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Performance of park as public space on the needs, availability, and affordability of services in Salatiga City (Study: Pancasila Park, Tingkir Park, Bendosari Park, and Sidomukti Park)

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ABSTRACT

Park as a public space is widely recognized in the global agenda to meet the targets of sustainable development goals in SDGs 3 and SDGs 11 to make cities and settlements healthy, inclusive, resilient and sustainable through the provision of Green Open Space (GOS). The commitment of Indonesian Government related to GOS is stated in the laws, the standard states that GOS in urban areas is 30% of the total area in which 12.5% is contained as a park in every settlement scale. Currently, Salatiga City has 4 parks with an average area of below 24,000 m^2 and there are several residence and settlement-scale parks with an area below 250 m^2. The purpose of this study is to determine park quantity against the needs, availability, and affordability. This study used a Geographic Information System (GIS) approach with a network analysist. Data collection method used questionnaire, observation and document review. The study showed (1) Based on the comparison between the existing needs and conditions of parks from 23 sub-districts, there were 9 sub-districts that had not met it 2) Based on the network analysis, the service affordability of 4 parks was only 57.53% of the urban area that had been served by parks, most of the areas in Argomulyo District had not been served. This study is a new study on park performance assessment with spatial analysis so future park development prioritizes areas that have a value gap between existing needs and conditions and have not been afforded by park service areas. The results of this study can be taken into consideration in the future development of park with a comprehensive analysis and database.

Keywords: public space; park; needs; affordability; services; GIS.

INTRODUCTION

Every year, cities in the world experience an increase in the number of people living in cities or what we call the phenomenon of urbanization. The growth rate in Indonesia has increased since 2016 by 2.5% so the urbanization rate is estimated to reach 68% in 2035 and 73% in 2045 (Sarosa, 2020). As the population increases, it will affect land use and lead to environmental degradation if not managed. Urban space as a balancer for ecosystems is in the form of green space which will be displaced by the use of built-up land since it is considered to have more economic value than green space which has no economic value (Ismaun, 2011). As a result of the declining environmental quality, the world responds by planning urban areas through the Sustainable Development Goals (SDGs) with one of its indicators related to ecological sustainability. Through SDGs 3 and SDGs 11, we are committed to providing inclusive, safe, resilient and sustainable public spaces. In Indonesia, the provision of Green Open Space is contained in the mandate of Law Number 26 of 2007 on spatial planning, which states that every city is required to provide GOS of 30% from the total area. For urban communities, a green area becomes a place for refreshment and relaxation both physically and mentally. Urban residents often look for places to recover physically and mentally for the better by interacting or accessing nature (Korpela in Neuvonen et al., 2007). Therefore, GOS is needed nearby settlements, it is supported by the findings of Hansen-Møller & Oustrup (2004) that GOS nearby settlements will have stronger contact with nature and as a place for physical exercises. It is related to the minimum amount of exercise recommended to maintain physical health, which is 30 minutes (Miilunpalo, 2001).

Salatiga City, one of the cities in Central Java Province, is located between the Joglosemar area (Jogjakarta, Solo, and Semarang). This condition causes the population growth rate to be

higher than Central Java Province (Purnomo et al, 2015). The increase in population will have an impact on land use in Salatiga City, an increase in built-up land such as housing and several other activities to support the economy. The development of settlements in Salatiga City showed that during 2006-2016, the largest developed settlement increased by 15.933% in Dukuh Sub-District and 6.26% in Tegalrejo Sub-District (Rahmawan, 2019). The settlement development will affect the land carrying capacity value which will have an impact on natural physical problems like flood. According to Department of Environment of Salatiga City in 2017, Salatiga City has a park area of 4.68 hectares or 0.08% from the total area. Salatiga City has 4 districts with 4 active parks but not all parks are used optimally by the community as indicated by the visit intensity patterns. Given the important benefit role of park as GOS it is necessary to conduct identification related to the provision of parks in terms of needs, availability and affordability of services. Therefore, this study was used to determine the extent of the success rate of parks in Salatiga City comprehensively through spatial and non-spatial analysis with three objectives (1) measuring the comparison of park needs and availability and (2) measuring park affordability.

