International Journal of Science and Engineering (IJSE)
Home page: http://ejournal.undip.ac.id/index.php/ijse

CONGESTION AS A RESULT OF SCHOOL AND SHOPPING CENTER ACTIVITY

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Abstract - *Development of land use in public facilities such as shopping center and school gives an impact on transportation problem in Manado City, North Sulawesi. To determine factors which have causal relationship with congestion as a result of school and shopping center activity then it need to be assessed and studied. Descriptive study with observational survey was used in this study. The study ran Structural Equation Modelling (SEM) by using AMOS program. Estimated method was used to calculate sample size then found 300 repondents, comprised : visitors and mall managers, school visitors, parents, school managers, Public Works department, and urban planning department .The study yielded a statistically significant correlation between school and shopping center activity with congestion s. The result indicated that school activity was positively related to congestion with p value at p=0,000 (p ≤ 0,05). Shopping center activity was positively related to congestion with p value at p=0,000 (p ≤ 0,05). The closer proximity from school to shooping center will causes severe traffic congestion. The relationship between school facility with proximity was found in p value at p=0,000 (p ≤ 0,05) . The relationship between shopping center facility with proximity was found in p value at p= 0,020 (p ≤ 0,05). While, the relationship between proximity with congestion was p= 0,008 (p ≤ 0,05). Monastery school and Mega Mall activity were affecting congestion because a closer proximity of two facilities. This indicates that the occurence of traffic congestion in Monastery School may be dependent on existence of Piere Tendean road link*

Keyword--*Congestion, Proximity Between Facilities, School Activity, Shopping Center Activity*
Submission: August 30, 2015 Corrected : September 29, 2015 Accepted: October 11, 2015

Doi: 10.12777/ijse.9.2.106-112
*[**How to cite this article**:* Kumaat, M., Mulyono, A.T., Sjafruddin, A., Setiadji, B.H. *(2015).* CONGESTION AS A RESULT OF SCHOOL AND SHOPPING CENTER ACTIVITY, *International Journal of Science and Engineering, 9(2),106-112.* **Doi**: 10.12777/ijse.9.2.106-112*]*

I. INTRODUCTION

This study is developed based on traffic congestion phenomenon that occurs in most cities in Indonesia. The occurence of traffic congestion in Manado city was a congestions that perceived by pedestrians. Congestion as a result of traveling evocation from certain type of land use was a dynamic phenomenon and the utility of space and time. In general, different type of land use will cause a different traveling evocation and attractiveness depends on type of public facilities (Hess *et al.,* 2002). The problem of public facilites activity in Manado city give arise in transportation problem, such as: 1) Several public facilities such as school and mall often cause congestion; 2) The duration and frequency of dysfunction often unobserved toward inadequacy of road network, thus the traffic congestion occurs; 3) Disorganized in arrangement of public facilities, vehicle parking alongside road, individual mobility, and vehicle accesiblity to go in and out from public facility.

Juditha (2008) describes the contribution of school in causing traffic congestion is varies, this is caused by every grade of school had different traveling evocation. This is due to differences in characteristic of children age and parents behavior to picking up and dropping off their child at school. Child safety, punctuality, weather condition and distance from home are an important factors in using private car. (Hillman, 1994; Bradshaw, 2000; Valentine, 1996; Ridgewell, *et al,* 2009).

Characteristic and life style in several citizen of Manado City have strongly influence their traveling pattern. Consumtive behavior and tendency to be extravagant cause shopping center as preferences location to shopping or recreation. ITC, Mega mall and monastery school are located close to each other for about 500 m. These closer

proximity will cause evocation and attractiveness of individual movement during school rush hour such as school start time and finish time.

According to introduction, hence this study is conducted to find a relation between factors affecting school and mall activity, proximity of two facilities, and congestion. Related measurement with factors are done by interview survey involving citizen opinion as pedestrians. By this study are also expected to construct a model linkage between public facilities activity, proximity of two facilities and congestion.

II. STUDY LOCATION

Manado city as capital city of North Sulawesi Island, Indonesia, which located in coordinate 1º. 30'-1[B1]º . 40' North Latitude, 124º 40'-126[B2]º50' East Longitudinal. Map figure of Manado city as seen in Figure 1. This study was conducted in two public facilities such as academic center and shopping center in Manado city which often occurs traffic congestion. There were 5 academic facilities observed in this study which located in Wenang district as Manado City center, such as 1) Don Bosco Junior High-Senior High school, 2) Manado State Junior High School 1,3) Eben Haezer Kindergarten-Elementary School, 4) Don Bosco Kindergarten-Elementary School and 5) Manado Monastery School. The schools location are closer to each facilities and give an impact in traffic congestion especially in WR Supratman road link and Diponegoro road link as seen in Figure 2.

