A SPATIAL ANALYSIS FOR ASSESSING THE SUITABILITY OF ELEMENTARY SCHOOL AS SOCIAL INFRASTRUCTURE AT THE NEIGHBOURHOOD UNIT SCALE IN SUPPORTING CHILD-FRIENDLY SURAKARTA

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Abstract: *Problem complexity and interest diversity often cause a city not able to accommodate its population's needs, among which are the children's needs. It has initiated the idea of the child-friendly city, which got a positive response from the Indonesian government, proven by the policy of child-friendly city/regency. Surakarta is one of the cities having a strong commitment to being a child-friendly city; however, the implementation has not been comprehensive to the level of neighbourhood unit. Elementary school is an essential social infrastructure for children that should be available at a neighbourhood unit. However, problems are still there, such as the capacity of elementary schools that is below the national standard and also the children's less safety and comfort in accessing the schools. This paper assesses the suitability of elementary school as a social infrastructure in supporting a child-friendly Surakarta based on four criteria, namely, (a) the serving capacity of the education facility, (b) the safe and comfortable access, (c) the completeness of the elementary schools, and (d) the prevalent access including for disabled children. The suitability measurement was done by using scoring analysis from the results of the field observation as well as the citizens' and the children's perceptions. The scoring results have shown that most of the elementary schools in Surakarta are still not suitable with the criteria so that they have not been able to support Surakarta as a child-friendly city.*

1. INTRODUCTION

One of the objectives in planning a city is to accommodate all of the citizens' needs, including children. However, the city's serving capacity in this regard is often partial, focusing on economic interest and not considering the children's needs (Joga, 2013). Cities can be no longer a good place to support the children's growth.

This problem encouraged Kevin Lynch to deliver his idea about child friendly city (Prasetyo, 2013). This idea was followed by international conferences, including in Habitat Conference II in 1996 held in Istanbul, Turkey, in which UNICEF and UNHABITAT introduced child friendly city initiative. Indonesia, then, gave a positive respond through its regulations (Kementerian Pemberdayaan Perempuan dan Perlindungan Anak, 2011). In the regulations, there are 31 indicators of child friendly city, including the availability of social infrastructure (education, health, and social culture facilities that accommodate children's interests, including those of disabled children). The policy is aimed at supporting the children's growth as through ensuring their basic need fulfillment in the growing period.

Limitedness of children independent mobility is one of the basic factors that should be considered in planning the social infrastructure development. Therefore, social facilities that are used daily in

neighbourhood unit scale are a priority in developing child friendly city. One of these is elementary school. Elementary school is a basic education service for 7-12 years-old children who have limited independent mobility ability (walking and using public transportation) compared to older children or adults. The high interest toward elementary school service makes it as the center of neighbourhood unit and should be within the walking distance for children, i.e. 0.5 mil or 800 meters from the farthest house as commanded by The Neighbourhood Unit concept (Perry, 1929; Reiner, 1963).

The Neighbourhood Unit is a physical design concept of smallest neighbourhood environment that is considered ideal because it can fulfill the sosiopsychological needs of its inhabitants. The philosophy of neighbourhood environment design has limited scope or area and limited by the connector road with the center of the higher hierarchy, completed with daily neighbourhood unit facility which can be accessed by walking safely and comfortably by its citizens (Perry, 1929; Reiner, 1963). The limitation of neighbourhood unit can be defined from the criteria of size, with the parameter of the distance to the elementary school (800 meters) and the number of citizens are 1.500-5.000; and also boundaries in the form of main road network (and collector) as the border (De Chiara, Panero, & Zelnik, 1995; Pancarrani & Pigawati, 2014; Perry, 1929; Reiner, 1963).

So, the elementary school as a child friendly social infrastructure must fulfill the criteria of serving capacity toward the number of citizens, safe and comfortable access for children, and prevalent access including for disabled children (Biggs & Carr, 2015; Charles et. al., 2006; Derr et. al., 2013; Woolcock et. al., 2010). Moreover, elementary school must have complete facility and infrastructure such as classroom, library, laboratory, headmaster room, teacher room, worship room, medical room, toilet, warehouse, playground, and sport field (Kyttä, 2004). Related to safety and comfortability in accessing elementary school, the facilities and infrastructure must be provided, such as School Safety Zone, street signage, street barrier, speed hump, street shade, and sitting group (rest area) of pedestrian track/sidewalk (Subulussalam, Rahayu, & Utomo, 2015).

Surakarta is one of sequential cities in the implementation of child friendly city concept, by gaining the appreciation of Nidya category in 2011. Related to the child friendly social infrastructure, the commitment of Surakarta was strengthened by proclaiming the vision to establish child friendly city in 2016, by building and developing social infrastructure and facilities in the city to kelurahan (village) levels. However, even though the social infrastructure development had been carried out in 51 kelurahan, it was still not in balance with the scope of serving area and the number of the children. Based on Indonesian National Standard (SNI) no 03-1733-2004 (BSN, 2004), Surakarta population was 500.000 people in 2004 and it ideally had 312 elementary schools. Nowadays, the number of elementary school in Surakarta is 268 schools (Dispendukcapil, 2013), which means that 44 more elementary schools are needed. From 268 elementary schools, there were only 34 elementary schools plus (which got fund for child friendly school program) and 7 inclusive elementary schools. In addtition, majority of street networks in Surakarta are not fulfilled with sidewalk, so that it does not gave guarantee toward the children safety in accessing elementary school. Based on the the problem described above, the research question is, "To what extent is the suitability of elementary school as a social infrastructure at the neighbourhood unit in supporting Surakarta child friendly city?"

2. DATA AND METHODS

2.1. Data

Surakarta has an area of 4,403 Ha, dominated by settlement zone. Referring to the criteria of neighbourhood unit, namely size, boundaries, and locality, Surakarta can be divided into 127 neighbourhood units (Putri et al., 2014). Surakarta has 268 elementary schools, in which there are only 34 elementary schools plus (which get fund for child friendly school program) and 7 inclusive elementary schools (BP3AKB, 2013). Each elementary school has various accessibilities based on fulfillment of distance criteria between the school and the farthest house which is reachable for children, free of continue traffic, separation of vehicle and pedestrian tracks, and guarantee of children safety in crossing the road (see **Appendix 2**). The completeness of facility and infrastructure in each elementary school is also varied based

on the availability of playground/ field, pedestrian track/sidewalk, school safety zone, street barrier, speed hump, street shade, sitting group (rest area), and street signage (see **Appendix 3**).

