Sustainable Urban Mobility: Level of People Mobilization in Surabaya

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Sustainable Urban Mobility: Level of People Mobilization in Surabaya

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Abstract: The designation of Surabaya as a city that serves as a national activity centre has led to its rapid growth. As a result, along with the growth and development, the people's interactions and movements also increase. The people mobilization and the regional compactness are used to evaluate the level of mobilization sustainability in Surabaya. The methods used in this research include mobility level analysis and compaction level analysis based on movement behaviour. The study's findings revealed that 43.41 % of the population had ideal movement, and 18.49 % were in the poor category. The level of regional compactness indicated that Genteng had the best level of compactness, owning a relatively close distribution of service centres in the district. The result of this study is expected to be applied to formulate urban spatial structures to encourage sustainable people mobilization behaviour.

Keywords: mobility; people mobilization; sustainable; Surabaya; Regional Compactness

1. Introduction

As the population increases, significant challenges occur in cities, including problems related to urban transportation, mobility needs, mechanisms to protect the environment, and ensuring social inclusion[1)]. Theoretically, transportation problems triggers attention to research or the development of sustainable transportation models, such as transit-oriented development, new urbanism, location efficient development, access management etc. The standards of sustainable transportation are; (1) transportation that prioritizes pedestrians; (2) low exhaust emissions; (3) sustainable mobility; and (4) modes of transportation that prioritize public transportation, especially the Mass Public Transport System[2)]. The system of urban mobility consists of various elements which strongly interact with each other. A strong urban system should be able to overcome threats and at the same time maintain the urban mobility system well[3)]. The level of accessibility in an area can be measured through the movement intensity, movement behavior, and time of travel between houses and community[4) 5)].

One of the cities in Indonesia with transportation problems is Surabaya. Surabaya was designated as a city that serves as a national activity center in East Java Province together with the urban areas of Gresik, Bangkalan, Mojokerto, Sidoarjo, Lamongan (locally known as Gerbangkertosusila) and Malang. This leads to the rapid growth of the city every year, which, along with the development, increases the people's interaction and movement[6)]. Surabaya has a variety of transportation systems, in terms of road network systems and modes of public transportation, accompanied by increasingly complex transportation problems, such as residential areas far from main roads and arterial and collector routes that are more difficult to reach by the transportation system. [7)]. The high use and diversity of transportation systems in the city of Surabaya affects increasing air pollution due to the use of transportation. During the COVID-19 pandemic, government policies suppressed the spread by suppressing the mobility and activity patterns of the people of Surabaya[8)]. Apart from that, travel costs and travel time affect people's mobility[9)]. The air pollution from vehicle exhaust gas reaches almost 70%. This is larger than the pollution produced by industries which only ranges from 10% - 15%. The rest comes from households, waste burning, wildfire and others. The highest contribution to emissions is from the industrial and transportation sectors. [10)]. The result of the air quality index monitoring in the city of Surabaya, East Java in the period of January - May 2022 showed number of 87.0874. This was based on the result of calculation of *Dinas Lingkungan Hidup* (environmental agency) of Surabaya through the air quality index monitoring tools installed at several locations. The figure was almost close to the threshold of air quality ($70 \leq x < 90$) [11)].

Policies and actions to solve the transportation problems have been planned and conducted such as energy-saving movement, emission restrictions, setting a

minimum number of car passengers (car-pooling and three-in-one), road levies (road pricing), road widening, inner-city toll roads construction, and mass transportation installations (bus rapid transit) [12]. In Surabaya, some ideas have constructed to overcome traffic congestion such as the plans of river transportation, busway or bus line. Those which have been implemented are the Surabaya-Sidoarjo commuter train, line canalization, and road capacity expansion.

The intense movement and need for transportation requires an effort to develop sustainable transportation[13]. The need for large-scale and continuous transportation and effective and efficient vehicle accessibility is the main support to meet people's demand for transportation[14][15]. This study aims to assess the sustainability of people mobilization in Surabaya by analyzing the mobility level of people mobilization and the regional compactness level. The findings of the study are expected to help formulate urban spatial structure policies that can encourage sustainable people mobilization behaviour in Surabaya. The level of regional compactness shows the diversity of activities (diversity), mixed-use land use so that an area can meet its own needs, increased accessibility by walking and cycling, and energy savings in public transportation in a region[15].

