Influence of Residential Spatial Position to Trip Generation in Surabaya

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***Abstract*— Zonal trip generation is usually assummed to be influenced only by demographic and economic variables. It is seldom to consider spatial position of the zones as an influence variables to its trip generation. In actual condition, people will consider strategic position of residential area when they choose to buy or rent of their home, in accordance with their place of activities such as working, studying for their children and shopping. This research aim is to calculate the influence of spatial position of residential zones from the activities centers to zonal trip generation in Surabaya, Indonesia. Surabaya has several activities centers that can be classified as urban centers and suburban centers. In order to define position of residential zones in relation with activities centers, travel time is defined as a spatial measure which can be measured using Google Maps. Trip generation data is compiled from origin-destination matrix from household interview survey. Regression analysis is used for calculation of the influence of spatial position of residential zones in relation to the activities centres to zonal trip generation. The result shows that travel time to urban center influences reduction of the residential trip generation more than travel time to suburban centers does. However, still many trips were not influenced by travel time from residential to city center since housing ownership in Surabaya is fixed system more than flexible one, and housing at periphery area much cheaper than at city center.**

Keywords—trip generation, geographical and spatial position, urban centre, suburban centre

I. INTRODUCTION

The development of big city that can be concentrated at a traditional city center or spread at multiple suburban centers will generate trip generation from residential areas. It is common to assume that trip generated from origin zones is influenced by zone population.

This research digging other possibilities of variables that can influence trip generation. Travel time to city center or suburban centers can be analysed as potensial variables as suggested by Dickey (1974) in several cases in US [1].

For this purpose, this research compiles origin destination data that is derived from a household interview survey hold by Transportation Office of Surabaya in 2011.

II. METHOD

Household interview survey is held in 2011 with respondent 7000 household, that means level accuracy more than 95% in accordance of subdivision to 31 subdistrict zoning system. Several origin-destination matrix is compiled from this data, including matrix of trip by modes, trip by purpose, home based and non home based, peak hours, and daily.

Data of population [2] and daily zonal trip production is shown in Table 1, while position of each zone is shown in Picture 1.

Regression analysis is used in analysis the influence of independent variables to the trip production, in this research are population and travel time to city center

Travel time to city center is measured using google maps, which presents three option. The fastest path is used in this research.

III. ANALYSIS

Regression analysis using population as independent variables and daily trip as dependent variables resulting regression model $Y = 0.5333 X + 42419$ and R^2 0.3552, as shown in Figure 2. On the other side, travel time to city center as independent variable resulting reggression model:$Y= -209.,2 X + 146073$ and R^2 0.1841 as shown in Figure 3.

Because the result is unsatisfied, a partision of data using geographical position was tried. Zones close city center consist of subdistric Gubeng, Tegalsari, Genteng, Simokerto, Pabean Cantikan, Bubutan and Krembangan is tested and resulting reggression model $Y= 1.0188 X + 7025.3$ wth R^2 0.8079 as shown in Figure 4. Using the same zones and travel time to city center as independent variable resultung model $Y= -2164.2 X – 160884$ with R^2 0.1524 as shown in Figure 5.

On the other hand a distant zones with rather high proportion of wealthy housing is chosen which includes subdistricts Gayungan, Tenggilis Mejoyo, Gununganyar, Rungkut, Sukolilo, Mulyorejo, Dukuhpakis, Wiyung, Lakarsantri, Sambikerep and Sukomanunggal is tested using population as independent variable and also travel time to city center as well.

