disaster-flood. so cannot keep many water then when water is flow out, it cause flooding.

A similar investigation that has been reported by [9] in Khartoum state due to the improper design of drainage As researchers know improper design of drainage can cause bad effect to the location. It may cause polluted due to the clogged debris and also the water could be stagnant thus, unpleasant smell can cause due to the factor of water stagnant because the drainage was choke clogged.

Summary

According to the decision tree in Figure 1, the proposed risk assessment for new township infrastructure development which are traffic risk, soil erosion and drainage system does not happen to be in a risky project. It is because the probability obtained from the calculation is 1 which is the right targeted value for the decision rules. If the total is more than value of 1, it is shows that the project might be risky in the future.

Traffic risk

This section.discusses the infrastructural township based on the previous risk assessment which located on the proposed area. The risk assessment evaluated is traffic risk is the significant risk. on a close landfill site at Kuantan researchers found that the major risk is traffic risk. Traffic risk is the risk that involved with pedestrian and vehicles. Due to the highway is located in commercial and tourism area as observed, hence the traffic risk is very high. First, traffic congestion will occur due to additional vehicles that use this road, making it the main road; thus, the original two lanes constructed are insufficient for the vehicles to pass by the road.First, it will cause the traffic congestion as show in -Figure 2 because too many vehicle will pass by this highway, so it will be a spot center hence the origin highway is not enough lane for the vehicle pass by. During congestion, it will cause the noise pollution also. The utilization of the car honk due to the impatient driver making the situation much worse and The driver will keep honk their car when they loss their patient for waiting hence it will disturb people daily activities. Next, it also will increase the rate of accident. Many vehicle

will drive very fast and they cannot stop immediately when needed so cause collision with other vehicle and collision with the passenger when they across the highway.

