

Knowledge Assessment of the Practice of Traffic Impact Assessment among the Authority in Johor, Malaysia

Lim Wei May, Raha Abd Rahman, Mohd Farid Hassan, Nordiana Mashros, Jezan Md Diah, Mohd Idrus Bin Mohd Masirin

¹ Faculty of Civil and Environmental Engineering, Universiti Tun Hussein Onn Malaysia, Batu Pahat, Malaysia

² Pejabat Tanah Kluang, Kluang, Malaysia

³ School of Civil Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, Skudai, Malaysia

⁴ Malaysia Institute of Transport, Universiti Teknologi MARA, Shah Alam, Malaysia

*Corresponding Author: limweimay@gmail.com

Abstract: Developments inevitably bring negative impacts to the road network such as traffic congestion, without proper planning tool, the impacts will become more pronounced and severe. Thus, Traffic Impact Assessment (TIA) has become an important document for the approving authority during the evaluation and approval of development proposal. In the decision making process, they have to acquire adequate knowledge to verify the feasibility and rationality of the application. This is one of the first study conducted to assess the staff's understanding in the practice of TIA. The design of the survey was self-administered questionnaire with the inputs from the staff from the local municipalities, town councils and public work departments. The knowledge, practice and attitude of the authority in TIA were analysed using SPSS analysis. The study reveals the staff in the central office were knowledgeable but lack of potential staff in local offices which could be due to the institutionalisation of TIA in central region. The improvements as agreed by the authority were more detailed guidelines with standardised checklist, monitoring programme, compulsory training courses and competency test.

Keywords: *traffic impact; assessment; authority; knowledge; practice; attitude*

1. Introduction

Traffic Impact Assessment (TIA) has become important as traffic growth are more pronounced with the unceasing development. Development inevitably generates impacts to its environment and traffic surrounding causing traffic congestion and accidents in major cities. The effective way to counter these problems is to address the traffic impacts in the easiest stage of planning. This is more effective in energy, cost and time than to overcome those impacts in the project later on. TIA is a common planning tool used worldwide to make sure the traffic system is in a control orderly manner. It serve as an important document to provide the approving authority with the necessary information during the evaluation and approval of a proposed development (Cooley et al., 2016; Kazaura Wilfred & Burra Marco, 2017; Salau, 2012).

In order for the approving authority to evaluate the TIA study report, they have to acquire adequate knowledge. Studies found that the lack of knowledge in the involving stakeholders is one of the major obstacle to successfully

implement TIA (Azra & Hoque, 2014). Besides, the institutionalization of the practice of TIA in major area results in limited experts and potential staff in the local offices which hinders the practice of TIA locally. Thus, this study aimed to assess the level of knowledge of the approving authority in the practice of TIA report submission.

2. Literature review

Studies found the common obstacles faced in the practice of TIA in developing countries are lack of knowledge, budget limitation, availability of standard process and legislation (Lim et al., 2019). Malaysia since 2011 has gazetted TIA Guidelines to standardise the practice of TIA uniformly in the country, the concerning issue is whether the concerned parties having enough knowledge regarding this matter to properly conduct the practice in Malaysia (Limapornwanitch et al., 2005; Yayat et al., 2016).

Corresponding Author: Lim Wei May, Faculty of Civil and Environmental Engineering, Universiti Tun Hussein Onn Malaysia, Batu Pahat, Malaysia, Email: limweimay@gmail.com

2.1 Traffic Impact Assessment (TIA)

Traffic impact assessment has been practiced in developed countries with standardised framework to carry the TIA study. As traffic continue to grow, developing countries also realised the significance for traffic impact analysis and have since adopted various models of the framework from developed countries along with the knowledge and the awareness for sustainable development (Yayat et al., 2015).