Park as Public Space

Stephen Carr states that there are five human needs in space, namely the need for comfort, relaxation, passive involvement, active involvement and discovery (Carr et al., 1992). Study reveals that urban public spaces enable people to fulfill these five needs and the most important role in fulfilling these needs lies in two types of urban public spaces, namely park and square (Bier in Micek & Staszewska, 2019).

Park Provision Needs in Cities

There are several assumptions underlying a needs assessment (1) a needs assessment is driven by the idea that the population for whom a park is planned should be calculated according to needs (Smoyer-Tomic et al., 2004), (2) a needs assessment assumes that the spatial distribution of population spread and resources in a given area are not even (Nicholls, 2001), (3) a needs assessment assumes that people will minimize travel costs (for example time, fuel, energy) by using resources closest to them (Harnik & Simms, 2004; Macintyre et al. al., 2008). The National Recreation Association (N.R.A) standards implement an allocation of 4 ha for 1,000 residents or 40 m2 per capita. However, in 1970, the park standard approach sparked criticism for applying the standards without taking into account the changes of demographic pattern, preference, and recreational behavior. In Indonesia, the determination of GOS area based on population is conducted by multiplying the population being served with the standard GOS area per capita in accordance with applicable regulations. The need for GOS based on the total population is 20 meters per person with details of 2.3 m2 per capita for park needs in each environmental unit.

Park Service Affordability

Quantity assessment can be combined with Geographic Information System (GIS) through the measurement of distance by identifying households or settlement centers within a certain distance value from GOS points (Kasperidus et al., 2008). UN-HABITAT issued a walking radius guidelines as the distance to reach public facilities by walking for five minutes or the equivalent of a distance of 400 meters using GIS software (UN-Habitat, 2020). There are three possible recommended travel distances (Byrne & Sipe, 2010) which scrutinizes a best practice guide for GOS provision:

1) Zone one of 400-meter distance, is the maximum distance that can be covered physically by adults with unhealthy conditions, old age, and unable to walk within 10 minutes
2) Zone two of 800-meter distance, is the maximum average distance that can be covered by a healthy adult who can walk for 10 minutes
3) Zone three of 2500-meter or 2.5-km distance, is the maximum average distance a physically fit adult can expect to cycle over the same period of time

RESEARCH METHODS

This study uses 2 measurement steps:

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1. Measuring comparison between park needs and availability
   The measurement of park needs based on population is calculated according to population in 2020 and projections are carried out for the next 20 years. Meanwhile, data on the park availability is obtained from the relevant agencies, namely Department of Environment of Salatiga City. Then the data is processed in Microsoft Excel to find out any comparison between the needs and the availability of parks in each sub-district of Salatiga City.
2. Measuring park service affordability.

   The measurement of park service affordability radius is carried out with the help of ArcGis using the Network Analyst tool. Network Analyst is a type of network analysis to determine the area covered with all accessible roads.

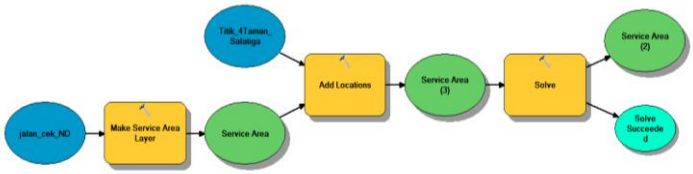

Figure 1 Park Service Affordability Analysis Process Scheme using Builder Model

RESULT AND DISCUSSION

Location of Study

The study was conducted in Salatiga City with an area of 5,678,110 hectares. Administratively, Salatiga City has 4 districts and 23 sub-districts, the focus of this study is 4 parks in Salatiga City namely Pancasila Park, Tingkir Park, Bendosari Park and Sidomukti Park. The four parks are spread across four districts, Pancasila Park is in Sidorejo District, Tingkir Park is in Tingkir District, Bendosari Park is in Argomulyo District, and Sidomukti Park is in Sidomukti District.