Table 1. Data consist of Population, travel time to city center and number of trip

No	Sub district	Population	Travel time to center (minutes)	Total trip (trip /day)	Trip by car (Trip/day)
1	Karangpilang	73100	40	80581	939
2	Jambangan	46200	23	55064	611
3	Gayungan	46900	18	113105	3296
4	Wonocolo	81800	21	109049	310
5	Tenggilis Mejoyo	56800	29	51338	254
6	Gunung Anyar	50300	36	64188	976
7	Rungkut	99900	30	80458	337
8	Sukolilo	104500	19	119734	1323
9	Mulyorejo	82700	27	103772	5056
10	Gubeng	154400	9	132050	1147
11	Wonokromo	184300	13	45838	1782
12	Dukuh Pakis	61100	22	18378	501
13	Wiyung	65000	23	42250	922
14	Lakar Santri	51600	40	43312	325
15	Sambi Kerep	55700	41	15525	91
16	Tandes	95200	31	152842	2248
17	Sukomanunggal	98700	25	102503	1359
18	Sawahan	224100	15	234004	2741
19	Tegal Sari	112200	8	150903	6910
20	Genteng	67900	9	78667	5525
21	Tambak Sari	229800	16	143076	3856
22	Kenjeran	134200	27	77173	1453
23	Bulak	37500	31	101409	807
24	Simokerto	102700	21	164850	5123
25	Semampir	196600	25	153909	11406
26	Pabean Cantian	91500	24	52268	758
27	Bubutan	114900	21	96284	6470
28	Krembangan	123700	19	89510	5641
29	Asemrowo	38800	28	83010	3148
30	Benowo	48700	40	101021	3174
31	Pakal	42900	45	44723	1627

