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The Physical Factors Comparison on Running-Bicycle Route in Chiangmai

Tanaporn Pannara ¹, Karuna Raksawin ²

¹ Graduate Student, ² Associate Professor Dr.,
Faculty of Architecture, Chiang Mai University, Chiang Mai Thailand, 50200

Tanaporn.pann@gmail.com, karuna.r@cmu.ac.th
Tel. (+66)83-707-9004

Abstract

This research focus on the recreation route around Chiang Mai International Exhibition and Convention Centre – 700th anniversary Chiangmai Stadium - Huay Tung Tao Lake. The main question is how to develop this route to support people's activities. The results from 400 users show that the users use the trail for other purposes beyond the primary intention, exercising such as recreation, transportation, travel. It can reveal that the need for two different types of users will make the future development of the route concerns more about multi-dimension along with exercise.

Keywords: bicycle route; running route; 700th Chiangmai Anniversary Stadium; route environmental factor

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1.0 Introduction

At present, the development of walking, running, and bicycle route, which are one of the recreation activities that help people use outdoor space for more exercise (Gobster, 1995). In some area, the development of these routes is done together with the environmental event such as the vast open space. The path that is parallel with the natural way, waterfront areas, rivers, canals, and the integrating design which has the layout, physical factors of routes that suitable for a different type of activities such as recreation, exercise, relax, transport, travel or study. Together with the social, economic, and cultural context which also needed considering in making a city plan to connecting the area in many dimensions and creating a balance between activities and nature (Searns, 1995).

In this research, the recreation and exercise route at the International Exhibition and Convention Centre – 700th Anniversary Chiangmai Stadium – Huay Tung Tao, is chosen to be the study area. At first, this area was made to create more exercise area for running and cycling and to connect the route in the 700th Anniversary Chiangmai Stadium. After the course occurred, it became trendy, so there is a plan in extending the path to reach the International Exhibition and Convention Centre and Huay Tung Tao, and the main question of the research is how to develop this route to support various of users.

2.0 Literature Review

2.1 Physical Factors of the route

In designing the way, the physical factors are necessary to develop, design, or add the elements of the road to be appropriate with the people's need. The physical factor chosen in this research refers to Paul H. Gobster (1995) research which mentioned that the factors influencing the use of the route such as beauty, flora, water resource, even surface, sound management, safety, distance from the traffic, peace and close to the habitat. The factors which cause the adverse effect of the route such as lack of utilities like drinking water or restrooms, lack of sign, rough surface, too short or too narrow route or the traffic problem like the junction between roads. These are the problems needed to be solved and is one of the main factors about the users' experience in the route.

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The Physical factors in this research divided into five groups,

1) Route environment, which is the context of size, proportion, material, atmosphere. The route must be able to use for various types of activities such as recreation, travel, maintenance (Flink & Searns, 1993). Moreover, it must be suitable for the route user characteristics which consist of the following factors: 1.1) length of the distance 1.2) number of routes 1.3) continuity of the course 1.4) the surface which is consistency 1.5) footpath 1.6) width of the route 1.7) dividing channels 1.8) accessing routes 1.9) shade 1.10) conforming to the climate of Thailand.

2) Florae, the route element that creates a pleasant, relaxing, and edification environment in various type of activities so that the florae selection should suit the route correctly (Flink & Searns, 1993). In the consistency of 1) using local florae 2) using florae that create shade 3) using colorful florae 4) creating scenic spots and open space, assembly point or activity area 5) The location of the route is consistent with the natural area or by the habitat and other important buildings.

3) Utilities are the factors which benefit the users, encourage other activities to happen. The services within the route should respond to the users' need (Akpinar, 2016). For Examples, 1) drinking water stop, 2) food area, 3) multi-purpose space; 4) restrooms, shower rooms and changing rooms; 5) Lockers and containers; 6) maps or signs; 7) equipment for the disabled; 8) parking spaces, including bicycle parking, motorcycle parking, car parking and parking for the disabled; 9) bicycle repair area; 10) pavilion; 11) trash can; 12) bench and chair; 13) table and chair for picnic; 14) light and electricity; 15) water pipe for watering plants; and 16) water sink for pet.