2. Method

This research uses quantitative research methods. Quantitative methods are the most dominant approach in describing, explaining, and predicting movement patterns and their impacts. The research location was determined in Surabaya based on the consideration that Surabaya has a diverse transportation system, in terms of road network systems and public transportation modes, accompanied by increasingly complex transportation problems (Intra-Modal Technical Study Across Urban City Surabaya Metropolitan Area. Mobility operationalization was aimed at identifying the mobility level of the region based on sustainable criteria with the main method of normative evaluation, namely fact-norm comparison [16].

Data are collected through interviews, questionnaires, and observation [17]. Observations were made to determine the condition of movement and the means of population mobility, which includes the road network and pedestrian paths. Questionnaires and interviews were used to identify the mobility of population movements.

Table 1 explains the number of samples taken. In determining the sample size, a home interview survey is used with ideal and minimum sample size criteria based on the number of residents in an area (Morlok 1985, Surabaya City Transportation Masterplan 2017).

Table 1: Sample Size Based on Population

Total Population	Recommended Ideal Sample	Recommended Minimum Sample
Under 50,000	1 in 5	1 in 10
50,000 – 150,000	1 in 8	1 in 20
150,000 – 350,000	1 in 10	1 in 60
350,000 – 500,000	1 in 15	1 in 80
500,000 – 1,000,000	1 in 20	1 in 150
1,000,000 – 2,000,000	1 in 25	1 in 300
di atas 2,000,000	1 in 40	1 in 400

Source: Morlok 1985

The population of Surabaya City in 2022 will be 2,887,223 people (Surabaya City in Figures for 2023). So, the ideal sample size is 1 in 40 (2.5%), or the minimum sample is 1 in 400 (0.25%). The sample sizes for household surveys in each zone are shown in Table 2 in detail.

Table 2: Research Sample

No	District/Zone	Number of families	Sample
1	Tegalsari	23,894	43
2	Genteng	13,938	25
3	Bubutan	23,176	41
4	Simokerto	21,306	38
5	Pabean Cantian	18,771	34
6	Semampir	38,637	69
7	Krembangan	25,032	45
8	Kenjeran	23,349	42
9	Bulak	7,023	13
10	Tambaksari	44,630	80
11	Gubeng	31,451	56
12	Rungkut	18,300	33
13	Tenggilis Mejoyo	11,096	20
14	Gunung Anyar	9,325	17
15	Sukolilo	19,872	35
16	Mulyorejo	15,876	28
17	Sawahan	44,651	80
18	Wonokromo	37,363	67
19	Karang Pilang	13,882	25
20	Dukuh Pakis	11,986	21
21	Wiyung	11,958	21
22	Wonocolo	16,125	29
23	Gayungan	9,030	16
24	Jambangan	8,592	15
25	Tandes	18,849	34
26	Sukomanunggal	19,473	35
27	Asem Rowo	7,697	14
28	Benowo	8,517	15
29	Lakarsantri	9,258	17
30	Pakal	7,343	13
31	Sambikerep	10,100	18
	Jumlah	**725,627**	**1,037**

Fig. 1 describes the analysis phase used in this study, including identifying the facts of population movement mobility and then compiling population movement data. From the population movement data, an assessment tool for the level of regional mobility and compaction was developed, and the next step was to analyze the level of regional mobility and compaction in Surabaya.

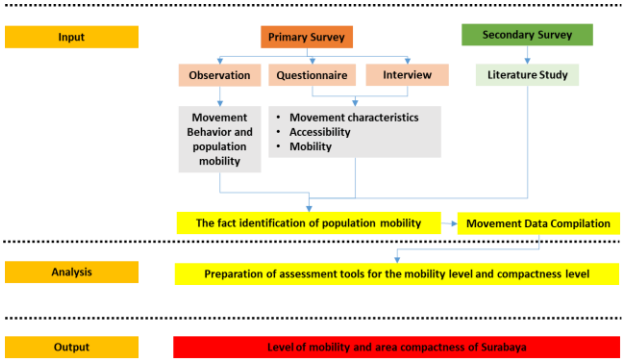

Fig. 1 Research Flow Chart

2.1. The fact identification of population mobility

The data of fact identification of mobility and the people mobilization was identified by performing data collection through household interviews related to the modes, frequency, motives, purpose, length, and time of the mobility [18].