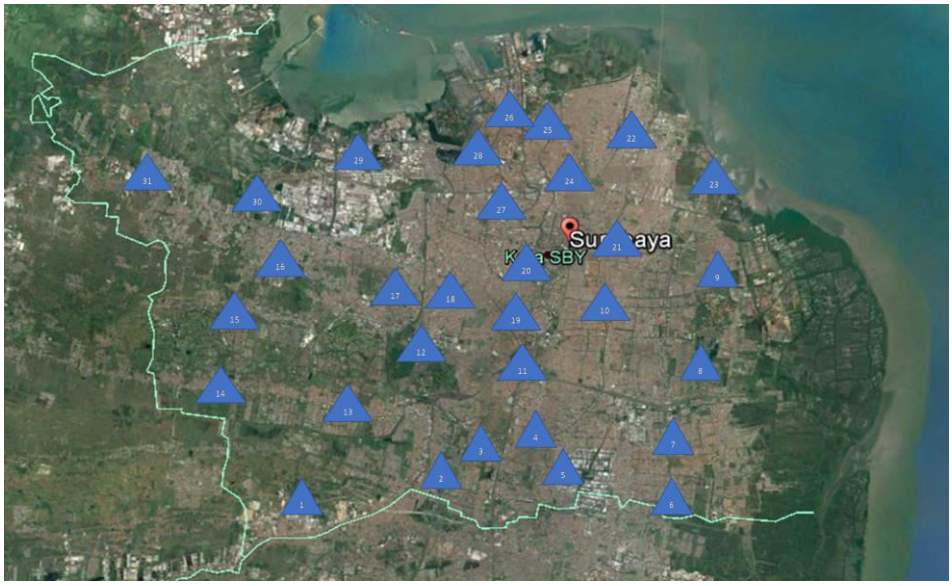

Figure 1. Position of zones based on subdistrict in Surabaya

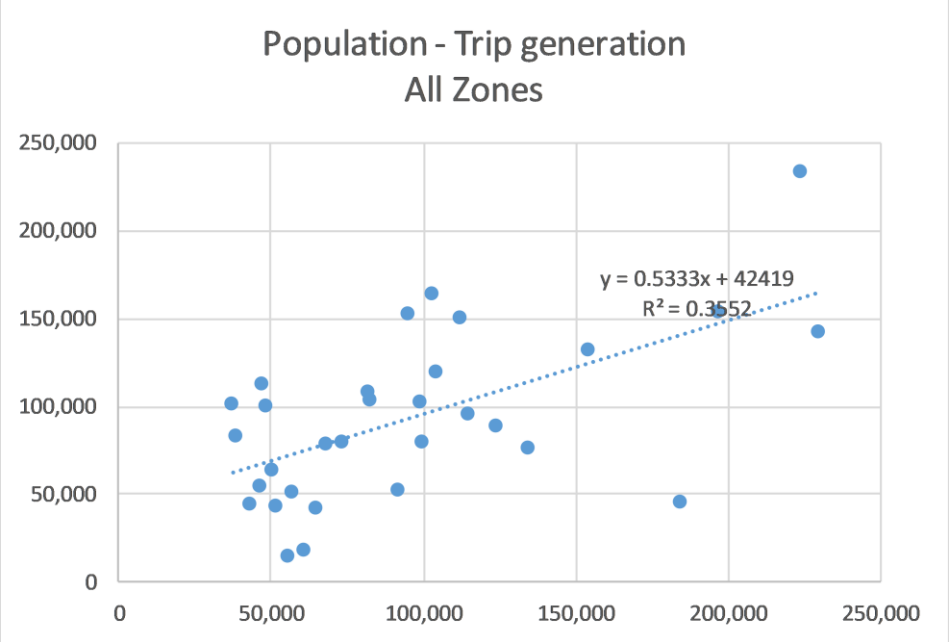

Figure 2. Influence of population to trip production of all zones

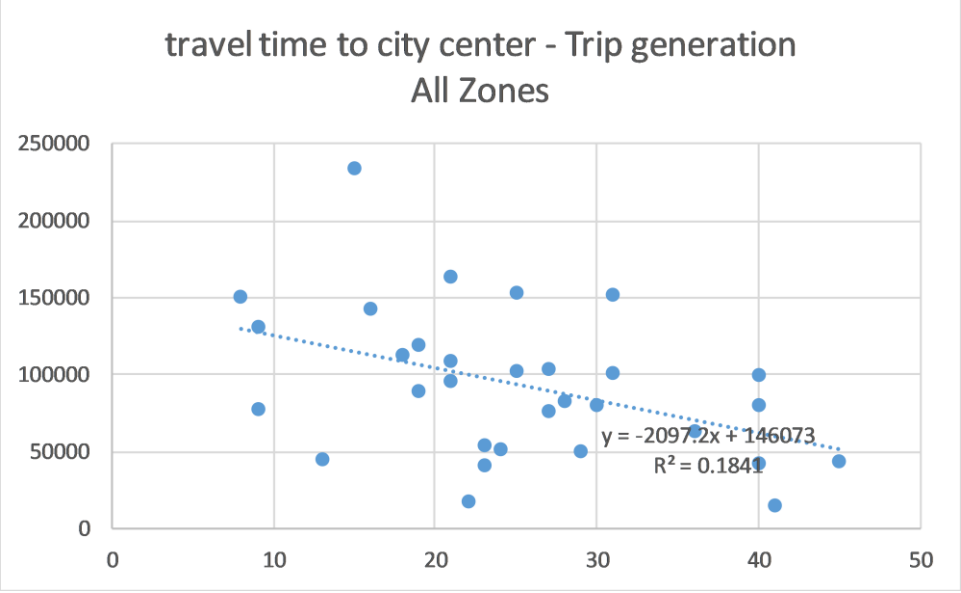

Figure 3. Influence of travel time to trip production of all zones

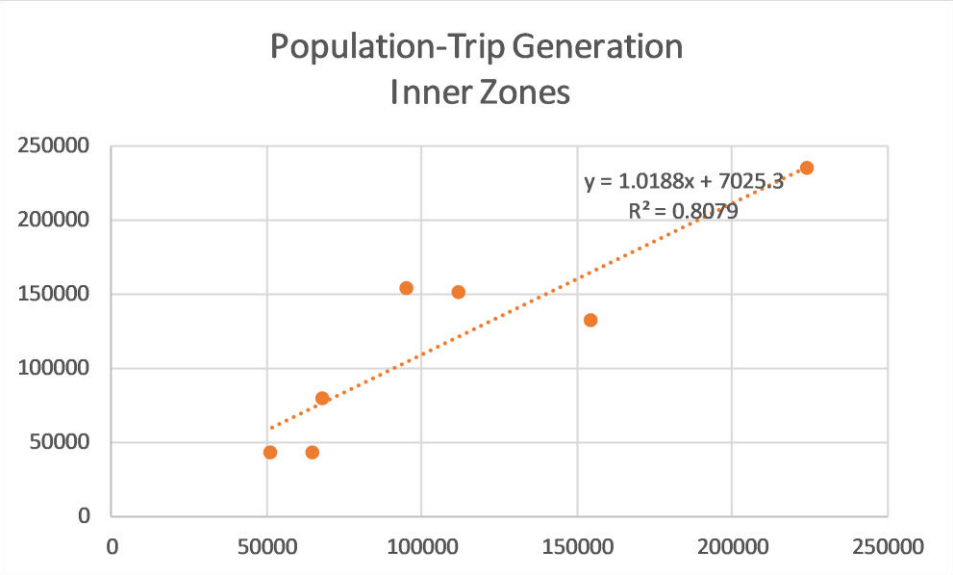

Figure 4. Influence of population to trip production of inner zones

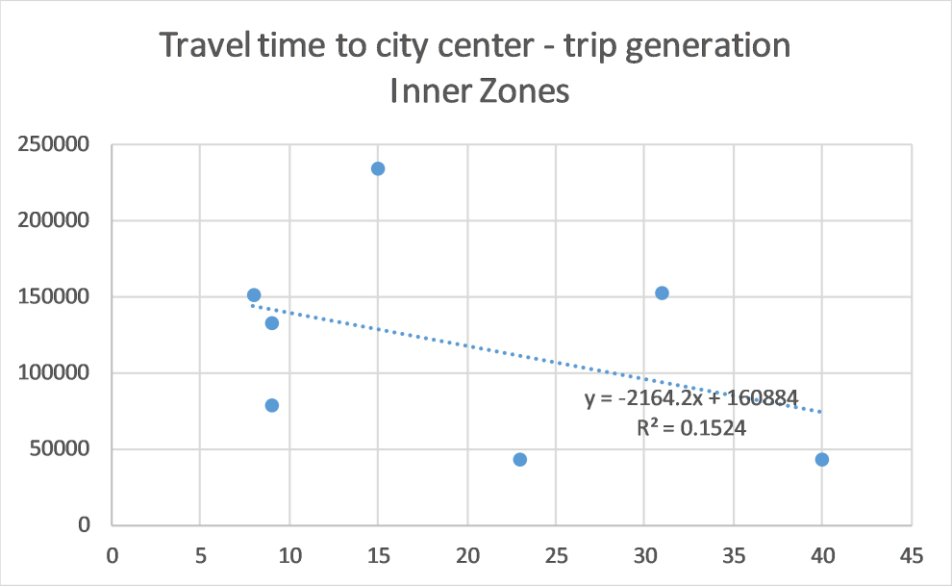

Figure 5. Influence of travel time to trip production of inner zones