Figure 1 Map of Neighbourhood Unit Distribution in Surakarta (Author, 2016)
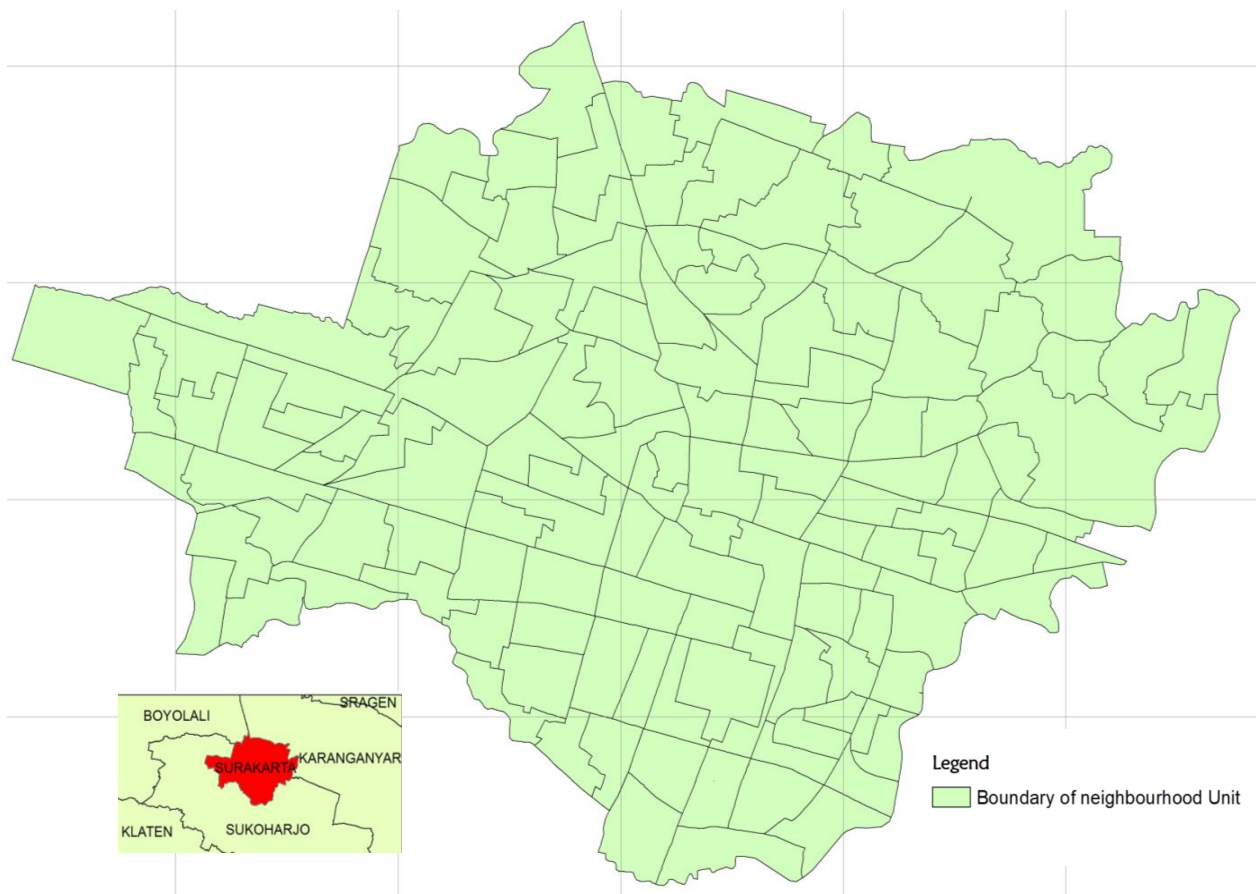
2.2. Methods

This study used deductive research approach, in which the research variables were previously defined and then they were used to arrange the necessary data. The data were then analyzed to know the suitability of elementary school in supporting child friendly city. The research aim was achieved through three targets using spatial analysis methods as follows:

A. Identification of Elementary School Serving Scope in Surakarta

The aim of this target was to know the zones of neighbourhood unit in Surakarta which belonged to elementary school serving scope. Identification of education facility serving scope was carried out by GIS mapping method (Wridt, 2010) based on the criteria of size (radius 800 meters from elementary school building) and boundaries (artery and collector borders). The result of this target would be basic map for the next analysis steps.

B. Identification of Elementary School Suitability Aspect as Neighbourhood Unit Scale Social Infrastructure in Supporting Surakarta Child Friendly

Identification of suitability aspect was carried out by documenting four suitability criteria, namely the serving capacity of education facility toward the number of citizen (K1), accessibility (K2), the completeness of supporting infrastructure of elementary school (K3), and prevalent access of elementary school facility (K4) as follows;

1) K1 (Serving Capacity of Education Facility Toward the Number of Citizen)

It was to know the implementation of elementary school service in each neighbourhood unit in Surakarta. It was carried out based on standard optimum scope of elementary school facility toward the number of citizen, in which K1 category was divided into three criteria as can be seen in **Table 1**.

2) K2 (Safe and Comfortable Accessibility)

The data were based on the observation result, the citizens' perception, and the children's perception. The citizens' perception was gained from questionnaire with the respondent criteria of household with elementary school aged children and had settled for at least 5 years (Putri, et. al., 2014). The criteria were based on the assumption that during 5 years living, the citizens had known the environment well, with the sample of 399 respondents. The number of the sample was then divided proportionally toward the household number in each neighbourhood unit zone.

The children's perception was identified based on questionnaire method with the criteria of children respondents who lived in neighbourhood unit zone. The sample in defining children's perception was gained by previously defining the sample number of elementary school using Slovin formula. The population of elementary school in Surakarta was 268 schools and 60 schools were chosen randomly. From the 60 schools, the children sample was calculated from population of 20,655 students. By using Isaac dan Michael table, 342 samples of elementary school students were proportionally divided toward the number of elementary school sample. Because there were three studies, namely normative study, citizens' perception, and children's perception, the average of the three studies was gained. Each scoring was classified into three categories as describe in **Table 1**.

3) K3 (Completeness Supporting Infrastructure of Elementary School))

The completeness of supporting infrastructure was carried out by doing observation toward elementary school in Surakarta. There were 60 elementary school samples in this study. There were several aspects in the supporting facility and infrastructure, namely play ground, pedestrian track, School Safety Zone (ZOSS)/Zebra Cross, street barrier, speed hump, street shade, pedestrian sitting group (rest area), and street signage. The scoring was carried out in each elementary school by giving poin 1 for available infrastructure and then calculated. The score of each elementary school was classified into three categories as can be seen in **Table 2.**

4) K4 (Prevalent Access of Elementary School Facility)

Prevalent access of elementary school facility was the condition which enabled schools to serve all children, including disable children. To know the prevalent access of elementary school facility, it was carried out by observation toward elementary schools which then classified into three categories as describe in **Table 2**.