Developing countries started counter traffic impact as part of environment study or in environment impact assessment (EIA) as an integrated assessment to identify and mitigate the transport impacts of the development. The study generally identifies the potential effects on noise, air pollution, vibration, pedestrian amenity (Carroll & Turpin, 2002; Roads Branch Public Works Department Malaysia, 2011). However, in the framework of EIA, TIA study is lacking in detailed standards, only the impact that direct at ingress and egress of the developed areas. Also TIA has yet to have the same statutory status and contribution in EIA. TIA study needed wider scope of area and continuous mitigation over time to ensure the effectiveness of the mitigation measures taken in overcoming traffic impacts (Abbas et al., 2014). The traffic components are deficiently revealed in environment impact study. The weak discussion on traffic management makes TIA necessary to completely and satisfactorily address the traffic concerns. A complete and reliable TIA study is essential to be useful in predicting and addressing transportation and traffic problems for a sustainable management and planning (Campbell, 2018; Jose Regin & Rene Val, 2005).

The high level of traffic and the need for regional study required the preparation of TIA to assess the effects of

Table 1. Trigger levels to warrant TIA (Road Engineering Association of Malaysia, 2011)

No.	Criteria	Trigger Levels
1	Peak Hour Trip Generation (Commuter peak)	150 added vehicles per hour (2-Way)
2	Off-Peak Hour Trip Generation (Generator peak occurs at the off-peak period)	200 added vehicles per hour (2-Way)
3	Size of residential development	200 dwelling units
4	Size of Commercial development	45.500 sq.ft. (gross floor area)

Note: Trip Generation Rates shall be based on the Malaysian Trip Generation Manual published by the Highway Planning Unit of the Ministry of Works, Malaysia

2.2 TIA procedure in Malaysia

The purpose of TIA is to assess the traffic impact in a systematic and scientific study and to mitigate those impact according to the right measures (Faheem, 2012). The guidelines is a document served as the main reference to the best practice of TIA in Malaysia.

Based on the flow of planning permission applications as presented in Figure1, the flow of planning permission

the development and traffic diversion to cater the capacity of the development (Botha, 2005). The increase in traffic problems such as accident and congestion induce risk on the users road safety and the high level of vehicle ownership with massive of road use at a time results in the need for TIA for the authority to consider in development planning (Rahman et al., 2017; Shiran et al., 2019).

There are three factors to road accident which are the roadway, driver, and vehicle. The study (Bilema et al., 2017; Lum & Reagan, 1995; Rahman & Ben-Edigbe, 2015) concluded that the geometric categories strongly influences driver behaviours. Malaysian Institute of Road Safety Research (MIROS) outlined the element to reduce accident risk is through policy, organisation, planning, implementation, evaluation, actions for improvement (Md Rohani & Buhari, 2013; Rohani et al., 2015). Thus, planning policy has enforced the use of TIA study as land use planning control because uncontrolled land use will cause traffic congestion, safety issues consequently leading to accidents and fatality on the road.

TIA has been in practice in Malaysia since the 90's but there is no policy to make TIA a mandatory report. Draft TIA guideline was proposed in 2005. In 2011, Road Engineering Association of Malaysia (REAM) gazetted the Malaysia Traffic Impact Assessment (TIA) Guidelines, REAM GL 10/2011 (Road Engineering Association of Malaysia, 2011). Currently under the town and Country Planning ACT (The Commissioner of Law Revision Malaysia, 2006), TIA report is to be included in the Development Proposal Report if the development meets the trigger requirements as in Table 1.

application, the approving authority plays the major role in the evaluation of the TIA report before proceed with the application approval. It is vital that the approving authority has sufficient knowledge on the TIA guidelines to provide the necessary information to the developer to properly conduct TIA. Approving Authority is the main decision makers the development application, TIA report is an important document for them because the report highlights the issue regarding road network planning and the impact to

the surrounding. A comprehensive TIA report will contain all the relevant information to assist them to measure and

consider before approving a development for land use (Withanaarachchi et al., 2012).