Data collected from household samples can efficiently and validly provide information about variable values in the form of (1) choice of mode of movement, (2) length of movement, (3) destination of movement, (4) duration of movement, (5) frequency movement, (6) purpose of movement, (7) timing of movement, etc., for each planning zone or area. The focus of the quantitative descriptive analysis stage lies in interpreting and transforming existing movement patterns in a city setting. Variables and variable values (data) to be taken in the study are described in Table 3:

Table 3 Research Variable

Variable	Sub Variable	Literature
Movement Characteristics	Movement mode	18)
	Movement frequency	19)
	Movement motives	20)
	Movement purpose	21)
	Changing modes of movement	
	Movement length	
	Movement time	
Accessibility	Movement length	
	Movement mode	
Mobility	Movement length	
	Movement mode	
	Movement cost	

2.2. The data compilation of the people mobilization

The data of people mobilization were compiled using the table format or frequency distribution diagram and cross-tabulation. The frequency distribution table was used for all types of movement behaviour, while the cross-tabulation was used especially to relate the movement modes variable and the movement length variable (mobility level assessment) (Fig. 2a) and to relate the movement length variable and other attributes (the assessment of compactness level, and sprawl level) of an area (Fig. 2b).

(a)

Movement Mode	Movement Length (m)						
	<375	376-750	751-1.500	1.501-3.000	3.001-6.000	6.001-12.000	>12.000
Pedestrian							
Non motorized							
Motorcycle							
four-wheel vehicle							
Public transportation							

Ideal Mobility | Good Mobility | Moderate Mobility | Bad Mobility

(b)

Attribute (District, Housing Type, etc)	Presentaion of The Movement Length (m)			
	<1.520 m (*Smart Growth*)	1.521-6.080 m (*Rurual Sprawl*)	>6.080 m (*Execissive Sprawl*)	Amount
.....				100%
.....				100%
.....				100%
.....				100%
.....				100%

Fig. 2 (a) Cross Tabulation between Mode and Length of Movement (Degree of Mobility); (b) Movement Long Cross Tabulation with Region Attributes (Cmpaction Level)

2.3. The preparation of the assessment tool of mobility level and regional compactness

The criteria introduced by Hasse and Kornbluh were used as the basis for the analysis to determine the criteria of sustainable movement behaviour. Although Hasse and Kornbluh explicitly emphasize more on the movement accessibility indicators involving distance and time dimensions, by including the movement mode criteria, their accessibility indicators indirectly contain mobility values (Fig. 3).

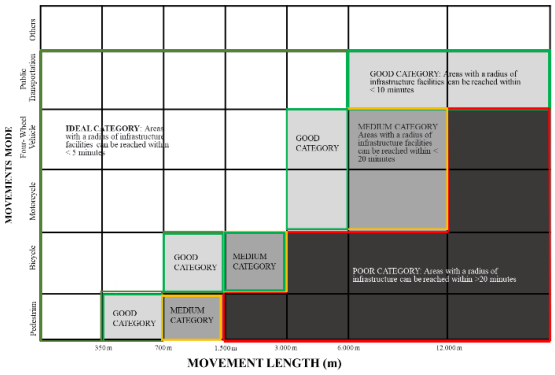

Fig. 3 The model of assessment of the sustainable mobility (the 2023 researchers summary)

Besides the assessment of the mobility level, the existing movement pattern can also be used as the indicator of compactness level or sprawl in a region or movement group (Fig. 3). The model of the mobility assessment can be used to measure the level of mobility individually or the regional or group movement, while the model of compactness level assessment can only be used to assess the regional or group movement as the aggregate results of the individual movement[22]. The level of regional compactness is divided into five categories, namely pedestrian-oriented area (walking smart growth), non-motor vehicle-oriented area (bicycle smart growth), suburban sprawl, rural sprawl, and excessive sprawl[8)18)].

2.4. The analysis of assessment of mobility and regional compactness

The data of the people mobilization in the city were put in cross-tabulation to get the classification of the mobility level (ideal, good, medium, and poor) and to get the classification of compactness level (smart growth, sprawl, and excessive sprawl). Overall, the method used in this study to quantify and interpret the level of sustainable mobility is explained in Table 4.