Table 1. Scoring Criteria (1) (Author, 2016)

Serving Capacity Toward the Number of Citizen (K1)		
Highly fulfilled (HF)	Fulfilled (F)	Not Fulfilled (NF)
<1,600 citizen/ES (Elementary School)	1,600 citizen/ES	>1,600 citizen/ES

Safe and Comfortable Access (K2)								
Observation			Citizens' perception			Children's perception		
Highly Fulfilled (HF)	Fulfilled (F)	Not Fulfilled (NF)	Highly Fulfilled (HF)	Fulfilled (F)	Not Fulfilled (NF)	Highly Fulfilled (HF)	Fulfilled (F)	Not Fulfilled (NF)
Radius <800 m (from the farthest house)	Radius 800-1000 meters (from the farthest house)	Radius >1000 meters (from the farthest house)	Very reachable	Reachable	Not reachable	Feel comfortable and safe (in walking)	Feel comfortable and not safe or feel safe but not comfortable (in walking)	Not feel comfortable and safe (in walking)
All of the street have width of pavement 3,5-6 meter, and have different material of pavement	Most of the street have pavement 3,5-6 meters	Wide, not suitable with the criteria and not have different pavement	Very safe	safe	Not safe			
There is separation barrier of pedestrian and vehicle track.	There is separation barrier of pedestrian and motor vehicle	There is no separation barrier	Very safe	safe	Not safe			
Elementary School in Environmental road: There is crossing-road facility	**Elementary School in Environmental road:** There is crossing-road facility	**Elementary School in Environmental road:** There is no crossing-road facility	Very safe	Safe	Not safe			
Elementary School in the higher local hierarchy road: There is unlevel street crossing facility, completed by ZoSS	**Elementary School in the higher local hierarchy road:** There is crossing facility, completed by ZoSS	**Elementary School in the higher local hierarchy road:** There is no crossing facility	-	-	-			

Table 2. Scoring Criteria (2) (Author, 2016)

Completeness of Supporting Infrastructure (K3)		
HF	F	NF
Score 6-8	Score 3-5	Score 0-2
Prevalent Access of Education Facility (K4)		
HF	F	NF
Plus Schools (child friendly schools) and inclusive school	Inclusive school	Disable students are rejected.

C. Analysis on Elementary School Suitability as Neighbourhood Unit Scale Social Infrastructure in Supporting Surakarta Child Friendly

Suitability analysis was carried out by using scoring technique and weighting with data input from the percentage of each criteria gained before. Weigh was the multiplier factor from each percentage of each criteria. Percentage of Not Fulfilled (NF) had weigh 1, Percentage of Fulfilled (F) had weigh 2, and Percentage of Highly fulfilled (HF) had weigh 3. Therefore, the highest score was 300, while the lowest score was 100. Then, the weighting result was classified into three classes of interval, namely 100-166.67 had score 1; 166.68-233.34 had score 2; 233.35-300 had score 3.

Based on the last scoring result of the criteria, the last scoring process took place entirely to determine the elementary school suitability as neighbourhood unit scale social infrastructure in supporting Surakarta Child Friendly. From the calculation result of all criteria, it was known that the lowest score was 4 and the highest was 12, so the class interval became 4-6.67 (Not Suitable); 6.68-13.34 (Suitable); and 13.35-12 (Very Suitable).

3. RESULTS AND DISCUSSION

The results are discussed in three sections, namely neighbourhood unit zone determination, suitability characteristic which consists of four aspects (K1, K2, K3, and K4), and suitability of elementary school facility in supporting Surakarta Child Friendly.

3.1. Serving Capacity of The Elementary School in Surakarta

Identification of serving capacity in Surakarta needed to do to make limitation of research area as the base of the next analysis. It was aimed to know neighbourhood unit area based on size and boundaries criteria. According to (De Chiara et al., 1995; Eisner, Gallion, & Eisner, 1993; Perry, 1929) the scope of neighbourhood unit was as far as 800 meters from the location of elementary school to be reached by children by walking.

The number was used as base in determining maximum radius of elementary school in Surakarta. In the criteria of boundaries, artery/collector roads were the bases in determining neighbourhood unit. The mapping result of the two criteria was then overlaid by GIS so that there were 102 zones of neighbourhood unit (3,880.16 Ha) which were served by elementary school. These zones then became the base for the next analysis. There were 25 zones or with the area of 523.8 Ha which were not reached by elementary school service (see **Figure 2**).

Figure 2. Map of Elementary School Serving Capacity in Each Neighbourhood Unit in Surakarta (Analysis, 2016)
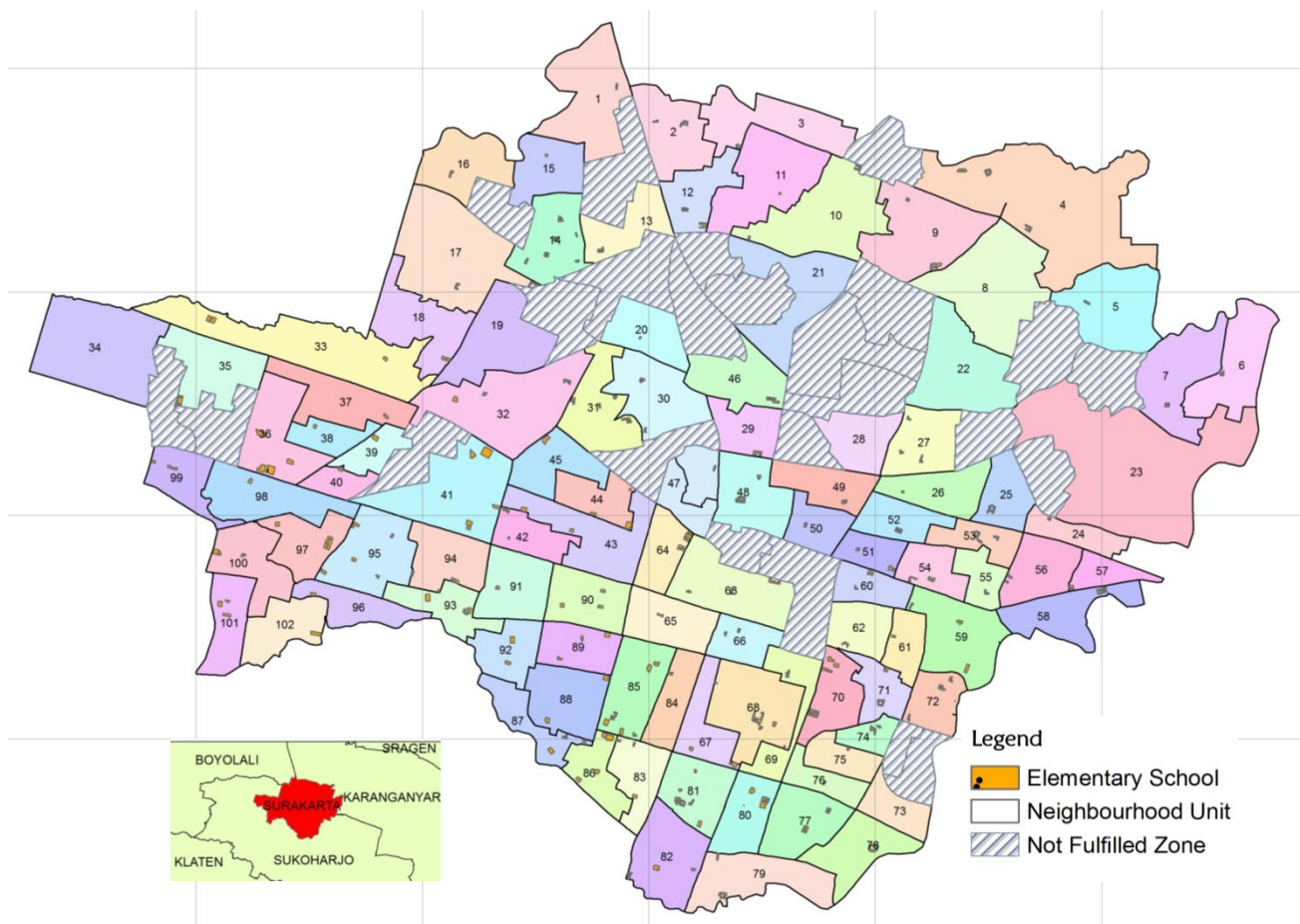