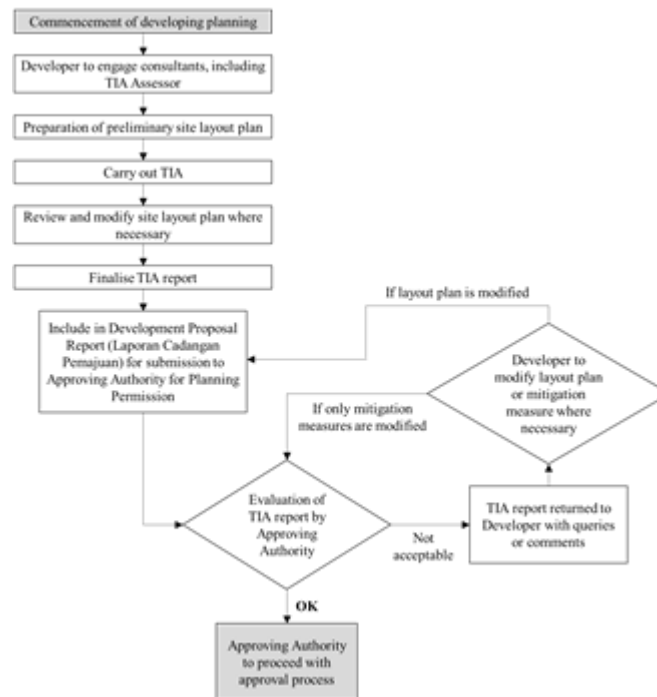


Figure 1. TIA in Planning Permission Application Process. (Road Engineering Association of Malaysia, 2011)

“Approving authority” is defined as the local authority and the road authority which has its power to act with accordance to the law (Road Engineering Association of Malaysia, 2011). Based on this definition, the co-ordination between the local and road authority is important in all levels of the government in order to uniformly apply the practice of TIA. Planning, organising, directing and controlling are the four important processes to increase the importance, integration and effectiveness of the practice (Van Rensburg & Van As, 2004).

The transportation planning applications are about the judgement and decision making of individuals and the organisation. The authority have to acquire the technical knowledge in understanding the input, representation, function and output of the traffic model. It is the ability of the person to identify the most important attributes, compare alternatives and choose the best value. This emphasise the need for training, transportation certificate program and formal college degree program in traffic management. The approving authority must possess the skill and knowledge to discuss with the involved parties such as the developers, the TIA assessors and the authority organisations for effective management. In preparation for their role as approving authority the knowledge in transportation system and experience are critical (Kutz, 2011). In a developing country like Malaysia, it is necessary to assess the staff handling TIA on their current level of understanding of the TIA and the technical knowledge of

the TIA study. This will assess the managerial level in handling TIA so as to ensure they are able to comprehend the importance of this TIA study.

3. Methodology

This survey was to evaluate the authority’s understanding in the practice of TIA. In order to conduct this study, Johor as one of the states in Malaysia was chosen as study area. Johor, which located in the south of the Malay Peninsula is a densely populated state in Malaysia with ceaseless developments and constant usage of transportation. This urban area was recorded the third highest in value of construction work. However, also had the record of one highest number of fatalities due to road accidents in Malaysia (Department of Statistics Malaysia, 2016; Ministry of Transport, 2015). The respondents for this study are randomly selected staff from local authority and road authority from local municipals, town councils and public work departments to prevent bias. The questionnaire were distributed to the relevant staff involving in TIA mainly the planning unit, traffic and transportation department that were in the planning and management unit and the maintenance unit. With a total of 120 questionnaire distributed, 100 respondents were collected in return from 4 local authority, 3 road authority and the state authority, whereby 59 of the respondents are directly involved in the TIA practice. Consent letters were given to the head officers

or engineers before distributed to the concerning respondents to complete the questionnaire. The questionnaire were left to the respondents and collected on the following day, they were self-administrated questionnaire and the participation was voluntary and anonymous.

In order to check the validity and reliability of the questionnaire, the questions were developed by transforming the theoretical contents from literature reviews, traffic and transportation handbooks, and TIA guidelines into questions with consultation with experts majoring in traffic engineering. Furthermore, the questionnaire was coupled with a covering letter containing the title and objectives of the study and was sent to the concerning authority involved in this practice. The questionnaire were tested for validity by using Cronbach's Alpha test. For clarity, the questionnaire is modified and has achieved the reliability coefficient of more than 0.70.