The surveyed school were school which located alongside main road and causing a traffic congestion on road link. Preferences in 5 schools were based on consideration that those schools have been operating for 50 years with total students were more than 500 students and school characteristic can be seen in Table 1. Proximity between schools location were in service radius as demanded in Peraturan Menteri Negara Perumahan Rakyat No 11 Tahun 2008 states that type of school such as kindergarten has 500 meter in radius, Elementary and junior high school has 1000 meter in radius, and senior high school has 3000 meter in radius. Location of 3 schools which has closer proximity were Eben Haezar, Don Bosco Junior/ Senior high school, and Manado State Junior High School 1 within radius 1000 meter. The closer proximity among schools were causing a traffic congestion and also showing uneven of school placement in Manado City.

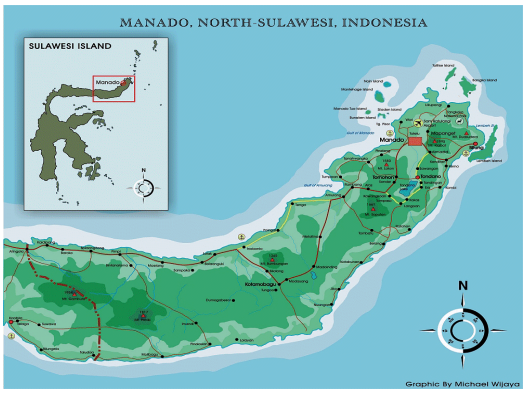

Figure 1. Manado City Map

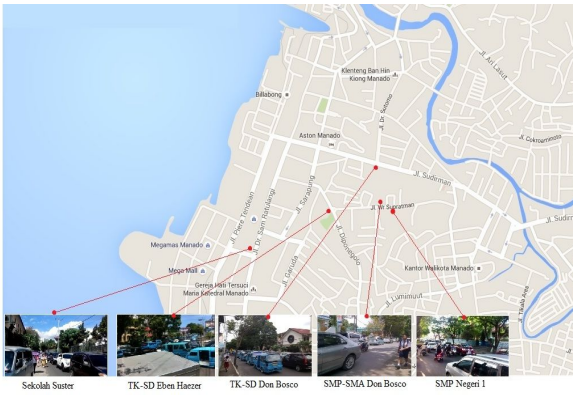

Figure 2. Closer Proximity of School Location

Table 1. School Characteristic, Operational year and Student Quantity in 2014

Name of School	Unit	Operational Year	Student Quantity	Student Total
Don Bosco	TK	1923	96	801
	SD	1924	705	
	SMP	1952	616	1163
	SMA	1952	547	
Monastery	TK	1912	84	
	SD 01	1912	198	
	SD 02	1921	219	2171
	SMP	1921	205	
	SMA	1957	633	
SMP Negeri 1	SMP	1954	832	1626
Eben haezar	TK	1969	1626	
	SD 1	1961	514	1140
	SD 2	1961	463	

Data source: School foundation of Don Bosco, Eben Haezar, Monastery and Manado State Junior High School 1

There were 4 location of shopping facility have been surveyed, such as Bahu mall, Manado Town Square (Mantos), Mega Mall, and ITC which located in downtown of Manado city with consideration of crowded mall. Average of mall visitor were more than 3500 visitors each day, during 3 days survey in Friday, 13 September 2013, Saturday 14 September 2013 dan Monday 16 September 2013 as seen in table 2.

Table 2. Number of Mall Visitors

Name of Mall	Number of Visitors		
	Friday	Saturday	Monday
Bahu Mall	3918	3568	3732
Manado Town Square	25125	34233	26887
Mega Mall	30393	40461	27321
ITC	19927	25945	23222

Mall location was studied based on number of visitor and also distance consideration between mall. Distace proximity among ITC, Mega Mall, Mantos and Bahu Mall were located in side of Manado bay as seen in Figure 3.