Table 4 The quantification method of mobility level in the study

Methods	Subjects	The sustainability standards	Literature
Mobility level	Transportation	• The higher the percentage of the mobility level, the more sustainable it is • The classification of mobility level: ideal, good, medium, and poor	18), 20), 25), 26)
The level of compactness based on the movement behavior	Transportation	• The higher the compactness level, the more sustainable it is • The classification of compactness level: smart growth, sprawl and excessive Sprawl	

3. Results and Discussion

3.1. The mobility level of the people mobilization in Surabaya

Mobility indicators containing value, distance, time and energy use or movement efficiency were used to measure the level of movement sustainability [27)28)29)]. This study succeeded in showing the mobility level of Surabaya's population. In general, the movement of the city of Surabaya, around 43.41%, is included in the ideal category. The level of regional compaction shows that the sub-district with the best compaction rate is the Genteng sub-district. Genteng sub-district is the area with the best compaction because Genteng sub-district has an ideal mobility rate of 100%, or all movements in Genteng sub-district (in all modes of movement) have an ideal and good level of mobility (Fig. 4. In addition, the movement time in the Genteng District is under 5 minutes and is included in the ideal category. A higher level of compaction can reduce carbon emissions in a city[30)].

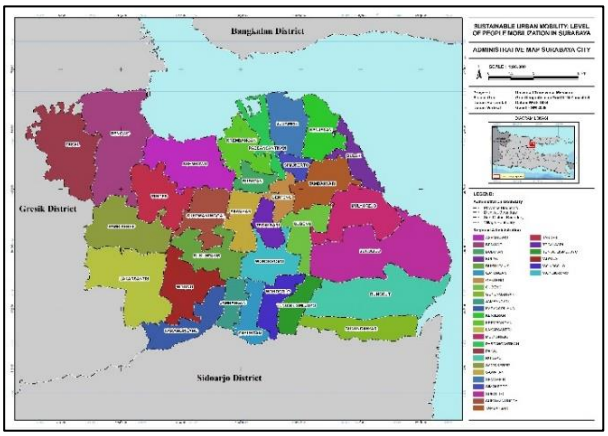

Fig. 4 Surabaya Administration Map

The level of compactness of an area shows intensity, diversity of activities, mixed-use land use so that an area can meet its own needs, increased accessibility by walking and cycling, and energy savings in public transportation with good mobility. The compactness of urban space can minimize energy from transport, water, materials, products and people [31)]. Compact cities provide advantages where a city plays a role in reducing fuel consumption, especially when travelling because, spatially, cities have diverse functions (mixed use) and places of work and leisure facilities are designed to be in one area. Community mobility and regional cohesiveness are important in formulating urban spatial structures that encourage sustainable community mobilization behaviour. Compact cities place more emphasis on energy efficiency and minimizing pollution because one of the compact city strategies is that we can carry out activities such as shopping, working and being able to walk, bike or take transit[8)]. Dumreicher (2000) states that a sustainable city must be compact, dense, diverse and well-integrated. A city should be easily accessible on foot, small enough to eliminate even the desire of a private vehicle owner but large enough to provide the opportunities and services that create the richness of city life [32)].

Table 5 and Figure 5 explain the level of mobility of population movements for the city of Surabaya, namely from 43.41% of ideal movement mobility, 6.59% use

public transportation, 3.51% on foot, 2.23% use bicycles, 28.77% % use motorbikes, and 2.31% use four-wheeled vehicles. Movement mobility in the excellent category was 21.66%, with details of 4.28% on foot, 1.97% by bicycle, 10.79% by motorbike, and 2.14% by motor vehicle. The mobility level of population movement in the medium category includes 16.01% of all movements with details of 2.05% on foot, 1.37% by bicycle, 9.93% using motorbikes, and 2.65% using four-wheeled vehicles. The level of poor mobility was 18.49%, with details of the use of walking mode at 1.97%, motorbikes at 12.33%, and four-wheeled vehicles at 3.77%.

By the characteristics of each mode of movement, the short category of movement (under 1,500 meters) is dominated by non-motorized vehicles and walking modes. In the middle distance (between 1,501 and 6,000 meters), motorcycles dominate, while the category above 6,001 meters is dominated by four-wheeled motorized vehicles. However, overall, motorbikes are the most widely used mode of transportation.