The modified questionnaire included three parts. The first part has been designed to obtain information about the demographic characteristics of the respondents and their attitudes towards TIA. The second part consisted of 20 questions covered the knowledge aspects about TIA. For the knowledge assessment, the correct, incorrect and incomplete answers were given 1, 2 and 3 respectively for "yes", "no" and "do not know". Hence, the level of knowledge of the respondents can be weighted with the number of correct answers in percentages. The indicator are then averaged and ranked. In the third part, the respondents were asked to indicate the level of agreement to the statement for improvements and the practices they used to conduct TIA. This section used five point rating scale from 1 to 5 (strongly disagree=1, disagree=2, neither=3, agree=4, strongly agree=5). The average rating below 3 is regarded as disagree, above 3 as agree and 3 as neither. Cronbach's alpha coefficient is used to determine the optimal internal consistency reliability of the questionnaire. The reliability

determined by Cronbach's alpha coefficient for part two is 0.852 and part three is 0.882, exceed 0.70 indicating the data is reliable. SPSS version 23 was used for the analysis. The mean responses and percentages of responses in each category was calculated and presented in tabular form. ANOVA was used to compare the selected parameters such as age, education levels, working experience in designated position and in the practice of TIA. Besides, chi-square was used to evaluate the cross-tab analysis between the methods of improvement with their achieved scores in part two of the questionnaire.

4. Results and discussions

This section discusses the respondents' demographic, knowledge assessment, knowledge towards the practice of TIA, attitudes of respondents in the practice of TIA, practice in TIA and the method to enhance the respondents' understanding in TIA.

4.1 Demographic of respondents

Table 2 demonstrates the demographic data of the respondents. Out of 59 respondents involved in this research, majority of them were 26 to 35 years old (52.5%), and the rate of those who were below 26 years old and 36 years old were 17.0% and 30.6% respectively. Education level of more than half of the respondents obtained diploma education (57.6%), follow by degree 30.5% of the total respondents, only a fraction of them having SPM (8.5%) and master (3.4%). 66.6% of the respondents had less than 10 years of working experience, 18.6% for 10 to 15 years and 5.1% with more than 20 years of experiences in their current designation. Evaluation according to their working experience in the practice of TIA, it has been found that 57.6% had less than 5 years of experiences.

Table 2. The demographic data

Demographic	Characteristic	Number	Percent
Age	<20	3	5.1
	20-25	7	11.9
	26-35	31	52.5
	36-40	9	15.3
	>40	9	15.3
Education level	SPM	5	8.5
	DIPLOMA	34	57.6
	DEGREE	18	30.5
	MASTER	2	3.4
Working experience	<5	21	35.6
	5-10	18	30.5
	10-15	11	18.6
	15-20	6	10.2
	>20	3	5.1

Working experience in TIA	<5	34	57.6
	5-10	12	20.3
	10-15	6	10.2
	15-20	6	10.2
	Missing	1	1.7

4.2 Knowledge assessment

The findings were analysed with the respect of age, educational level and working experience both in their current designation and in the practice of TIA. Table 3

shows the different average mean point of respondents on the aspect of their knowledge with accordance to their demographic background.

Table 3. Relationship between age, education level and working experience with the achievable scores

No.	Demographic	Characteristic	Knowledge Assessment (%)	Significant
a	Age	<20	50.00 ± 8.66	P=0.464
		20-25	67.1 ± 19.33	
		26-35	59.19 ± 16.39	
		36-40	63.89 ± 19.65	
		>40	66.11 ± 14.53	
b	Education level	SPM	54.00 ± 8.2	P=0.419
		DIPLOMA	61.92 ± 19.73	
		DEGREE	60.83 ± 0.036	
		MASTER	77.55 ± 24.75	
c	Working experience	<5	64.05 ± 3.14	P=0.469
		5-10	56.11 ± 3.87	
		10-15	61.36 ± 22.37	
		15-20	69.17 ± 16.56	
		>20	60.00 ± 8.67	
d	Working experience in TIA	<5	61.92 ± 15.67	P=0.104
		5-10	52.92 ± 9.40	
		10-15	71.67 ± 23.39	
		15-20	67.5 ± 22.75	