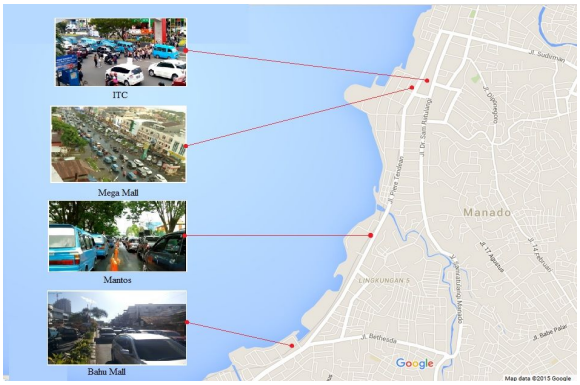

Figure 3. The Close Proximity of Mall Location in Manado City

III. METHOD

The qualitative study in descriptive method with questionnaire survey by observational was used in this study. Hypotheses developed in these study was:

Ho : There is no correlation in school activity, mall activity, and distance between public facility toward congestion signals.

H_1 : There is a correlation in school activity, mall activity, and distance between public facility toward congestion signals.

Calculation result in statistic is used a significance limit of alpha 5% (0,05). If p value < α, thus Ho is rejected or hypotheses of H_1 is accepted and if p value > α, thus Ho is accepted or hypotheses of H_1 is rejected.

The study was developed for this study was using *Structural Equation Modelling* (SEM) with AMOS program. Sample size was calculated based on estimation method in SEM. Composition of sample size was taken for each respondent groups as seen in Table 3. The data was collected by questionnaire to assess a relation in school activity and mall acitivity and congestion toward pedestrians response.

Table 3. Composition of Sample Size

No.	Respondent Criteria	Total
1.	Mall visitors	135 respondent
2.	School visitors and parents	135 respondent
3.	Goverment department (Public Works department, and Urban Planning department) , school management and mall management	30 respondent
	Total	300 Respondent

IV. RESULT AND DISSCUSION

Variety of public facilities activity in downtown of Manado city were causing congestion, therefore the study were conducted in 9 location of public facilities,such as 4 malls and 5 schools which the most crowded. Respondent characteristics in this study were measured based on gender, age, educational status, marital status, employment status, and residence. As an effort to gaining information about tendency in certain characteristic then every characteristic measurement was grouped into several groups. The result of structural model in correlation of school activity, mall and distance proximity toward congestion can be seen in **Figure 4.** Relationship of school activity, mall and distance proximity toward congestion were relatively measured by 21 indicator of variables. These variables were variable which has been validated by CFA(*Confirmatory factor Analysis)*examination. The examination purpose to structural model relation was to know a relationship among school activity, mall activity, distance proximity between

public facilities and congestion. Analysis result of structural model was based on causality relation between variables that located in theoretical justification to support analysis.

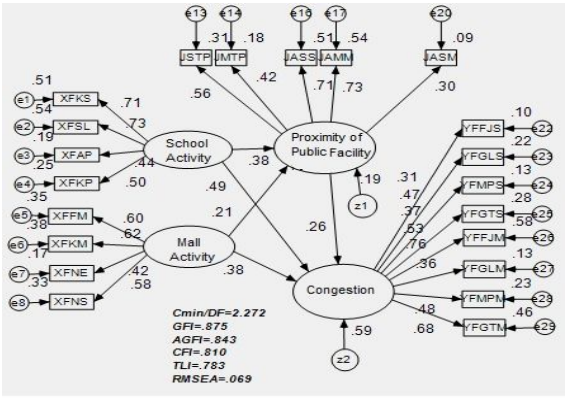

Figure 4. The examination result of structural model in relationship of school activity, mall and distance proximity toward congestion.

Description:
XFKS = School Quality Factor, XFSL = Social and Environment Factor , XFAP = Public Transport Factor, XFKP = Private Vehicle Factor , XFFM= Physical Of Mall Factor, XFKM = Coqnitive Of Mall Factor, XFNE = Economic Value Factor, XFNS = Social Value Factor, JSTP = School distance against road pavement, JMTP =mall distance against road pavement, JASS =distance between school, JAMM = distance between mall, JASM = distance between school and mall ,FFJS = Physical School Road Factor , YFGLS = School Land Use Factor, FMPS = Road Users (Human)around School Factor, YFGTS = School Technical Factor, YFFJM = Road Mall Physical Factor, YFGLM = Mall Land Use Factor, YFMPM = Road Users (Human) around Mall, YFGTM = Mall Technical Factor .

Analysis result from structural model with AMOS program showed a positive relation among school activity, mall activity, and distance between public facility toward congestion. According to model trial result in each parameter value was obtained a result of conformity model trial as seen in Table 4.