3.2. Suitability Characteristics

a) K1 (Serving Capacity of Elementary School Facility Toward the Number of Citizen)

The serving capacity of elementary school facility toward the number of citizen was known by the result of scoring analysis. There were 37 education facilities in neighbourhood unit zone or 36.27% with the category of highly fulfilled by elementary school facility service. The rest, 65 of education facilities in neighbourhood unit zone or 63.73 % had not fulfilled category. In other words, the number of citizen in the 65 neighbourhood unit zones was more than the serving capacity of elementary school facility (see **Figure 3**).
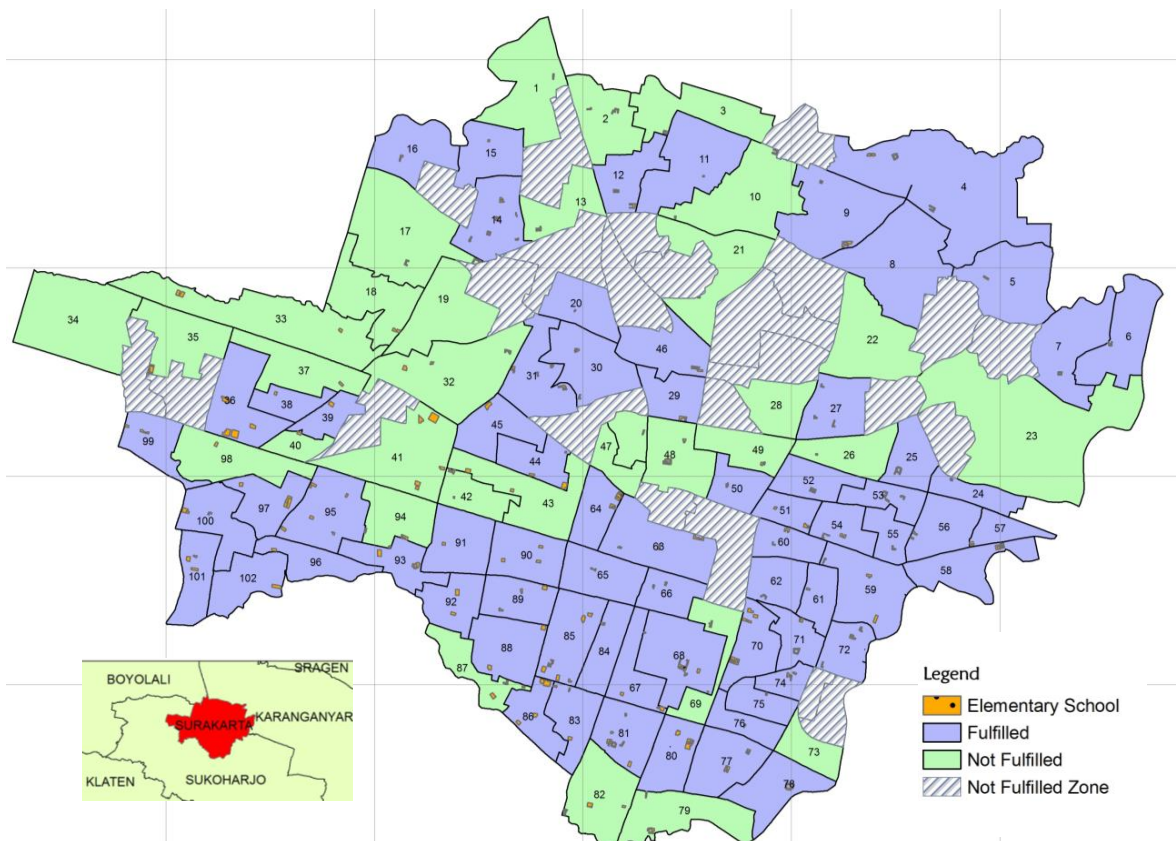
b) K2 (Safe and Comfortable Accessibility)

Based on analysis result, most of the elementary school in neighbourhood unit zones had fulfilled the safe and comfortable accessibility for children to reach the school. Elementary schools with the category of fulfilled were 64.71% or 66 education facilities. As much as 35.29% or 36 elementary school had the criteria of not fulfilled. In other words, the zones did not have safe and comfortable accessibility. There was no elementary school with the criteria of highly fulfilled (see **Figure 4**).

Figure 3. Distribution Map of Neighbourhood Unit
Based on Serving Capacity (Analysis, 2016)