Mean ± standard deviation

Mean = 61.44 ± 16.74

4.2.1 Age

When the result was examined by taking into consideration the five age groups, it can be observed that the average scores were fluctuating in trend Table 3.a, whereby the age group 20 to 25 score the highest of 67.1 ± 19.33 with the probability of 0.464, P>0.05. The findings also shows that those age more than 36 years old and 40 years old scored slightly lesser of 63.89 ± 19.65 and 66.11 ± 14.53 respectively. Thus, there was no significant difference in the average points of knowledge with respect to age variable (P>0.05).

4.2.2 Education level

The education level of the respondents have been evaluated in four different categories in Table 3.b. The difference between the average scores received from all four education levels was statistically insignificant (P>0.05). On the other

hand, the scores increased with the orderly arrangement of the different education level and the highest average scores recorded were by the respondents who obtained master (77.55±24.75). This can be observed that the high average scores received were by those with higher degree of education level. However, there was no significant difference in the average points of knowledge with respect to education level variable P=0.419 > 0.05. Thus, education level did not influence the scores the respondents achieved in the knowledge assessment.

4.2.3 Working experience

The findings with respect to the working experience as in Table 3.c statistically, there was no significant difference between the knowledge aspect and the duration of working experiences (P>0.05). Table 3.d represented the average mean score on knowledge with respect to the working experience in the practice of TIA. It was observed that the

authority with working experience more than 10 years of experiences scores higher than those below 10 years in general but there was still no significant difference between the working experience and level of knowledge. Thus, the scores they achieved could not directly reflect the working experience that they had.

In short, the average scores of all the respondents were 61.44 ± 16.74 and the results they achieved in the knowledge assessment were not greatly influenced by their

demographic background. Whether in age, education level and working experience, they understanding in the practice of TIA could be due to other reasons. Previous study had discussed about the institutionalisation of the practice in major city which causes the local area to neglect the TIA study and the concentration of knowledgeable staff in major cities. In order to determine the potential effects, the findings are further analysed in terms of each authority, their practices and attitudes towards TIA.

Table 4. Relationship between age, education level and working experience with the achievable scores

Department	Mean
LA_1	65
RA_1	65.8 ± 10.21
LA_2	60.0 ± 7.07
RA_2	46 ± 2.11
LA_3	53.33 ± 6.61
LA_4	51.0 ± 7.38
RA_S	95

LA: local authority

RA: road authority

RA: road authority from the state

Table 4 tabulated the mean scores achieved by the 4 local authority, 3 road authority and a state authority. All authority obtained lower scores than they were expected to (total scores of 100 percent) except the scores by the state authority of 95%. The results shows the relative higher scores in the state road authority. This also reflects the inadequacy of the staff in the local authority and road authority situated in the district and town level in grasping the subject matters.

4.3 Knowledge on the practice of TIA

Overall, the knowledge level of the authority was fairly well, with a mean value of 61.44 shown in Table 5. Based on

Table 6, respondents had good recognitions on what TIA was where the respondents had reasonably good knowledge on the trigger values to warrant TIA study, definition of TIA and criteria of the TIA study correctly. Being part of the management, they were weak towards the role of the parties involved in the practice of TIA. Despite having acceptable knowledge in TIA study in general, the role of the parties involved in TIA was still no fully comprehended. Besides that, the trigger value to warrant TIA study is one of the critical information, if not fully grasped, is insufficient for the staff to successfully establish TIA study and ensuring development that meets the threshold value do carry out the TIA study.