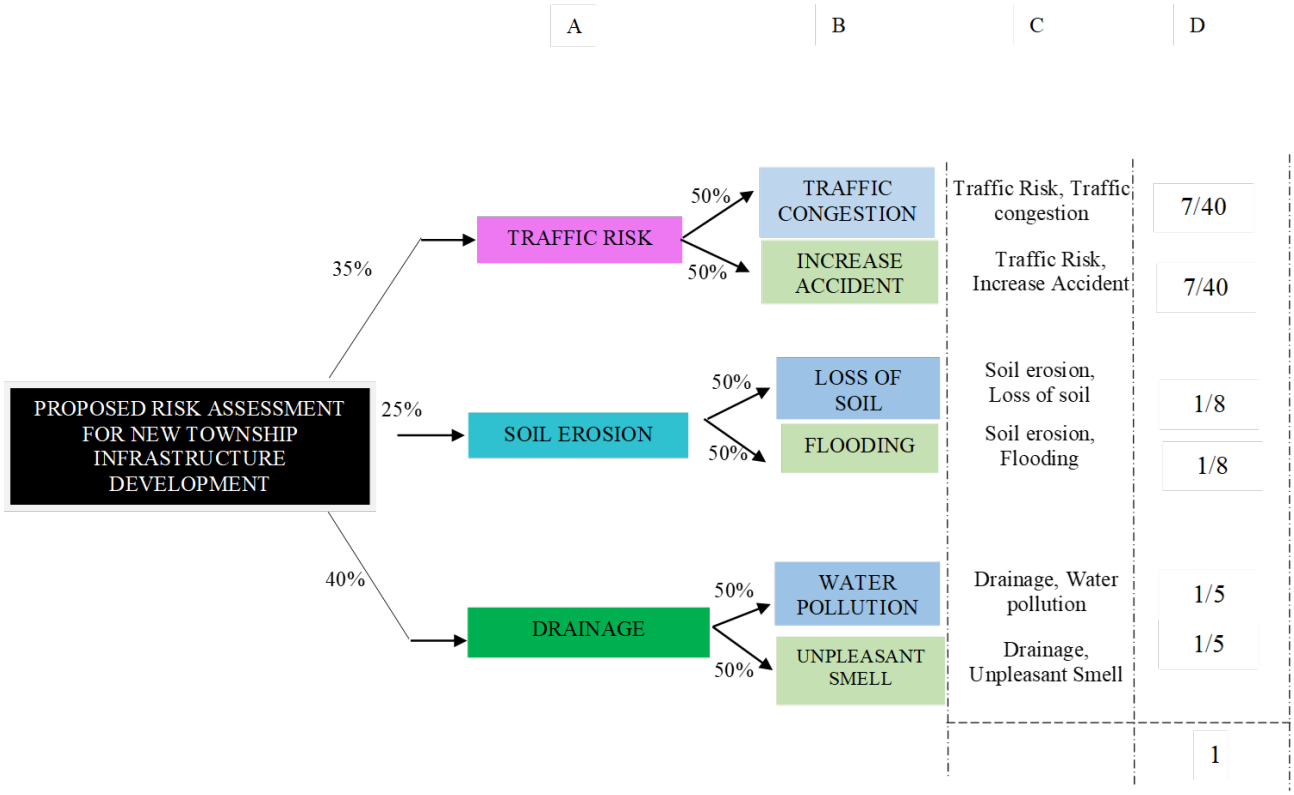

Figure 1. The tree diagram of the top major risk

Figure 2. Heavy trafic congestion at Jalan Tanah Putih Kuantan

To reduce the traffic congestion, the study suggest researchers plan to constructs additional lane from to lanes to three lanesfor a 3.8 km stretch from the fast food mcd until the bridge before giant. First, researchers will divide this 3.8km into 3 zones.

In order to proposea concept for constructing a new additional lane, conduct site exploration need to be carried out to determine the possible obstacles . the study founds many obstacles such as bus stop, street light, pond roadside stall, sign board, trees and the most critical is the existing bridge and flyover. Every zone will having nine street light because every 0.35km will have one street light, it also has six bus stops, in zone 2 it has two bus stop while zone 3 has three bus stop so researchers will remove street light and bus stop then replace them back for further 3.5meter due to additional lane is needed. Trees beside the road researchers will cut off then clean the site. Next roadside stall researchers will warning them to remove because they are without license to do at there. Then, for the pond, researchers will recover back it, then

drainage system researchers will recover also, but will redo a new drainage system at proper place, to avoid any flood risk.

For the critical obstacle-existing bridge, researchers will extend the length of the span because it will disturb the additional lane area. Hence, the column also need to remove to further distance 3.5 meter to support the pedestrian bridge. Therefore, the new propose pedestrian bridge shows at figure 2.

Figure 3. New propose pedestrian bridge

Lastly, another critical obstacle is existing flyover. Hence, the need to move the blue pipe, drainage system and construct river front. With having the riverfront, people surrounding can having their leisure time at there Then, the need also to propose a concept of new township at there like commercial area, to attract more people come to visit that place. The new township design is like figure below.

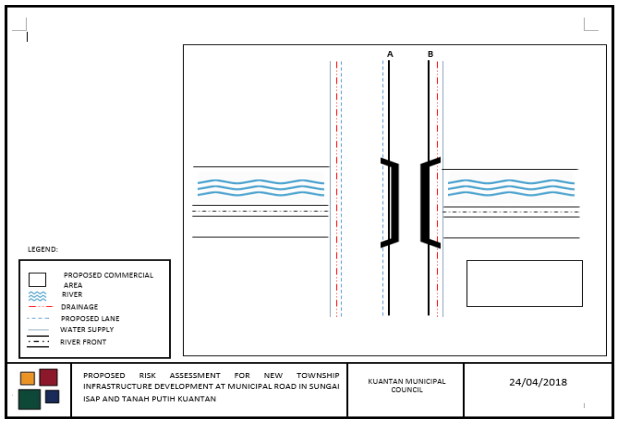

Figure 4. New township design

Soil Erosion

This section discusses the existing infrastructural township which locatedat the proposed area. . the study found that the major risk is soil erosion. Soil erosion happened when the topsoil, which is the upper-most layer of the ground, is moved from one spot to another. Topsoil is the top layer of soil and is the most fertile because it contains the most organic, nutrient-rich materials. The top soil is exposed and is often blown away by wind or washed away by rain. When soil erosion occurs, the movement of the detached topsoil is typically facilitated by either a natural process such as wind or water movement.

One of the main causes of soil erosion is water erosion, which is the loss of topsoil due to water. Raindrops fall directly on topsoil. The impact of the raindrops loosens the material bonding it together, allowing small fragments to detach. If the rainfall continues, water gathers on the ground, causing water flow on the land surface, known as surface water runoff. This runoff carries the detached soil materials away and deposits them elsewhere [10]. Besides that soil erosion happened because lack of vegetation. Plants and crops help maintain the structure of soils, reducing the amount of soil erosion. Areas with less naturally occurring flora may be a hint that the soil is prone to erosion.

Figure 5. The soil erosion that happened at Kuantan

As the soil erosion is identify as one of the risk assessment in the proposed area, the water pollution have been evaluated as one the effect from the risk [5] .. A major problem with runoff from soils is there is a greater likelihood that sediment and contamination of soil that will flow to drainage, river or others water sources. Next, one of the effects of soil erosion is soil compaction. When soil under the topsoil becomes compacted and stiff, it reduces the ability for water to infiltrate these deeper levels, keeping runoff at greater levels, which increases the risk of more serious erosion. Moreover, the effect of soil erosion is poor drainage: Sometimes too much compaction with sand can lead to an effective crust that seals in the surface layer, making it even harder for water to pass through to deeper layers. In some ways, this can help erosion because of the densely packed soil, but if it perpetuates greater levels of runoff from rainwater or flooding, it can negatively impact the crucial topsoil.