4) Safety, divided into two main parts,

4.1) Traffic safety to prevent danger caused by traffic, transportation, and route usage. Traffic safety include 1) Traffic light for bicycle or pedestrian, 2) colors band at the co-intersection area, 3) bicycle and pedestrian signs on the route, 4) barrier, 5) crosswalk or cross bridge, and 6) traffic signs.

4.2) Safety in crimes to prevent the danger caused by robbery and various physical attacks with the following factors: 1) CCTV systems, 2) service points for security personnel and police officers, and 3) emergency phones.

5) The beauty of the environment, design, and maintenance are artistic factors that create interest and attract users to the route which can represent identity, history, and culture of the area (Flink & Searns, 1993) including 1) beauty and harmony of the environment, 2) highlights in the vital areas of the route, 3) regularly repair system, 4) beauty of the plants and 5) cleanliness of the route.

3.0 Methodology

Research Methods and surveys divided into designated research objectives and limitation knowledge, study areas and evaluation process as follows,

3.1 Research Objectives and limitation knowledge

The purpose of this research is the study about user's activities, the objectives of route usage, and the needed of environmental factors for finding ways to develop the recreation route for support all type of users.

Thus, the limitation knowledge of this research focus on the study of route objectives, physical environment factors of recreation and exercise route, and the determination of sample population is 400 experienced trail users in the study area which has described in the study area and evaluation process.

3.2 Study area

This research is selected the recreation route around Chiang Mai International Exhibition and Convention Centre – 700th anniversary Chiangmai Stadium - Huay Tung Tao Lake because this route has mostly usage in Chiang Mai city. The construction of the route due to the purpose of a particular exercise. The starting point is at the beginning of the 700th-anniversary stadium, which is a populated area for a walk, run, and cycle around the stadium. This activity caused the development of the area in front of the stadium to connect the road to become a loop for running. Later in 2558 BE., The Department of Highways has created a route to run - cycling at the International Convention Center linking to the 700th Anniversary Stadium to reach the Huay Tung Tao entrance through the government area, school and tourist attractions by using the area along with the canal. The primary purpose of this route is mainly for exercise, and it expanded development to the Lan Nern Num and Pack Squadron in 2560 BE.

Information gathered by the observation on site and questionnaire divided by time, which is weekdays and weekends. The information gathering process collected in two periods, 8.00 – 10.00 and 17.00 – 20.00 between January and February 2561 BE. The sample will spend 10-15 minutes on the questionnaire by selecting 400 of a non-specific population group of users of the route around the International Convention Center - Huay Tung Tao.

3.3 Evaluation Process

Information collecting from 400 trail users and divided into two main parts: objective information and information on physical environment requirements. The first part is a questionnaire about the objective of the route users that can select more than one answer. After the processing in part1, the next process is continuity to test in step two.

The second part is a questionnaire about the physical requirements of the route including the physical environment, florae, utilities, safety, beauty, and maintenance, about the needed of physical environment factors users that can also select more than one answer.

Afterward, the results of the second part are processed by the preliminary statistical method and compared the percentage of groups with a coefficient difference test [P1-P2]. If any issues from the analysis are less than five, the factors will be explained in the discussion.