Legend
- Elementary School
- Highly Fulfilled
- Not Fulfilled
- Not Fulfilled Zone
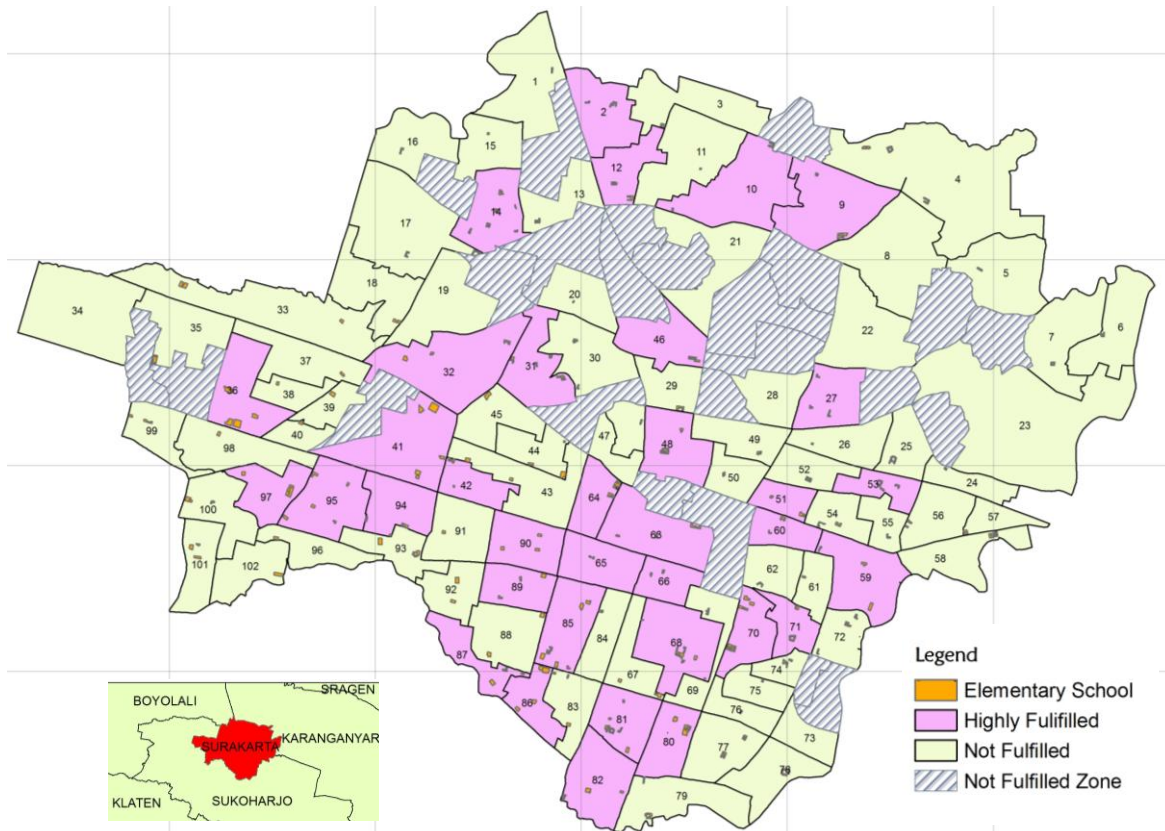
Figure 4. Distribution Map of Neighbourhood Unit
Based on Comfort and Secure Accessibility (Analysis, 2016)

Legend
- Elementary School
- Fulfilled
- Not Fulfilled
- Not Fulfilled Zone

Identification was carried out based on the citizens' perception toward accessibility in reaching elementary school. Most of the citizens believed that each elementary school had safe and comfortable accessibility. There were 66 elementary school with the criteria of fulfilled based on the citizens' perception or 64.71%. Elementary school with the criteria of highly fulfilled were 7 zones or 6.86%, while the criteria of not fulfilled were 28.43% or 29 elementary school (see **Figure 5**).

Figure 5. Distribution Map of Neighbourhood Unit
Based on Comfort and Secure Accessibility for Children Criteria (Citizen Perception) (Analysis, 2016)
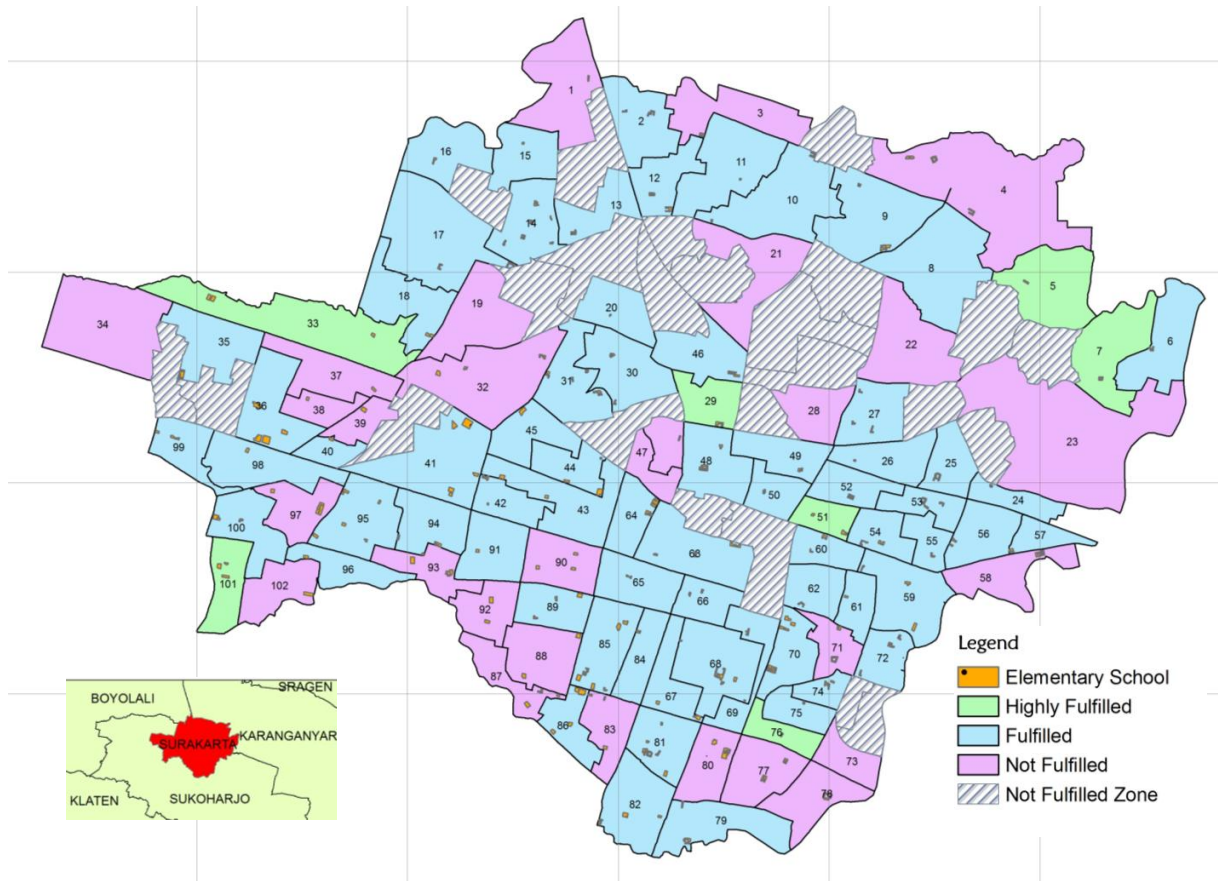
Identification was carried out by previously knowing the number of sample schools, then the number of children was determined. The number of sample school was 60 schools, with the sample number of students 342. In general, the children who walked to school considered that the elementary school had fulfilled the criteria of safe and comfortable accessibility very well. As many as 44.83% of elementary school were considered to have safe and comfortable accessibility for children. As many as 37.93% of elementary school had the category of fulfilled in the aspect of safe and comfortable accessibility for children. While, 17.24% of elementary school did not fulfilled the criteria of safe and comfortable accessibility for children.

c)   Completeness of Elementary School Supporting Infrastructure (K3)

The completeness of elementary school infrastructure was seen from the availability of play ground, pedestrian track, School Safety Zone (ZOSS)/Zebra Cross, street barrier, speed hump, street shade, rest area (sitting group of pedestrian track) and street signage. The completeness of elementary school supporting infrastructure was gained from observation in 60 schools in Surakarta with the result in **Appendix 3**. The percentage of completeness was seen from the availability of elementary school infrastructure. Most of the education facilities did not fulfill the supporting infrastructure (58.33%). There were only 25% of education facilities which fulfilled the criteria, while the other 16.67% had highly fulfilled criteria. From seven

supporting infrastructure there was no elementary school which had rest area (sitting group of pedestrian track). Most of the elementary school had garden as one of the completeness of elementary school supporting infrastructure.

d) Access for Disable Children (K4)

Prevalent access of elementary school facility was measured based on the availability of elementary school facility to serve disable children. There was only one neighbourhood unit had elementary school (0.98%) with the criteria of highly fulfilled. Most of the neighbourhood unit in Surakarta did not fulfill the access for disable children. This number reached 77.45% or 79 neighbourhood unit. The rest, 21.57% of neighbourhood unit (22 zones) had the criteria of fulfilled.