Table 4. *Goodness of Fit Index* Result in School activity and mall trials

No.	*Goodness of fit index*	*Cut off value*	Result value	Description
1	Cmin/DF	≤ 2,00	2,272	Moderate
2	GFI	≥ 0,90	0,875	Moderate
3	AGFI	≥ 0,90	0,843	Moderate
4	CFI	≥ 0,90	0,810	Moderate
5	TLI	≥ 0,90	0,783	Moderate
6	RMSEA	≤ 0,08	0,069	Adequate

Goodness of fit index parameter was generally examined can be concluded that the construct model was a marginal fit. Statistically, those values were reflecting the whole accepted equation model. These equation model contains a meaning that avalaible data has been supporting the relation among latent variable of school activity, mall activity, and distance between public facility toward congestion, thus model can be used to predict a population. From those statistical test above, the next step was to examining value among construct of public facility activity, distance and congestion. Significancy trial result from parametric value of relationship between construct can be seen in Table 5.

Table 5. Significancy test of Standardized Regression in relation between Construct and Structural Model Indicator

Relation between Variables			Estimation	S.E.	C.R.	P	Descriptive
Proximity between facilities	←	School activity	0.472	0.123	3.832	0.000	Significant
Proximity between facilities	←	Mall activity	0.214	0.092	2.328	0.020	Significant
Congestion	←	School activity	0.278	0.078	3.545	0.000	Significant
Congestion	←	Mall activity	0.180	0.054	3.336	0.000	Significant
Congestion	←	Proximity between facilities	0.117	0.044	2.643	0.008	Significant

Conclusion from Table 5 was as follows: there was correlation between school activity with congestion and distance at p=0,000 ($p \leq 0,05$), correlation between mall activity with congestion was p=0,000 ($p \leq 0,05$), school activity with distance proximity was p=0,000 ($p \leq 0,05$), mall activity with distance proximity was p=0,020 ($p \leq 0,05$), distance proximity with congestion was p=0,008 ($p \leq 0,05$). The statistic t values were (3,832) ; (2,328) ; (3,545) ; (3,336) ; (2,643) respectively and bigger than t table value = 1,96 (alpha standard value 5%). This

indicates that mall activity, school activity have significant correlation with congestion and distance proximity between public facilities.

Hypotheses stated that the correlation of school activity, mall activity and distance proximity between public facility toward congestion were referral result from various studies theoritically and empirically. Relationship of school and mall activity were seperately discussed below.

Relationship between School Activity with Congestion

Relationship between school activity with congestion was showed by coefficient network value at 0.49. Congestion indicator as an impact of school activity were:

a. Road Physical Factor around School
   Indicator which correlated with physical road factor, were : 1) a lot of intersection,2) low road quality, 3) design and road capacity. Respondent assesment result was related to inadequate indicator assesment with the highest index value at 53.21 for road quality, and the lowest at 51.70 for design and road capacity. From 3 to 5 schools was being a study location that nearby an intersection such as Kindergarten/ Elementary Eben Haezar, Monastery school, and kindergarten/ elementary Don Bosco which often causing a traffic congestion in the morning during school start time and afternoon during school finish time. Road quality was in a good condition but average velocity of vehicle at kindergarten/elementery of eben haezar which located in diponegoro street was 5 km/ hour in peak hour at (11.00 - 14.00) on Friday, 13 September 2013. It was similar with Santoso study (1997) states the traffic congestion is an implication from congestion as a result of decrement in road service. Yan and Crooks (2010) states the traffic congestion in road network is characterized by slower velocity, prolonged time travel and increment of vehicle queue.
b. Land use Factor around school
   Indicators were related to land use factor around school such as 1) proximity school with residences; 2) distribution of school location; 3) School enterance placement . The trial result was correlated with these indicator that showed from 277 research respondent, all indicators have an inadequate result. The highest index value only 52.78% was an indicator of school proximity with residences and indicator of school location distribution. If the result index was compared with the expected index at 70.80%,then the value was distant from expected respondent index value. These result showed that shool as study object was located far from student residences. These condition was resulting the need to use vehicle to go to school. The impact of vehical using was an increament of motorized vehicle using around school. Indicator of school location distribution adn school enterance placement were assessed insufficient by respondent School location as study object was clustered in one district and closer to each other. School enterance was generally facing toward main road but closer to road pavement side.
   Congestion happened on Friday at (11.00-14.00) AM besides caused by school acitivity from 3 schools in surroundings and also caused by mosque activity around school. The land use such as mosque which located around school has affected traffic flows, because of Friday prayer that coincide with school finish time. Vehicle parking around mosque and school were making a traffic more congested around school. These result was supported by Marpaung study (2005) states that the obstruction on side road are an impact of traffic congestion with increament of mobility activity and land use alongside the main road.
c. Pedestrian Factor around School
   Indicators were related to human factor as pedestrian around school such as : 1) patient and driver tolerance; 2) frequency of pedestrian; and 3) violation of traffic policy. The assesment result has correlation with these indicators were known from 277 study respondent, all indicators have an inadequate result. The highest index value was 52.78% such as indicator of pedestrian frequency and violation of traffic policy. In fact, from the three existing indicators, indicator of patient and driver intolerance were indicators with the lowest value (only 49.10%). This condition showed that patient and driver tolerance, pedestrian frequency and violation of traffic policy around school were gave an impact in increament of congestion around school. A number of pedestrian during peak hour of public activity caused a driver to reducing their vehicle velocity and priorizing the pedestiran. Tamin (2000) states that traffic congestion will causing a great loss for road users especially in time wasting.
d. Technical Factor around School
   Indicators were related with school technical factor, such as : 1) vehicle parking alongside road; 2) competition of road space, and 3) frequency of mass transit activity. The assessment result has a correlation with these indicators were known from 277 study respondents, all indicators have an inadequate result. The highest index value was 53.14% such as indicator of competition in road space. In fact, from three existing indicators, frequency of mass transit activity was an indicator with the lowest value (only 51.94%) this condition showed that road function around school will be disrupted as an impact of vehicle parking alongside road and competition of road space by private vehicle. Frequency of mass transit activity on WR Supratman road link was low because did not passed by mass transit route. The impact of no mass transit route then several students should walk to diponegoro street and Sudirman street. It was similar with Moreton study (2006) states that the increament of vehicle users for children purposes to go to school has caused a vehicle parking alongside road.

Correlation of Mall Activity Toward Congestion

Correlation of mall activity towar congestion was showed by coefficient network value at 0.33. Indicator of congestion as an impact of mall activity was :

a. Physical Factor of Mall
   These indicators were correlated with physical factor around mall such as: 1) Intersection condition; 2) Road quality; 3) Design and road capacity. The assessment result has a correlation with these indicators from 277 study respondents were known that none of indicators has a adequate result. The highest index value was 53.56% such as poor road quality. If the index assessment result was compared with expected level of interest index then the value still far from the respondent expected index value. This result showed an inadequate of intersection condition, road quality, and design and road capacity around mall and has an impact in increament of congestion. Average vehicle velocity in ITC mall which located in Piere Tendean street especially in direction of down town to Malalayang was 7 km/hour during peak hour at (17.00 - 18.00) pm on Friday, 6 September 2013.
b. Mall land use factor
   These Indicators were correlated with land use factor around mall such as: 1) proximity between mall with residences; 2) distribution of mall location; 3) mall enterance. The assessment result has a correlation with these indicators were known from 277 study respondents that all indicators have an inadequate result. The highest index value was 52.98% such as indicator of proximity between mall with residences and indicator of distribution of mall location. This result showed that mall as the study object has a distant location from residences then it was needed to use vehicle to go to mall. Indicator of distribution of mall location and mall enterance were also have an inadequate result.The location of mall was entirely located on side road and closer to each other. In general, the enterance was directly face to main road with 12 in depth from road pavement. Vehicle queue happened as a result from numerous vehicle were entering into mall. The queue condition was longer during conflict such as the intersection of traffic flow from vehicle on side road which opposite from mall location. This similar with Yan and Crooks study (2010) states that the traffic congestion on road network happens as a result from growth of need in vehicle mobility then creating a limitation in vehicle movement.
c. Mall Road Users Factor
   These indicators were correlated with users factor around mall such as :1) patient and driver tolerance; 2) frequency of pedestrians; and 3) violation of traffic policy. The assessment result has a correlation with these indicators were known from 277 study respondents, all indicators have an inadequate result. The highest index value was 52.78% such as indicator of violation of traffic policy. In fact, from three existing indicator, patient and driver tolerance were indicators with the lowest value (only 49.53%). These condition showrd patiend and driver tolerance, frequency of pedestrians and violation of traffic policy around mall will increase a congestion around mall. Pedestrians were using a road to crossing and this was caused by the unavailabilitty footbrige facility to connect mega mall and ITC.
d. Mall Technical Factor
   These indicators were correlated with mall technical factor, such as: 1) vehicle parking alongside road; 2) competition of road space; and 3) frequency of mass traffic activity. This assessment has a correlation with these indicators were known from 277 study respondent , all indicators have an inadequate result. The highest index value was 52.71% such as indicator of vehicle parking alongside road. In fact, from thress existing indicator, frequency of mass transit activity was an indicator with the lowest value (only 52.35%). This condition showed that the occurence of congestion has a relation with traffic behavior such as increasing the number of vehicle parking alongside road, competition of road space and frequency of mass transit activity.