Table 5 The frequency distribution of the mobility level of people mobilization
(The length of the movement based on movement modes)

Movement Modes	**The Mobility Level Categories**				
	Ideal	**Good**	**Medium**	**Poor**	**Sub total**
Pedestrian	3.51 %	4.28 %	2.05 %	2.31 %	12.16 %
Bicycle	2.23 %	1.97 %	1.37 %	0.51 %	6.08 %
Motor cycle	28.77 %	10.79 %	9.93 %	12.33 %	61.82 %
four-wheeled vehicle	2.31 %	2.14 %	2.65 %	3.77 %	10.87 %
Public transport	6.59 %	2.4 8 %	0.0 0 %	0.0 0 %	9.0 8 %
Sub total	**43.41 %**	**21.66 %**	**16.01 %**	**18.92 %**	**100.0 0 %**

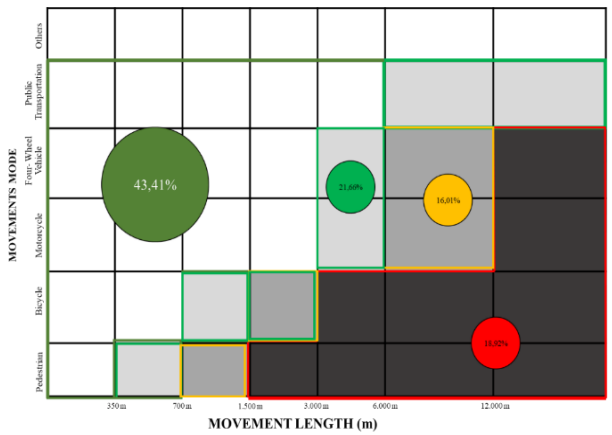

Fig. 5 Frequency Distribution of Population Movement Mobility Levels

The mobility level is categorized based on the mode use and the districts in Surabaya[33]. The result of the mobility level analysis each district will be one of the important things for the next analysis namely the relationship between the movement behavior[33] and the spatial structure [22]. Figure 5 explains that Genteng District is the district with the best level of mobility. The best level of mobility is indicated by an ideal mobility level percentage of 100%, or all movements in the Genteng sub-district (in all modes of movement) have an ideal and good level of mobility. Movement time in Genteng District is under 5 minutes by walking mode with a movement length under a radius of 375 m, bicycle mode with a movement length under a radius of 750 m, motorbike and four-wheeled vehicle modes with a movement length under a radius of 3,000 m, and transportation modes general with a movement length below a radius of 6,000 m. Every increase in mobility has implications for resource use, starting from walking mode, which requires shoes, sandals, and energy (calories), to motorized vehicle mode, which requires motorized vehicles, land for facilities, infrastructure, fuel, and institutions that manage the transportation system. The level of mobility influences sustainability through differences in energy consumption. A good level of mobility will reduce resource use and encourage social interaction through compaction[34]. On the other hand, the Karangpilang sub-district has the worst mobility level, with a level of mobility in the medium and poor categories approaching 65%. The bad category is seen based on the movement time of more than 20 minutes, which includes movement using walking modes with a movement length of more than 1,500 m, bicycle modes with a movement length of more than 3,000 m, or motorbikes and four-wheeled vehicles with a movement length of above 12,000 m. Districts with mobility level above the average of Surabaya are Wonocolo, Sawahan, and Tambaksari, Simokerto, Sukomanunggal, Gubeng, Bubutan, Sukolilo, Genteng, and Asemrowo. The rest districts have mobility level under the average of Surabaya. The level of mobility in this area shows that the lack of diversity of activities and land uses has an impact on the level of accessibility. If it is related to movement patterns, the diversity of activities and land uses in an area will have an impact on the length of movement that people will make. So, the greater the diversity, the more sustainable the area [35].

Figure. 6 represents the comparison of the level of population mobility in each sample district. The concept of compaction is applied to minimize energy for transportation, water, goods and human needs so that it leads to efficient use of city land. A good land use plan will reduce the need for long journeys, making interactions easier[8]. Figure. 6 shows the low level of mobility in several areas in Surabaya, including Wonocolo, Sawahan, Tambaksari, Simokerto, Sukomanunggal, Gubeng, Bubutan, Sukolilo, Genteng, and Asemrowo. The low level of mobility in several areas in Surabaya

shows that there is spatial inequality in several areas in the city of Surabaya.