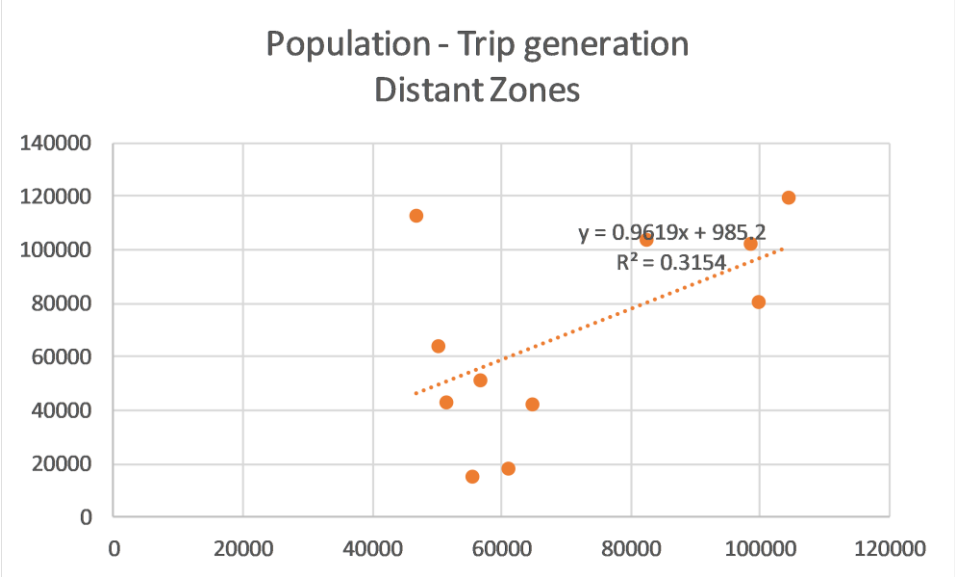

Figure 6. Influence of population to trip production of distant zones

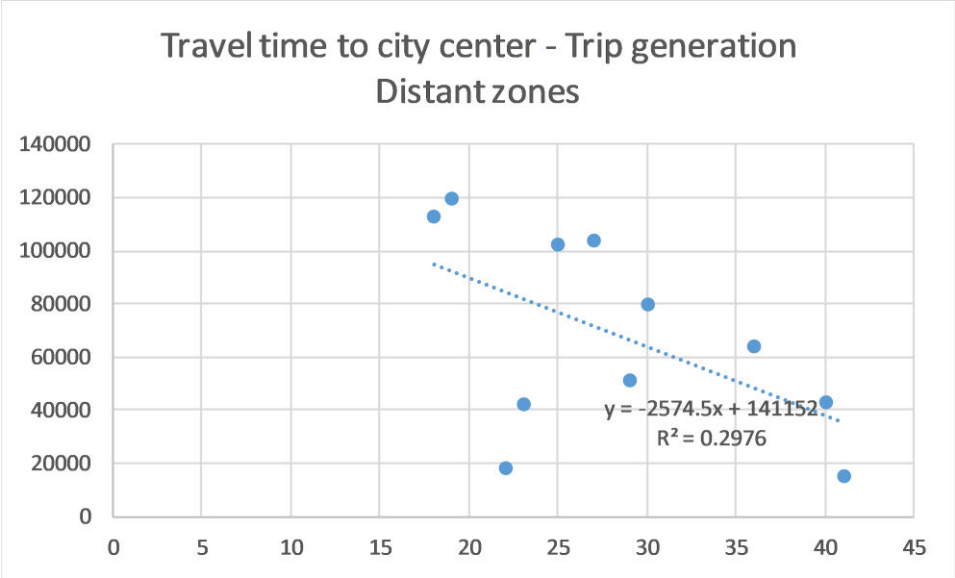

Figure 7. Influence of travel time to trip production of distant zones

With population as independent variable a formula Y=0.9619 X + 985.2 and R^2 0.3154 as shown in Figure 6, While travel time tu city center as independent variable give formula Y = -2574.5 X – 141152 and R^2 0.2976.

IV. RESULTS AND DISCUSSION

For the whole city, reggression model R^2 0.3552 and 0.1841 for population and travel time to central respectively. Both are unsatisfied.

For inner city trip, the population and travel time to central give R^2 0.8079 and 0.1524. It is shown that population significantly influencing trip generation.

For trip generation of distant zones, .R^2 for population variable is 0.3154, while travel time to central give R^2 0.2976. Therefore influence of travel time to central to trip generation is slightly increase, but it is not significant.

IV. REFERENCES

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