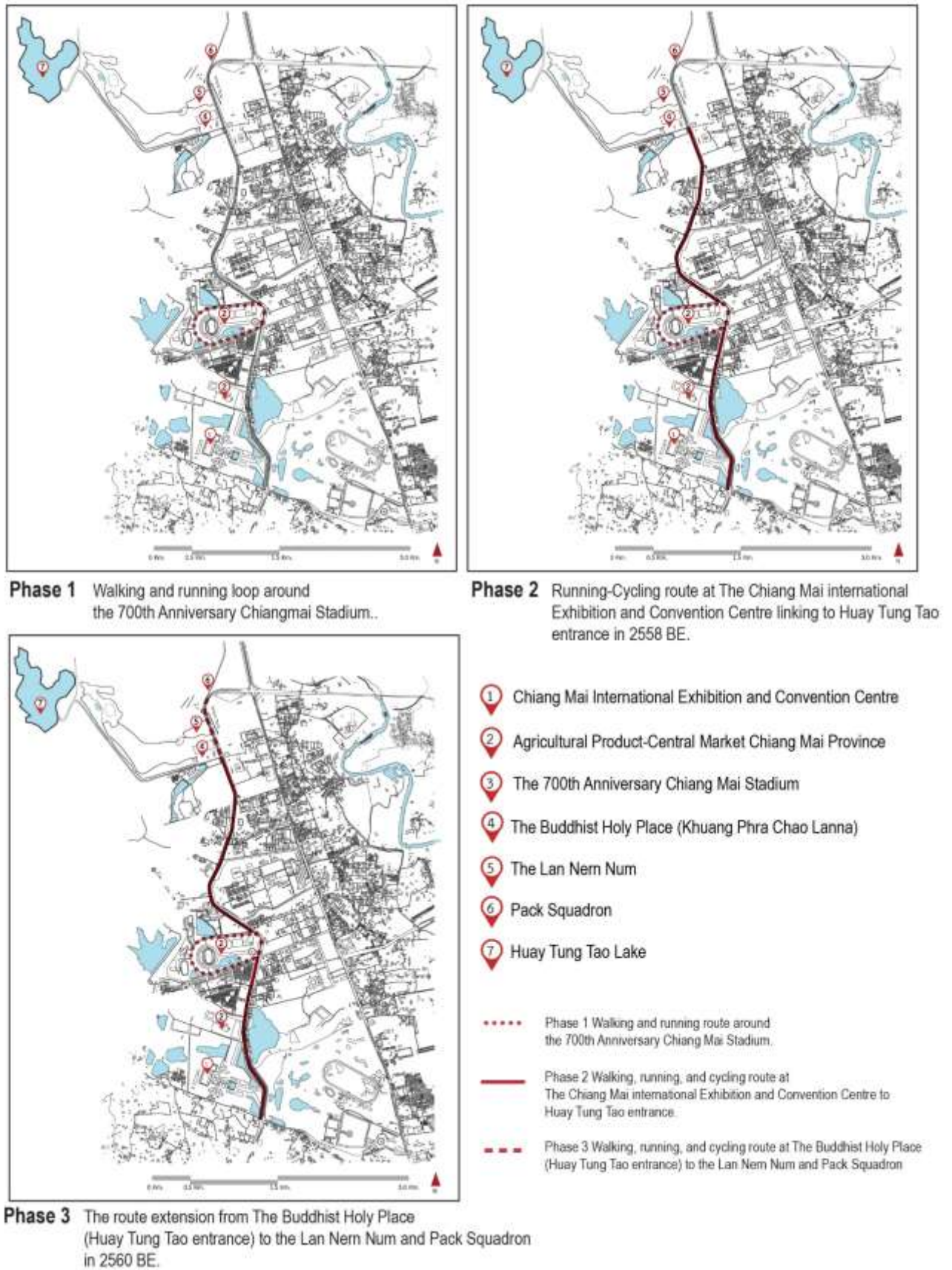


Fig. 1: Map of route development

4.0 Findings

The data analysis by statistics method as frequency and percentage as follows,

4.1 Result from the first questionnaire

According to table 1, the percentage of respondents who use the route for exercise only is 55.75 percent (Group 1), and the percentage of respondents who use the course for training and other activities is 44.25 percent. (Group 2)

Table 1. The Objective of the route

The objective of the route	Group 1 (N=223) 55.75%		Group 2 (N=177) 44.25 %	
	Frequency	Percentage	Frequency	Percentage
Exercise recreation and health	233	100	161	40.76
Transportation	0	0	56	14.18
Take a rest	0	0	112	28.35
Natural learning	0	0	33	8.35
Tourism	0	0	32	8.10
Others	0	0	1	0.25

By analyzing the ratio of the second group, it shows that there are various types of usage objectives such as exercise, recreations and health maintenance for 40.76 percent, travel, and transportation 14.18 percent, recreations 28.35 percent, environmental study 8.35 percent, travel 8.10 percent and other 0.25 percent.