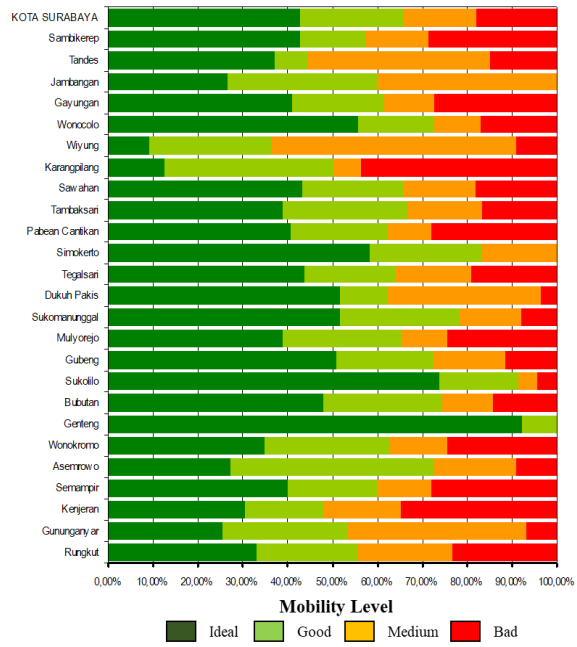

Fig. 6 Category Level of Mobility of Population Movement for Each District

3.2. The level of regional compactness in Surabaya based on the people mobilization behavior

The level of regional compactness is categorized into smart growth (radius of the service centre is under 1,500 meters), sprawl (radius of the service centre is between 1,501 meters to 6,000 meters) and excessive sprawl (radius of the service centre is above 6,000 meters)[18]. Table 6 explains that among the thirty-one (31) sample sub-districts, Genteng sub-district is the area with the best level of compaction or a relatively close distribution of service centres. This is indicated by the movement length radius <1,500 meters (smart growth) in Genteng District being the highest among other districts, namely 84.62%. Apart from that, the length of movement within a radius of >6,000 meters (Excessive Sprawl) in Genteng District is 0% or the lowest among other districts. Increasing accessibility and permeability of space can increase the comfort and sustainability of urban space by providing facilities. One of them is providing a pedestrian-friendly environment (walkability)[36].

Meanwhile, looking at the sub-district with the worst compaction, Bulak Subdistrict is the area with the worst compaction level among the other sub-districts. The worst compaction level is indicated by the movement length radius <1,500 meters (smart growth) in Bulak District, which is the lowest among other districts, namely 0%. In addition, the movement length at a radius of > 6,000 meters in Bulak District is 100% or the highest among other sub-districts.

In the category of movement length of less than 1,500 meters (Smart Growth), the most significant frequency was in Genteng sub-district (84.62%), while the lowest was in Bulak, Benowo, Lakar Santri, Pakal, and out-of-town sub-districts (0.00%). In the movement length category of less than 1,500-6,000 meters (Rural Sprawl), the most significant frequency was in Asemrowo sub-district (63.64%), while the lowest was in Bulak, Krembangan, Tenggilis Mejoyo, and Pakal sub-districts (0.00%). Meanwhile, in the prolonged movement category over 6,000 meters (Exercissiv Sprawl), the most significant frequency was in Bulak sub-district (100%), while the lowest was in Genteng sub-district (0.00%) (Fig. 7).