3.3. Suitability of Elementary Education as Neighbourhood Unit Scale Social Infrastructure in Supporting Surakarta Child Friendly City

Suitability of elementary school in supporting Surakarta child friendly city was known from the scoring result of K1, K2, K3, and K4 (see **Appendix 1**). The highest score for the category of highly fulfilled was in the aspect of serving capacity toward the number of citizen (36.27%), while the lowest was in the aspect of prevalent access for disable children (0.98%). It showed that elementary schools in Surakarta had not been able to give prevalent service for all children, including for those who were disable. There were only 7 elementary schools which implemented inclusive schools.

Even though the percentage of highly fulfilled was quite low, but the percentage of fulfilled was quite high. The highest score for the category of fulfilled was the average score of safe and comfortable accessibility for children, as many as 55.78%. However, there was quite significant percentage difference between the normative study (observation result) and the citizens' perception, with children's perception. The result of observation and percentage of the citizens' perception was the same 64.71%, while, the children's perception was only 37.93%. It meant that there was different need of accessibility between the adults' and children's thinking pattern or normative study. Therefore, there was potentially other criteria which could be acknowledged in the next research related to variables of accessibility which was comfortable for children.

In other hand, there were criteria which only got the percentage of 0% in the category of fulfilled, namely serving capacity aspect toward the number of citizen. It meant that there was no zone which fulfilled the criteria of fulfilled in the aspect of serving capacity toward the number of citizen. However, in this criteria, there were 36.27% in the category of highly fulfilled, which meant that there was unequal citizen density in the radius of 800 meters from elementary school. It indicated that citizen distribution in Surakarta was not quite equal, so that there was gap of number of citizen served by the elementary school.

Such an irony for Surakarta city which got the appreciation of Nindya category for the child friendly city. The average percentage of not fulfilled was 56.60%, far from the category of highly fulfilled (17.3%) and fulfilled (25.6%). This case, in general, showed that most of neighbourhood unit zones in Surakarta city had not fulfilled the criteria of K1, K2, K3 and K4 aspects in supporting child friendly city (See **Table 3**). The aspect which mostly did not fulfill the criteria was K4 (77.45%). It meant that 77.45% of neighbourhood unit zones in Surakarta did not provide prevalent access including for disable children. In contrary, the lowest score was in average of accessibility criteria which was safe and comfortable (26.99%). It meant that the majority of neighbourhood unit zones included in the category of able to fulfill the accessibility indicator in reaching elementary education from each house.

Table 3. Final Scoring Result (Analysis, 2016)

Criteria	Score
K1	2
K2	2
K3	1
K4	1
Total Score	6 (Not Suitable)

Based on the result of scoring analysis and weighting of four criteria, the final result showed that elementary school social infrastructure in Surakarta had not been able to support the establishment of child friendly city. This result was gained from 102 neighbourhood unit zones or 88% of the area of Surakarta which were served by elementary school social infrastructure seen from the radius of 800 meters from the schools. Meanwhile, 25 neighbourhood unit zones or 12% from the area of Surakarta even were not reachable by the elementary school service. It meant that the level of fulfillment of Surakarta in elementary school service as child friendly city was still low.

4. CONCLUSION

4.1. Conclusion

The establishment of Surakarta as a child friendly city must be comprehensive and down to the level of neighbourhood unit, especially when considering that infrastructure and facilities at the neighbourhood unit are daily used by children and should be within their walking distance. Elementary schools in Surakarta have not been able to support the establishment of child friendly city. From the total area of 4,403 Ha, there are only 3,879.2 Ha or 88% of the area which included in the ideal serving radius of elementary schools. There are 523.8 Ha or 12% of Surakarta area that is not included in the ideal serving radius of any elementary school. It means that the elementary school age children in those areas cannot get their rights to reach schools independently (by walking).

Meanwhile, in the area that is within the ideal serving radius of elementary schools, it is found out that many of the neighbourhood units do not fulfill the four criteria of child friendly infrastructure, whether in the serving capacity toward the number of citizens, safe and comfortable accessibility, completeness of elementary school supporting infrastructure, as well as prevalent access including for disabled children. The order of priority to improve the situation based on the scores is as follows: (1) prevalent access for disable children; (2) serving capacity toward the number of citizens; (3) completeness of elementary school supporting infrastructure; and (4) safe and comfortable access in reaching elementary school facility.

4.2. Suggestion

Elementary schools are vital in supporting the establishment of Surakarta child friendly city. Therefore, planning and development of elementary school as neighbourhood social infrastructure should fulfill the criteria of child friendly infrastructure. The priority of elementary school service improvement can be done as follows: (1) building elementary schools in neighbourhood unit zones which are not included in the serving radius of elementary school, by considering the population trend of 7-12 year-old children in the area; (2) improving the number of inclusive schools or equalization of the plus school program; (3) improving the admission capacity of elementary schools (through parallel classes); (4) improving the completeness of facility and infrastructure of elementary education; and (5) improving the security and comfort in reaching the elementary schools by considering the children's aspiration.

5. REFERENCES

Badan Standarisasi Nasional. (2004). *SNI 03-1733-2004 Tentang Tata Cara Perencanaan Lingkungan Perumahan di Perkotaan*. *Jakarta: BSN*.

Biggs, S., & Carr, A. (2015). Age-and Child-Friendly Cities and the Promise of Intergenerational Space. *Journal of Social Work Practice*, *29*(1), 99–112.

BP3AKB. (2013). *Profil Anak Kota Surakarta 2013*. Surakarta: BP3AKB.

Charles, J. R. et al. (2006). Efficacy of a child-friendly form of constraint-induced movement therapy in hemiplegic cerebral palsy: a randomized control trial. *Developmental Medicine & Child Neurology*, *48*(08), 635–642.

De Chiara, J. et al. (1995). *Time-saver standards for housing and residential development*. McGraw-Hill Companies.