Table 5. Analysis by questions

No	Questions	Number of correct answers	% of correct answers
1	Trigger/threshold	55	93.22
2	Definition	13	22.03*
3	Criteria of study	36	61.02
4	Criteria of study	33	55.90
5	Role of AA	21	35.60*
6	Definition	10	16.95*
7	Definition	56	94.92
8	Criteria of study	50	84.75
9	Definition	33	55.93
10	Trigger/threshold	45	76.27
11	Trigger/threshold	20	33.90*
12	Role of AA	52	88.14
13	Trigger/threshold	18	30.51*

14	Criteria of study	52	88.14
15	Definition	55	93.22
16	Criteria of study	26	44.07*
17	Role of TIA Assessor	18	30.51*
18	Role of TIA Assessor	52	88.14
19	Role of AA	22	37.29*
20	Role of developer	22	33.29*

Mean ± standard deviation

Cronbach's alpha (20Qs) = 0.852

Mean = 61.44 ± 16.74

(a) * % of correct answers less than 50%

Table 6. The analysis of each question based on category

Category	Number of (a)/ total questions	Rank
Trigger/threshold	2/4	good
Definition	2/5	satisfactory
Criteria of study	1/5	satisfactory
Role of AA	2/3	weak
Role/ Criteria of TIA Assessor	1/2	good
Role of developer	1/1	weak

(a) * % of correct answers less than 50% from Table 5.

4.4 Attitudes of respondents towards the practice of TIA

Based on Table 7, the respondents agreed that the current legal jurisdiction provided the authority to compel the submission of TIA reports when being challenged the relevant statutes. When the development meets the threshold values to warrant TIA study, they have the legal right to request from the developer the TIA report to be included in the development proposal application. Besides, they also strongly agreed to have compulsory training courses or programmes on traffic impact assessment be held constantly to train personnel involved in this department. Institution of Engineers Malaysia, IEM had previously conducted such programme but it is not compulsory (Chin Kar et al., 2015). Compulsory training programme

organised by any road provider such as Public Work Department conducted by the Road Engineering Association of Malaysia or Institution of Engineers will ensure the staff acquire the needed skill and knowledge to handle TIA. In line with the agreement, competency test can be held for those who is the Authority that approve the TIA report submission. This way only competent person is appointed for the evaluation and approval of the TIA in the development application. Furthermore, during the evaluation process, a board should be created with the present of all the important members especially with the present of TIA consultant or assessor. This statement is strongly agreed by the respondents with a mean point of 4.85 that evaluation could be done in a meeting.

Table 7. Analysis by questions

No	Item	mean score (1-5)	overall
1	Authority	4.34	agree
2	Training courses	4.81	Strongly agree
3	Competency test for authority	4.78	Strongly agree
4	Evaluation done in meeting	4.85	Strongly agree
5	More detailed guidelines	4.80	Strongly agree
6	Standardised checklist	4.88	Strongly agree
7	Monitoring programme	4.80	Strongly agree

Cronbach's alpha (7Q) = 0.882

In terms of the practice of TIA, the respondents strongly agree to have more detailed guidelines of TIA with standardised checklist and continuous monitoring

programme to be included in the TIA study. The current guidelines should provide more detailed information on the method to evaluate the TIA report submission. Adding

checklist to the current TIA guidelines will help to standardise the evaluation process. In addition, monitoring programme will assist in the continuous monitoring of the traffic impact after the TIA report submission was approved. Clarification of the legal aspects in the guidelines will provide a clear framework in the implementation of TIA (Larastiti & Yulianto, 2015). Previous study had mentioned the key areas for improvement including monitoring and review of TIAs. Monitoring practices of road development and the strict enforcement of legislation is required to achieve the minimum satisfactory standards and have positive impacts on the long-term outcomes of road developments in Malaysia. Besides, this improvement also will ensure the traffic impact mitigation measures are adopted in the project implementation (Campbell, 2018; Cooley et al., 2016; Kazaura Wilfred & Burra Marco, 2017).