Table 6 Frequency Distribution of Movement Length by District

No	District	Percentage Length of Population Movement		
		Smart Growth (<1,500 m)	Rural Sprawl (1,501m – 6,000m)	Execissive Sprawl (> 6,000m)
1	Rungkut	8.62%	43.97%	47.41%
2	Gununganyar	11.36%	38.64%	50.00%
3	Kenjeran	26.09%	26.09%	47.83%
4	Semampir	12.00%	48.00%	40.00%
5	Asemrowo	18.18%	63.64%	18.18%
6	Wonokromo	24.42%	44.19%	31.40%
7	Genteng	84.62%	15.38%	0.00%
8	Bubutan	31.63%	44.90%	23.47%
9	Sukolilo	60.87%	30.43%	8.70%
10	Gubeng	31.88%	44.93%	23.19%
11	Mulyorejo	28.57%	38.78%	32.65%
12	Sukomanung	32.18%	45.98%	21.84%
13	Dukuh Pakis	37.93%	31.03%	31.03%
14	Tegalsari	34.04%	34.04%	31.91%
15	Simokerto	33.33%	50.00%	16.67%
16	Pabean Cantikan	31.65%	40.51%	27.85%
17	Krembangan	57.14%	0.00%	42.86%
18	Bulak	0.00%	0.00%	100%
19	Tambaksari	44.44%	38.89%	16.67%
20	Tenggilis Mejoyo	50.00%	0.00%	50.00%
21	Sawahan	29.55%	43.18%	27.27%
22	Karangpilang	21.05%	31.58%	47.37%
23	Wiyung	9.09%	27.27%	63.64%
24	Wonocolo	54.55%	21.59%	23.86%
25	Gayungan	43.18%	34.09%	22.73%
26	Jambangan	26.67%	53.33%	20.00%
27	Tandes	25.93%	18.52%	55.56%
28	Benowo	0.00%	66.67%	33.33%
29	Lakarsantri	0.00%	33.33%	66.67%
30	Pakal	0.00%	0.00%	100%
31	Sambikerep	14.29%	28.57%	57.14%
32	Luar Kota	0.00%	26.09%	73.91%
	Total	29.74%	37.89%	32.37%

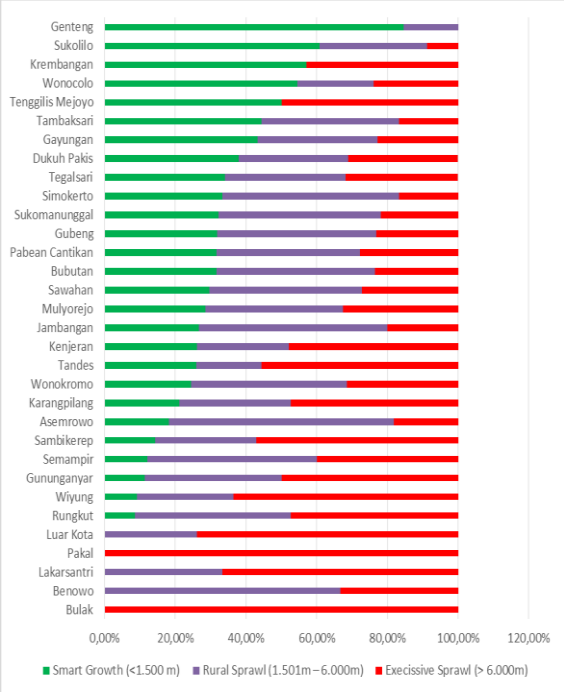

Fig. 7 Compaction Level Category for Each District

The description is further clarified by the Fig. 8 and Fig. 9 below showing the district clustering based on the level of regional compactness. There are five typologies of district clusters.

- **Typology 1** consists of Rungkut, Semampir, Gununganyar, Wiyung, Karangpilang, Sambikerep, Kenjeran, and Tandes districts. These districts need to be at a better level of compactness. This characteristic is indicated by the movement length behaviour of 50 % - 70 % that do at least as far as 6 km, 20-35% do between 1,500 m to 6,080 m, and the rest, 20-50%, do below 1,500 m. The low level of population density causes the poor level of regional compaction in Typology 1. One form of an urban area with a compact concept, according to (Dantzig & Saaty, 1978), is an urban area that has high-density settlements. High-density settlements can be an indicator of the level of effectiveness of land use in an area. Low population density will affect the low diversity of activities, diversity of land use intensity, level of private vehicle use, and percentage of population growth, so it will have an impact on the level of area compaction in a region.
- **Typology 2** consists of Jambangan, Simokerto, Wonokromo, Sawahan, Bubutan, Gubeng, Mulyorejo, Pabean Cantikan, Sukomanunggal, Gubeng, Tegalsari, Dukuh Pakis, Gayungan, dan Tambaksari Districts. They have better characteristics than **Typology 1** in terms of movement below 1,500 km. In addition, movement above 6 km is done by only about 10 % to 35%. Areas in Typology 2 show a better level of compaction compared to areas in Typology 1, and population density in Typology 2 areas is higher than in areas in Typology 1. So, this has implications for better levels of area compaction.
- Typology 3 are Tenggilis Mejoyo and Krembangan Districts. They are the districts with the best short-distant movement (under 1,500 m), done by 55 % - 85 %. Area in typology three shows that the level of compaction in the area is in the good category. In other words, areas in this typology have a fairly high level of density. The compact city concept really supports high-density development and mixed land use; this high population density also needs to be accompanied by efforts to unify various activities in areas related to optimizing land and city infrastructure[8].
- **Typology 4** consists of Benowo, Asemworo, and Lakarsantri has better characteristics than Typology 1 regarding movement under 1,500 km. In addition, the movement above 6 km between 10-30%. Areas in Typology 4 show a better level of compaction compared to areas in Typology 3. Area compaction in this area is in a better category with a high level of density and high diversity.
- **Typology 5** consists of Wonocolo, Genteng, and Sukolilo, which are sub-districts with good short-distance movement (under 1,500 m), namely between 85-100%. Areas in typology 5 show a better level of compaction compared to other typologies. The level of population density in typology five areas is high. A good level of compliance will encourage transportation efficiency, energy savings, and social interaction[15,37].