4.2 Needed Physical Factors

Physical factors divided into five parts, including route, flora, facilities, safety and aesthetics, and maintenance. Each data section uses preliminary statistical calculations. Moreover, showing the difference of data from the two sample groups to compare the physical factors that both groups have different needs (Table 2 to Table 5).

Factor 1 Route

From a literature review Can specify 11 sub-factors; length of distance, number of routes, continuity of ways, smoothness of the surface, type of surface, a width of the footpath, width of the traffic channel, traffic dividing, route access, shadow of the route, consistency with Thailand's climate. The sample group can give other additional comments, and the results from two sample groups show in table 2.

Table 2. Route Factor

Factors	Group 1 (N=223) 55.75%		Group 2 (N=177) 44.25 %		[P1-P2]
	Frequency	Percentage (P1)	Frequency	Percentage (P2)	
Length of distance	66	29.60	73	41.24	11.65
Number of routes	66	29.60	73	41.24	11.65
Continuity of routes	72	32.29	80	45.20	12.91
Smoothness of the surface	114	21.12	97	54.80	33.68
Type of surface	41	18.39	47	26.55	8.17
Width of the footpath	83	37.22	82	46.33	9.11
Width of the traffic channel	69	30.94	57	32.20	1.26
Traffic dividing	67	30.04	72	40.68	10.63
Route access	40	17.94	59	33.33	15.40
Shadow of the route	87	39.01	99	55.93	16.92
Consistency with Thailand's climate	42	18.83	42	23.73	4.89
Others	5	2.24	6	3.39	1.15

Factor 2 Florae

The Florae factor contains 9 varieties: 1) Local Florae 2) plants that create shades 3) colorful plants 4) fragrant plants 5) animal food source plants 6) viewpoint, open space, assembly point, and activity area 7) route location corresponds with the residential district 8) position of the future route in accordance with the nature such as river or canal and 9) other suggestions by the respondents as shown in table 3.

Table 3. Florae Factor

Factors	Group 1 (N=223)		Group 2 (N=177)		[P1-P2]
	Frequency	Percentage (P1)	Frequency	Percentage (P2)	
Local Florae	84	37.69	84	47.46	9.79
Plants that create shades	158	70.85	139	78.53	7.68
Colorful plants	100	44.84	84	47.46	2.61
Fragrant plants	63	28.25	69	38.98	10.73
Animal food source plants	13	5.83	29	16.83	10.55
Viewpoint, open space, assembly point, and activity area	83	37.22	97	54.80	17.58
Route location corresponds with the residential area	43	19.28	59	33.33	14.05
Location of the future route by nature such as river or canal	43	19.28	62	35.05	15.75
Others	0	0	1	0.56	0.56

Factor 3 Utilities

The utility factor contains 21 varieties which are 1) Drinking water area 2) food area 3) multi-purpose space 4) restrooms, shower rooms and changing rooms 5) lockers and containers 6) maps and signs 7) utilities for the disabled 8) car parking 9) bicycle parking 10) motorcycle parking 11) car parking for the disabled 12) bicycle repair area 13) pavilion 14) trash cans 15) benches and chairs 16) picnic tables 17) lights and electricity 18) exercise equipment 19) plant watering faucet 20) water sink for pet and 21) other utilities suggested by the respondents as shown in table 4.