4.5 Practice in TIA

Figure 2, Figure 3 and Figure 4 presented the results obtained from the three questions regarding the current practice of TIA by the local authority. Bases on Fig 2, 57.6% of the respondents referred to their superiors for the approval of the TIA report. As part of the local authority or the road authority, they have the sovereignty in the traffic management and planning including the responsibility to fulfil the process of TIA. Playing their part in the approval will ensure the establishment of TIA as the management in handling the conduct of this practice. If the definition of “Approving Authority” in the guidelines of TIA is not well understood, there will be obstacle as to who the report will be approved by. Thus, there is the occurrence to seek for top management or other more knowledgeable person. This can be seen that only 8.5% of the respondents involved in the approval of the TIA study themselves. Whereas, 44.1% of the respondents practiced giving approvals in meeting. This way the report can be critically review with the present of the developers and TIA assessors to produce more

meaningful discussions and outcomes to overcome the traffic impacts. This is agreeable with the above findings where the TIA report submission evaluation and approval should be given during meeting with the participating stakeholders as agreed in Table 7.

In the *Garis Panduan Untuk Memproses Permohonan Pembangunan Tepi Jalan Persekutuan, ATJ 3/2011* suggested the duration for the whole process for the approval of TIA report would take about two weeks or 14 days. In this study, Figure 3, found that 67.8% of the report approvals took more than two weeks, only 13.6% took less than two weeks. Some (15.3%) even took more than a month for the whole process. This lead the study to determine the cause of the delay, Fig 4. majority 71.2% of them agreed the consultant or the developer contributed to the delay, for example the incompleteness of the TIA report on time, difficulties to meet the requirements as in the guidelines and unable to fulfil the modifications or requests of the authority. Only minority (10.2%) of them agreed the problem was due to postpone of regular meeting. Other cause was the lack of in-house capacity to evaluate the reports, 25.4% of them agreed to this statement.

Previous studies also discussed on this matter, in the promotion of sustainable urban development, the capacity of the authority to deal with the traffic management is a vital element. Besides, the authority as part of the government should promote TIA to developers because few really understand the essential of TIA being established. Government is the main party who take the responsibility of city planning, they have to hold TIA as the tool to control land development. The lack of potential staff in the authority with sufficient knowledge will hinders the success in the implementation of TIA which will result in the delay of the process and it reflects the ineffectiveness of the government in providing tool to prevent this from occurring (Azra & Hoque, 2014; Currans & Clifton, 2018; Muhammad et al., 2017).