Figure 6. The soil from the river bank flow to the river due to soil erosion.

The solution for soil erosion is surface cover and runoff. Surface cover is a major factor to control erosion because it reduces the impact of raindrops falling on bare soils and wind removing soil particles. It also reduces the speed of water flowing over the land. Erosion risk is significantly reduced when there is more than 30% soil cover. Total cover is achievable for many grazing and cropping systems. Runoff concentrates as it flows down slope. By the time rivers draining large catchments reach the coast, they are usually just a few hundred meters wide. Even though surface cover encourages runoff to spread, runoff concentration is inevitable.

Figure 7. The example of soil erosion control by cover the surface of the soil.

Drainage

In order to achieve the sustainable and developed new township of infrastructure in certain places, this study have identified several problems around the targeted location.. This is due to analyzing and solving the problems to avoid any risks to the surrounding people and environment. Thus, one of the problems is regarding the drainage system. The drainage system that was built by the roadside is in a bad condition. Fromthe observation, there are lots of rubbish, trash

cans, plastics and other waste materials that are floating on the surface of the water in the drain and flowing with the water into the drainage system. This is very dangerous because it could damage the systems itself such as clogging of drain and it might cause flood as well. Furthermore, since the condition is very bad like having bad smell and unhygienic, the chances of the people around to have any diseases is very high. This is due to the growth of bacteria that exists in the drainage.

Figure 8. Condition of the drainage system.

Besides, the design of the drainage also not in a proper way. The design itself plays the important role to have a good and stable flow of water in the drain. From the pfigure 8the height of the drainage is not reaching the standard design that have been decide by the high department of the construction. As a consequence, the water from the drain will overflowing out from the space they supposed to flow. This might give inconvenient to the surrounding people and area. In worst cases, this could lead to flood which also had happened before in few years ago in Sungai Isap, Kuantan.

Figure 9. Improper design of the drainage system.

Figure 10. Previous flood in Sungai Isap, Kuantan

Therefore, some mitigations need to be taken into consideration in order to avoid any risks that could face by the surrounding area at the city. And the mitigation is by designing a new concept of drainage system such as grassed swale is designed to cater any excess water from perimeter drain (for individual building) whilst the flow from pervious and impermeable surface will be directed to the grassed swale. These vegetated systems also provide runoff quality treatment by removing low concentrations and quantities of TSS, heavy metals, hydrocarbons and nutrients from storm water. The vegetated systems remove pollutants by means of sedimentation, filtration, and soil absorption and plant uptake.

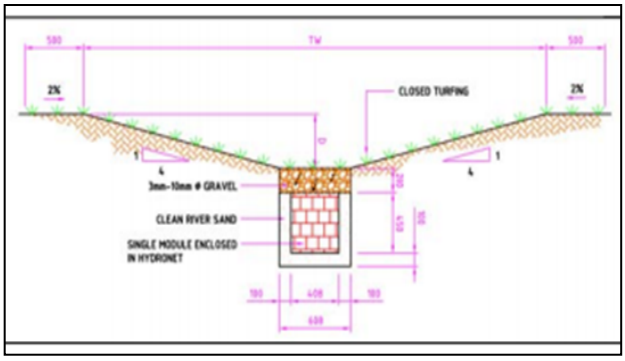

Figure 11. Grassed swale

Lastly, in order to avoid the overflow of the water from the drain, a concrete drain is one of the best way to prevent this problem. This is because the concrete drain can stand the pressure of the water in the drain if it is too overflowing. And to avoid the drain from clogged, a big and more channels of culverts are provided to have a constant flow of the water in the drain. And this culvert comes with a filtration system which can filter any waste disposal such as plastics, trash cans and etc from flowing together with the water.

Figure 12. Culvert

CONCLUSION

As summary, the concept propose that have been conducted shows the exposures of barrier in designing a city.. In this research, the application of concept of risk management as the process of identifying risks and planning actions to manage

the risks [4]. In this research, identified several risks which are traffic risk, soil erosion and drainage system. The best solution is then listed and selected for implementation. Many benefit that can be gain to the community if the solution is implemented. One of the benefits is that the development carried out will facilitate the community in using the road. Then, researchers also can reduce the risk of accident and traffic congestion at the area. Besides, commercial businesses will be growing rapidly, and new activities are on the rise. The improved roads allow access to previously isolated communities, school, health center's and markets because there will be development of new road along the area that have been targeted. Then, the team have developed erosion proposal after identifying that soil erosion have occur at the selected area.

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