Table 4. Utility factor

Factors	Group 1 (N=223)		Group 2 (N=177)		[P1-P2]
	Frequency	Percentage (P1)	Frequency	Percentage (P2)	
Drinking water area	124	55.61	99	55.93	0.33
Food area	40	17.94	38	21.47	3.53
Multi-purpose area	20	8.97	30	16.95	7.89
Restrooms, shower rooms and changing rooms	100	44.84	107	60.45	15.61
Lockers and containers	67	30.04	59	33.33	3.29
Maps and signs	54	24.22	72	40.68	16.46
Utilities for the disabled	41	18.39	45	25.42	7.04
Car parking	71	31.84	59	33.33	1.49
Bicycle parking	49	21.97	52	29.38	7.41
Motorcycle parking	38	17.04	44	24.86	7.82
Car parking for the disabled	18	8.07	30	16.95	8.88
Bicycle repair area	24	10.76	31	17.51	6.75
Pavilion	57	25.56	68	38.42	12.86
Trash cans	106	47.53	106	59.89	12.35
Benches and chairs	86	38.57	72	40.68	2.11
Picnic tables	36	16.14	37	20.90	4.76
Lights and electricity	141	63.23	122	68.93	5.70
Exercise equipment	97	43.50	63	35.59	7.90
Plant watering faucet	10	4.48	14	7.91	3.43
Water sink for pet	14	6.28	20	11.30	5.02
Others	2	0.90	3	1.69	0.80

Factor 4 Route Safety

1) Traffic Safety

The traffic safety contains 7 varieties; 1) traffic lights for bicycle 2) color stripes at the junction 3) signs for pedestrians and bicycles on the route 4) barrier 5) crosswalk or crossing bridge 6) traffic signs such as speed limit, distance signs 7) others and 8) sample group which did not answer in this section. As shown in table 5,

Table 5. Route safety Factor

Factors	Group 1 (N=223)		Group 2 (N=177)		[P1-P2]
	Frequency	Percentage (P1)	Frequency	Percentage (P2)	
Traffic light for bicycle	131	58.78	118	66.67	7.92
Color stripes at the junction	92	41.26	95	53.67	12.42
Signs for pedestrians and bicycle on the route	91	40.81	100	56.60	15.69
Barrier	77	34.53	71	40.11	5.58
Crosswalk or crossing bridge	68	30.49	77	43.50	13.01
Traffic signs such as speed limit, distance signs	70	31.39	72	40.68	9.29
Others	3	1.35	3	1.69	0.35
Sample group which did not answer in this section	1	0.45	2	1.13	0.68

2) Crime Safety

The crime safety factor contains five varieties, 1) CCTV systems 2) service points for security personnel and police officers 3) emergency phones 4) others and 5) sample group which did not answer in this section. As shown in table 6,

Table 6. Crime Factor

Factors	Group 1 (N=223)		Group 2 (N=177)		[P1-P2]
	Frequency	Percentage (P1)	Frequency	Percentage (P2)	
CCTV systems	194	87.00	153	86.44	0.55
Service points for security personnel and police officers	125	56.05	129	72.88	16.83
Emergency phones	80	35.87	71	40.11	4.24
Others	2	0.90	1	0.56	0.33
Sample group which did not answer in this section	1	0.45	2	1.13	0.68

Factor 5 The beauty of the environment, design, and maintenance

The beauty of the environment, design, and maintenance contains 8 varieties which are 1) beauty and harmony of the environment 2) highlights in the important areas of the route 3) regularly repair system 4) beauty of the plants 5) the beautiful facilities design to suitable for areas such as integrating with local identity 6) cleanliness of the route 7) other suggestions and 8) sample group which did not answer in this section. As shown in table 7,