Empirically, this study has shown the school activity and mall activity will caused a traffic congestion, therefore gave an impact in congestion. The model has explained that simultaneously the distrance between public facility, school activity and mall activity has a significant positive relation toward congestion. These can be seen in Table 5, the value of $t_{hitung} > t_{tabel}$, it means that H_o is rejected or H_1 is accepted and there is a relation in congestion as a result of school activity, mall activity and distance proximity. These equation explained that the closer distance proximity between public facility, then increasing the occurence of congestion at 0.26 which was significantly proven, with t hitung value = 2,643 > t tabel =1,96, the increament of school activity will increasing the occurence of congestion at 0,49 with t hitung value =3,545 > t tabel , the increament of mall activity will increasing the occurance of congestion at 0,38 with t hitung value = 3,336 > t tabel. Distance proximity of public facility, school activity, and mall activity were simultaneously capable to explain a dysfunctinal road at 59%, Distance to public facilities, school activities, and the activities of the mall, all together are able to explain the function disorders by 59%, the rest is other factor influences

V. CONCLUSION

According to analysis result in school and mall location at Manado City, the author conclude that :

a. School and mall activity has positive relation and significant in causing congestion. The magnitude of congestion was depended with school and mall acitivy.

The correlation between school activity and congestion showed in p value at p=0,000 ($p \leq 0,05$) with t_{hitung} value = 3,545 > 1,96. The correlation between mall activity and congestion showed in p value at p=0,000 ($p \leq 0,05$) with t_{hitung} value = 3,336 > 1,96.

b. The closer distance proximity between school and mall activity will causing a greater road dysfunction. The correlation between school activity and distance was showed in p value, at p=0,000 ($p \leq 0,05$) with t_{hitung} value = 3,832 > 1,96. The correlation between mall activity and distance proximity of two facilities, was showed in p value at p=0,020 ($p \leq 0,05$) with t_{hitung} value = 2,328 > 1,96. While the correlation between distance proximity and congestion was showed in p value at p= 0,008 ($p \leq 0,05$) with t_{hitung} value = 2,643 > 1,96 This was showed that mall and school activity has a significant correlation with congestion and distance proximity between public facilities.
c. The distance between schools location was demanded in peraturan Menteri Negara Perumahan Rakyat No 11 Tahun 2008 states that type of kindergarten school has a 500 m in radius, elementary and junior high school has a 1000 meter in radius, and senior high school has a 3000 meter in radius. The violation in radius of student service happened in 3 schools such as kindergarten/ elementary of Eben Haezar, Junior/senior high school of Don Bosco and State junior high school 1 which located within 1000 meter in radius. Besides, the uneven of school distribution in downtown will caused a congestion. The three schools were proven to have a traffic congestion in morning and afternoon during traffic peak hour at Diponegoro street-W.R Supratman street.
d. Monastery school activity and mega mall activity were correlated with congestion because of the distance proximity between two facilities. This was evident in traffic congestion that happened in Piere Tendean road link and affected until Sam Ratulangi street which monastery school was located.

VI. RECOMMENDATION

It is recommended that the traffic management shoud be improved by the increasing number of congestion as a result of public activity such as school and mall. The land use structuring was related to distance between public facilities especially those directly correlated with road dysfunction should be considered. In addition, for a long term it is recommended to formulate the best distance proximity between public facilities thus the road dysfunction as a result of public facility interaction could be minimalized.

ACKNOWLEDGEMENT

These study is a part of Engineering Faculty of Diponegoro Univeristy, Phd Program of Civil Engineering. We thank for our superintendent of Engineering Faculty of Diponegoro Univeristy, Phd Program of Civil Engineering, Public Works Department, and Urban Planning Department.

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