Based on the compactness level characteristic, the best order is **Typology 5, Typology 3, Typology 2, Typology 4, and Typology 1.**

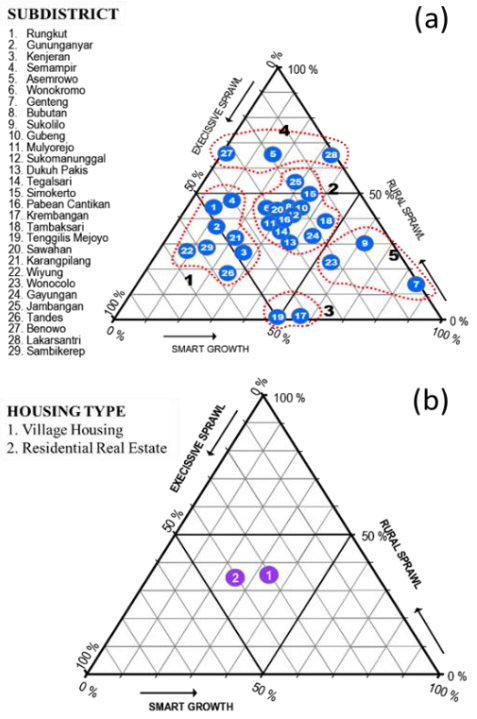

Fig. 8 (a) Compaction Level by District; (b) Compaction Rate by Housing Type

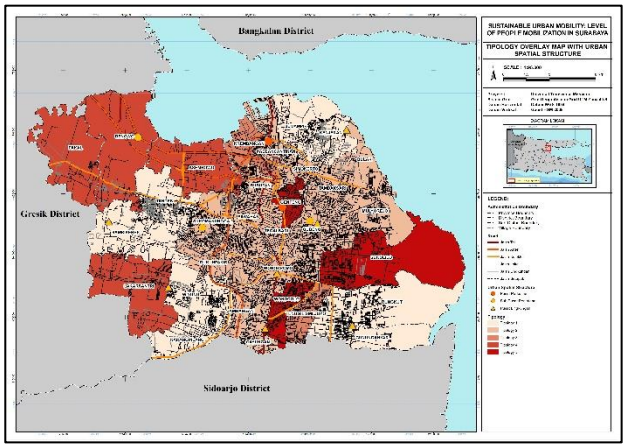

Fig. 9 Peta Compaction Level by District

4. Conclusion

The level of mobility of community mobilization in the city of Surabaya is in the ideal category. The level of mobility affects sustainability through the large number of vehicles and energy consumption (fuel oil). The higher the level of mobility in an area, the fewer vehicles there are and the lower the energy consumption. The higher the level of compaction of an area, the more sustainable the area is. A good level of mobility and compaction will reduce resource (energy) use and also encourage social interaction through compaction. Community mobility and regional cohesiveness are important in formulating urban spatial structures that encourage sustainable community mobilization behaviour. The ideas of reducing travel distances, increasing sustainable transportation, human-based urban planning and compact cities, and environmental sustainability are expected to be useful in creating urban spatial structures that are able to encourage sustainable community mobilization behaviour. Further research can be carried out regarding models and propositions of sustainable urban spatial structures based on movement behaviour.

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