Table 7. The beauty of the environment, design, and maintenance factors

Factors	Group 1 (N=223)		Group 2 (N=177)		[P1-P2]
	Frequency	Percentage (P1)	Frequency	Percentage (P2)	
Beauty and harmony of the environment	130	58.30	112	68.23	4.98
Highlights in the important areas of the route	82	36.77	79	44.63	7.86
Regularly repair system	149	66.82	119	67.23	0.42
The beauty of the plants	109	48.88	92	51.98	3.10
the beautiful facilities design to suitable for areas such as integrating with local identity	60	26.91	79	44.63	17.73
Cleanliness of the route	96	43.05	109	61.58	18.53
Others	0	0.00	1	0.56	0.56
Sample group which did not answer in this section	2	0.90	1	0.56	0.33

5.0 Discussion

From the information gathered, it can be analyzed in different topics as follows,

5.1 Objective of the Route and differences of users

The main objective of the route is mainly for exercise. The survey found that the actual use of the way is by two groups of users. The first group is using the trail for training only, and the second group is for other activities such as relax, transport, study, and travel. The research results show the differences types of users and the variety of activities on the route.

Therefore, this activity may show the inappropriateness in design, which can lead to risks on the route. For example, the bikers may need to reduce their speed to avoid the pedestrian. The future development of this route should consider in making the route for specific use to be most efficient and support various type of users.

5.2 Physical Factors

By analyzing the two groups, the conclusions are as follows,

1) Route Factor: The expansion of route width: The route already has an appropriate width for the actual activity in the area, which depends on the extent of the area location and type of users in general. The width of the route according to AASHTO standards and the State of Iowa Department of National Resources such as the width of the cycling route, if there is a single lane, the width should be 5 feet (about 1.50 meters), and two lanes are about 10 feet (about 3.00 meters). The path for walking - running in the city should be at least 5 feet (about 1.50 meters) and in the rural route should be at least 4 feet (about 1.20 meters). The path for the disabled should be at least 5 feet (about 1.50 meters). The route at the 700th Anniversary Stadium at present is a two-lane with 1.60 meters wide which is currently under the standard. The expansion of the route width will make it more suitable for the activities.

Design Factor: under Thailand's climate, the route design should be by the local environment so that in Thailand. The route should be consistent with the tropical style such as adding more shade to makes the journey last longer and benefit the repairmen process in the future.

2) Florae Requirement: two groups of users have different requirements due to the changes that different type of florae will create distinct route surface, shade level, and identity of the route. The beauty of the road will enhance visual quality (Flink & Searns, 1993), which will make the course more interesting than the path that has the same florae along the way.

3) Utility Factor: two groups of users have a different need in utilities such as drinking water area, food area, lockers and containers, parking area, benched and chairs, exercise equipment, and water faucet. Some comments refer to the route users with pets. These factors show that there are also users with other objectives than exercising, such as recreation. These concerns make the more utilities added to the route will make the road more likely to be used in more activities.

4) Route Safety Factor: All of the users have scored more than five, which means there is no difference in need of safety facilities in the route. However, there are some comments from the second group of users about the sign, safety signs, and medical equipment or the electrocardiogram (AED) to prevent the danger t that will occur to the users.

5) Crime Safety Factor: There is a theory of the path mentioned the risk of crime on the trail could prevent by the physical elements such as a dense or dark area, especially during the night which may become a random source of danger. There are many ways to prevent crimes that may occur on the route so that there should be more security devices or security management within the area. The main factors for the safety of the direction in preventing crimes are the installation of a CCTV system and emergency telephone. There are also suggestions in adding more light, medical equipment, and monitoring officers due to the route which currently an isolated area that may be at risk of crime.

6) The Beauty, Design and Maintenance Factors: The Beauty Factors design and maintenance are essential to the route development process because it can represent the identity of the area and attract more users to the route. The needs of 2 group of users are to make the road more beautiful and coordinate with an environment, maintain the route surface to be smooth and regularly repair so that the rout can keep its beautiful state.

6.0 Conclusion & Recommendations

The results show different ideas of route development and answer the research question about the physical factors requirement of the route management, as stated above. The furniture can fix to make the route respond users' demand and cover various type of activities such as exercising, relaxing, traveling, transporting or studying and increase the route quality to be more efficient in the future.

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