Derr, V. et al. (2013). A City for All Citizens: Integrating Children and Youth from Marginalized Populations into City Planning. *Buildings*, *3*(3), 482–505. http://doi.org/10.3390/buildings3030482

Dinas Kependudukan dan Pencatatan Sipil Kota Surakarta. (2013). *Statistik Tahun 2013 : Penduduk Menurut Karakteristik Demografi*, Retrieved from http://dispendukcapil.surakarta.go.id

Eisner, S. et al. (1993). *The urban pattern*. John Wiley & Sons.

Joga, N. (2013). *Gerakan Kota Hijau*. Jakarta: Gramedia Pustaka Utama.

Kementerian Pemberdayaan Perempuan dan Perlindungan Anak. (2011). *Permen Nomor 11 Tahun 2011 tentang Kebijakan Pengembangan Kabupaten/Kota Layak Anak (KLA)*. Jakarta: Sekretariat Negara Republik Indonesia

Kementerian Pemberdayaan Perempuan dan Perlindungan Anak. (2011). *Permen Nomor 12 Tahun 2011 tentang Indikator Kabupaten/Kota Layak Anak (KLA)*. Jakarta: Sekretariat Negara Republik Indonesia

Kyttä, M. (2004). The extent of children's independent mobility and the number of actualized affordances as criteria for child-friendly environments. *Journal of Environmental Psychology*, *24*(2), 179–198.

Pancarrani, G., & Pigawati, B. (2014). Evaluasi Kesesuaian Lokasi dan Jangkauan Pelayanan Sekolah Menengah Umum di Kecamatan Kebakkramat Kabupaten Karanganyar. *Geoplanning: Journal of Geomatics and Planning*, *1*(2), 65-73

Perry, C. A. (1929). The Neighbourhood Unit. Neighbourhood and Community Planning. *Regional Plan of New York and Its Environs, Regional Survey*, *7*.

Prasetyo, M. I. (2013). Evaluasi Kebijakan Sidoarjo Kota Ramah Anak di Kecamatan Krembung, Kabupaten Sidoarjo. *Kebijakan Dan Manajemen Publik*, *1*(1), 149–156.

Putri, R. A. et al. (2014). *Model Pemberdayaan Pengadaan Infrastruktur Sosial Berkelanjutan Skala Neighbourhood Unit Menuju Surakarta Layak Anak*. Research Report. LPPM Sebelas Maret University.

Reiner, T. A. (1963). *The place of the ideal community in urban planning*. University of Pennsylvania Press.

Subulussalam, M. D. et al. (2015). Peran Pelayanan Sekolah Dasar Dalam Mendukung Kota Layak Anak di Surakarta. *Arsitektura*, *13*(2).

Woolcock, G. et al. (2010). Urban research and child-friendly cities: a new Australian outline. *Children's Geographies*, *8*(2), 177–192.

Wridt, P. (2010). A qualitative GIS approach to mapping urban neighbourhoods with children to promote physical activity and child-friendly community planning. *Environment and Planning B: Planning and Design*, *37*(1), 129–147.

APPENDICES

Appendix 1.Scoring result of K1, K2, K3, K4

Criteria	Neighbourhood Unit Zone	Total	Percentage	Score
	Scoring result of K1			
HF	2,4,9,10,12,14,27,46,31,32,36,41,42,64,63,48,60,51,53,59,71,70,68,66,85, 65,90,94,95,97,89,87,86,81,82,80,71	37	36.27	108.81
F	-	0	0	0
NF	1,3,5,6,7,8,11,13,15,16,17,18,19,20,21,22,23,24,25,26,28,29,30,33,34,35, 37,38,40,39,43,45,44,47,49,50,62,52,54,55,56,57,58,61,72,69,67,84,91,98, 99,100,101,102,96,93,92,88,83,79,77,73,76,75,74	65	63.73	63.73
	Suitability Result of K1			**172.54**
	Observation			
HF		0	0	0
F	5,6,7,9,11,12,14,15,16,20,24,25,27,29,30,31,36,38,39,45,44,64,63,50,62,60 ,51,52,53,54,55,56,57,58,59,61,72,71,70,68,67,66,84,85,65,90,91,95,97,99, 100,101,102,93,92,89,88,86,83,81,80,77,78,76,75,74	66	64.71	
NF	1,2,3,4,8,10,13,17,18,19,21,22,23,26,28,32,33,34,35,37,49,41,42,43,47,48, 49,69,94,98,96,87,82,79,73,40	36	35.29	
	Citizens' Perception			
HF	5,7,29, 33,51,101,76	7	0.98	
F	2,6,9,10,11,12,13,14,15,16,17,18, 20,24,25,26,27,46,48, 30,31,35,36,40, 41,42, 43,45, 44, 64, 63, 49, 50, 62, 60, 52, 53, 54, 55, 56,57,59, 61,72, 70,69, 68,67, 66,84, 85, 65,91, 94, 95, 98, 99, 100, 96, 89,86, 81, 82, 79, 75,74,	66	64.71	
NF	1, 3,4, 8, 19, 21, 22, 23, 28, 32,34, 37, 38, 39, 47, 58, 71, 90, 97, 102, 93, 92, 88,87, 83, 80, 77, 78, 73	29	28.43	
	Children's perception (Appendix 2)			
	HF *	52	4.83	
	F *	44	37.93	
	NF *	20	17.24	
	Average Scoring Result of K2			
	HF		15.27	45.80
	F		55.78	111.56
	NF		26.98	26.98
	Suitabiliy Result of K2			**184,34**
	Scoring Result of K3 (Appendix 3)			
	HF *	10	16.67	50.01
	F *	15	25	50
	NF *	35	58.33	58.33
	Suitabiliy Result of K3			**158.34**

			Scoring Result of K4		
HF		89	1	0.98	2.94
F	1, 4,29,32,33,39,52, 54,55,90, 91, 94,97,98, 99, 100, 101, 96, 93, 88, 81, 77		22	21.57	43.14
NF	2,3, 5,6,7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22,23, 24, 25, 26, 27, 28, 46, 30, 31,34, 35, 36, 37, 38, 40, 41, 42, 43, 45, 44, 47, 64, 63, 48, 49, 50, 62, 60, 51, 53, 56, 57,58, 59, 61,72, 71,70, 69, 68, 67, 66, 84,85, 65, 95, 102, 92, 87, 86, 83, 82, 79, 80, 78, 73, 76, 75, 74		79	77.45	77.45
Suitability result of K4					**123.53**

*) Not based on zone, but based on school and children samples

Appendix 2. Documentation Result of Walking Children Perception

Zone	A	B	C	D
1	0	1	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	1	0	0
9	0	1	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	1
13	0	1	1	1
14	0	0	0	0
15	0	0	0	0
16	1	1	1	1
17	0	1	1	0
18	0	1	1	0
19	0	1	1	1
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	1	0	0	0
25	1	0	0	0
26	0	0	0	0
27	0	1	1	0
28	1	1	1	0
29	0	1	1	0
30	0	1	1	1
31	0	0	0	0
32	0	0	0	0
33	0	1	1	1
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	1	0	0