Figure 2. The approval of TIA report by the authority

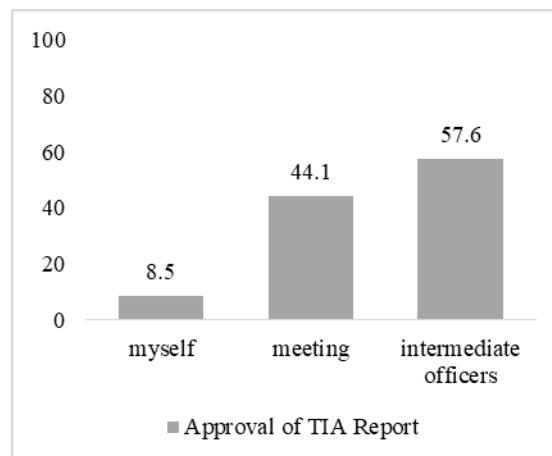


Figure 3. The duration for the approval of TIA report

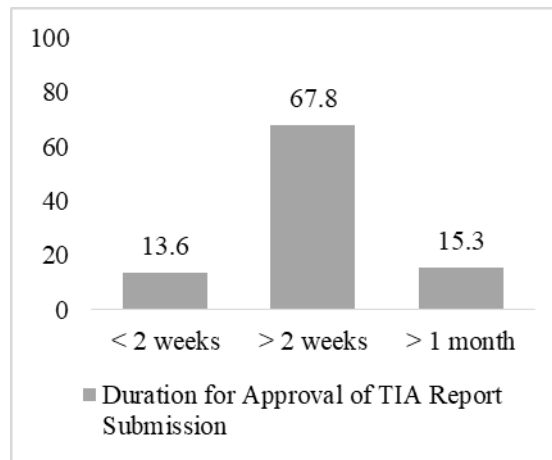
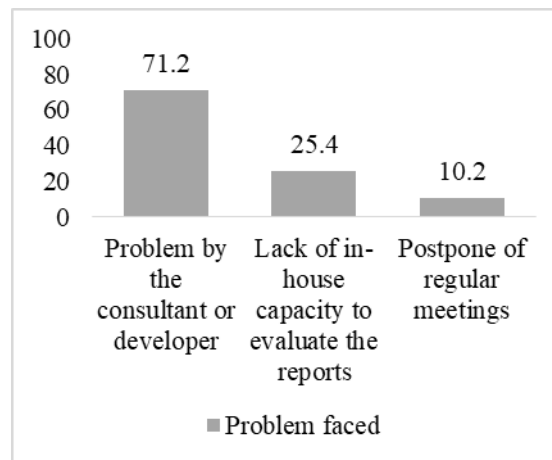


Figure 4. The problem faced during the practice of TIA



4.6 The method to enhance their understanding in TIA

A cross table analysis was done between the individual score of the respondents with the method used by them to enhance their understanding in TIA, the results is tabulated in Table 8. The analysis showed that 34% of the respondents agreed training will help to improve their understanding in TIA with a chi-square result of $P=0.835 > 0.05$. Even most of them agreed to training as an enhancement method, their achieved scores showed there was no significant difference ($P > 0.05$) in training and achieved scores. This data indicated that training is necessary to improve their level of knowledge but training could not be the only method for them to achieved good knowledge in TIA. Similarly, learning from professionals in TIA study, 24% of them agreed to this method but the chi-square of 0.501 expressed no significant difference between the two variables. This mean there is a better way to improve their understanding in TIA. Self-study or self-advancement also one of the method used by the

respondent, 13% of them agree to this idea of self-improvement, the chi-square result approximately 0.057 suggested that there were slight relationship as to this method. Additionally, the most relatable method is through experience, 23% of them agreed to this method and the chi-square result of $0.016 < P=0.05$ indicated that those with higher scores were because they had better experience in the practice of TIA. However, a mixed method of training, learning from professionals, self-study and though experience should be the way to enhance their knowledge, this can be seen in the ANOVA result on the working experience and scores where there was no significant difference between the variables. This data demonstrates that those with the higher scores believed that experience had help them in better understanding TIA and the other methods had helped them to achieved better results, one cannot depend solely on one method to enhance one's knowledge.

Table 8. Relationship between method of improvement and knowledge

Item	Agreed (percent)	Chi-square
Training	34	0.835
Professionals	24	0.501
Own	13	0.057

5. Conclusion

This self-assessment questionnaire survey was conducted to get an in-depth appraisal of the current state of the staff in the road and local authority in their capacities in understanding TIA study. With these empirical study, appropriate recommendations can be drawn. The average score of the respondents was 61.44 percent with a standard deviation of 16.74 percent which considered to be at a fairly good level of knowledge. Overall, the staff had good recognition in the definition of TIA, its study criteria, and the threshold value of the development but this information are the prerequisite that must be fully grasped by them to establish TIA study effectively. Meanwhile, being in the management and handling of TIA, weak understanding in the role of the parties involved will be a drawback to the implementation because as the first-line workforce is their primary contributions that will achieve the goals and success of TIA. The concentration of knowledgeable staff in major city and the low level of know-how in the local regions can be seen in the disparity of the staff from the local authority and road authority in the knowledge of TIA. This is a reflection of the institutionalisation of TIA in central regions due to the lack of potential staff in local offices. The co-operation between the authority, developers and TIA assessor, nevertheless the sufficient knowledgeable manpower are needed efforts to successfully implement TIA. Thus, the improvements as agreed by the respondents were more detailed guidelines with standardised checklist and monitoring programme, compulsory training courses to enhance their knowledge in the practice and competency test for the personnel who evaluate and approve the TIA report. It is important that TIA is implemented efficiently by the authority especially at the early stage of project development in minimising the traffic impacts so as to prevent drastic impacts in future developments and land use.

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