Zone	A	B	C	D
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	1	1	0
43	0	1	0	0
44	0	0	0	0
45	0	1	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	1	1	0	0
53	1	0	0	1
54	1	1	0	0
55	0	1	0	0
56	0	0	0	0
57	0	1	0	0
58	0	1	0	1
59	1	1	1	0
60	0	0	1	0
61	0	1	0	0
62	0	1	0	0
63	0	0	0	0
64	0	1	1	1
65	0	0	0	0
66	0	0	0	1
67	0	0	0	0
68	0	1	0	0
69	0	1	0	0
70	0	1	0	0
71	0	1	0	1
72	0	0	0	1
73	0	0	0	0
74	1	1	0	0
75	0	1	0	0

Zone	A	B	C	D
76	0	1	0	0
77	0	1	0	0
78	0	1	0	0
79	0	1	0	1
80	0	0	0	0
81	0	0	0	0
82	0	1	0	0
83	0	1	0	1
84	0	1	0	0
85	0	0	0	0
86	1	1	0	0
87	0	0	0	0
88	0	1	0	0
89	0	1	0	0
90	0	0	1	0
91	0	1	0	0
92	0	1	0	0
93	0	0	0	0
94	0	0	0	0
95	0	1	0	0
96	0	1	0	0
97	0	0	0	0
98	0	0	0	0
99	0	1	0	0
100	1	1	0	0
101	0	0	0	0
102	0	0	0	0
103	0	1	0	0
104	0	1	0	0
105	0	1	0	1
106	0	1	0	0
107	0	1	0	0
108	0	0	0	0
109	1	1	0	0
110	0	0	0	0
111	0	0	0	0
112	1	0	0	1
113	1	1	0	0

Zone	A	B	C	D
114	0	0	0	0
115	0	0	0	0
116	0	1	0	0

Notes :

A : distance between the school and the farthest house

B : free of continue traffic

C : separation of vehicle and pedestrian tracks,

D : guarantee of children safety in crossing the road

1 : comfortable/safe

0 : not comfortable/not safe

Appendix 3. Documentation Result of Elementary School Supporting Infrastructure Completeness

School's Name	A	B	C	D	E	F	G	H
SDN Cemara 2 Ska	1	1	1	1	0	1	0	1
SDN Kleco 1	1	1	1	1	0	1	0	1
SD II Al Abidin	1	0	0	0	0	0	0	0
SD Al Firdaus	1	0	1	1	0	1	0	1
SD Muhammadiyah 1 Ketelan	1	1	0	1	0	0	0	0
SDN Nusukan 44	1	0	1	0	0	0	0	0
SD Al-Azhar Syifa Budi Solo	1	1	1	1	0	1	0	1
SD Djama Atul Ikhwan	1	0	0	1	0	0	0	0
SD Islam Terpadu Nur Hidayah	1	0	0	0	0	0	0	0
SD Ta'mirul Islam	1	0	0	0	0	0	0	0
SD Marsudirini	1	0	0	0	0	0	0	0
SD Muhammadiyah PK Kota Barat	1	0	1	1	1	1	0	0
SD Pangudi Luhur I	1	0	0	0	0	0	0	0
SDN Joglo	1	0	1	1	0	0	0	1
SD Al Islam 2 Jamsaren	1	0	1	1	0	0	0	1
SDN Cengklik 1	1	1	1	1	0	1	0	1
SD Kristen Kalam Kudus	1	1	1	1	0	1	0	1
SDN Mangkubumen Kidul No 16	1	1	1	1	0	1	0	0
SDN Mangkubumen Lor No 15	1	1	1	1	0	1	0	1
SDN Madyotaman	1	1	1	1	1	1	0	1
SDN Sabranglor	1	0	0	0	0	0	0	0
SDN Kemasan 1	1	0	0	1	0	0	0	0
SDN Mangkuyudan	0	0	1	1	0	0	0	1
SDN Pajang I No 93	1	0	0	0	0	0	0	0
SDN Sriwedari No. 197	1	0	0	0	0	0	0	0
SDN Jajar I	1	0	0	0	0	0	0	0
SDN Laweyan	1	0	0	0	0	0	0	0
SDN Premulung	0	0	0	0	0	0	0	0
SDN Setono	0	0	0	0	0	0	0	0
SDN Kawatan No 19	1	0	0	1	0	1	0	0
SDN Kemasan II	1	0	0	1	1	0	0	0
SDN Serengan I No. 70	1	0	1	0	0	0	0	1
SDN Slembaran	1	0	0	1	0	1	0	0
SD Islam Bakti I Joyotakan	1	0	0	0	0	0	0	0
SD Islam Darussalam Surakarta	0	0	0	0	1	0	0	0
SD Muhammadiyah 14	0	0	0	0	0	0	0	0
SD Muhammadiyah 7	1	0	0	0	0	0	0	0
SD Pamardisiwi	1	0	0	0	0	0	0	0
SD Muhammadiyah 21 Ska	0	0	0	0	0	0	0	0
SDN Baturono No. 136	1	0	0	0	0	0	0	0
SDN Kusumodilagan	1	0	0	0	0	0	0	0
SDN Amanah Umah	1	0	0	0	0	0	0	0
SDN Demangan No. 195	1	0	0	0	0	0	0	0
SDN Pasarkliwon	1	0	0	0	0	0	0	0
SDN Kalangan	1	1	0	1	0	0	0	0

School's Name	A	B	C	D	E	F	G	H
SDN Debegan	1	0	0	0	0	0	0	0
SDN Mijen II	1	0	0	0	0	0	0	0
SDN Mijen I	1	0	0	0	0	0	0	0
SDN Pucangsawit No.119	1	1	0	1	1	1	0	1
SDN Purwodiningratan	1	1	1	1	0	1	0	0
SDN Purwoprajan 2	1	0	0	0	0	1	0	0
SDN Ngemplak No. 149	1	0	0	0	0	0	0	0
SDN Tumenggungan	1	1	1	1	1	1	0	1
SDN Yosodipuro No. 104	1	1	1	1	0	1	0	1
SDN Ketelan No.12	1	0	1	0	0	1	0	1
SDN Munggung II	1	0	0	1	0	0	0	0
SDN Bibis Wetan	1	0	0	0	0	0	0	0
SDN Bibiskalang No. 46	1	1	0	1	0	0	0	0
SDN Bibisluhur I No. 147	1	0	0	1	0	0	0	0
SDN Bibisluhur II No.203	1	0	0	1	0	0	0	0
Jumlah	53	15	19	27	6	18	0	16

Notes :

A: Garden/ field/Play ground

B: Pedestrian track

C: School Safety Zone (ZoSS)

D: Street Barrier

E: speed hump

F: shade street

G: Rest area (Sitting group of pedestrian track)

H: Street Signage

1: Available

0: Unavailable