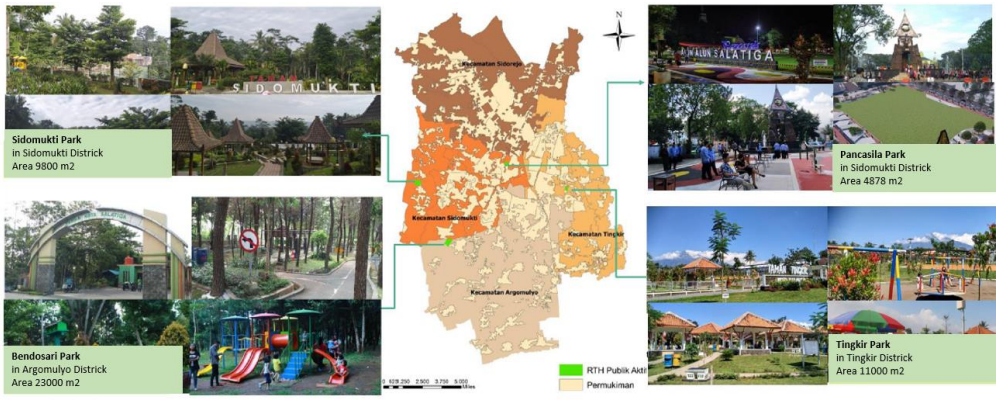

Figure 2. Location of Study

Result of Analysis

The results of the analysis on the performance of park quantity provision consist of two discussions, the first is measuring the comparison between park needs and availability, and the second is measuring park affordability, with the following explanations:

1. **Measuring the Comparison between Park Needs and Availability**

- Measuring Park Needs

  Park needs based on population is the standard used by most countries in the world, the standard is then adjusted to urban characteristics as a starting point to offer a basis for planning park provision. Therefore, the standard becomes 28.5 m2 per capita to 56 m2 per capita, while

in Indonesia it is governed in Ministerial Regulation number 5 of 2008. The followings are the calculation of needs based on population.

Table 1. Calculation of Park Needs

Calculation on	Standard	Park Type	Standard	Measuring (2020)
Population	Statewide et al., 2016	Taman Mini (*Mini Park*)	2,5 - 5 $m^2/_{capita}$	49,02 - 98,04 hectare
		Taman Lingkungan Bermain (*Neighborhood Playgrounds*)	5 - 15 $m^2/_{capita}$	98,04 - 294,12 hectare
		Taman Lingkungan (*Neighborhood Parks*)	10 - 20 $m^2/_{capita}$	196,08- 392,16 hectare
		Bidang Bermain Komunitas (*Community Playfields*)	5 - 8 $m^2/_{capita}$	98,04 - 156,87 hectare
		Taman Komunitas (*Comunity Park*)	5 - 8 $m^2/_{capita}$	98,04- 156,87 hectare
		Total	27,5 - 56 $m^2/_{capita}$	539,23 - 1098,06 hectare
		Percent of Area		9,50 %- 19,34 %
	Permen PU No 5 tahun 2008	RTs Park	1 $m^2/_{capita}$	19,61 hectare
		RWs Park	0,5 $m^2/_{capita}$	9,80 hectare
		Sub-District Pak	0,3 $m^2/_{capita}$	5,88 hectare
		District Park	0,2 $m^2/_{capita}$	3,92 hectare
		City Park	0,3 $m^2/_{capita}$	5,88 hectare
		Total	2,3 $^2/_{capita}$	45,10 hectare
		Percent of Area		0,79 %

- Park Availability

According to the data from Bappelitbangda in the Salatiga City GOS Roadmap document, Salatiga City is currently having a park area of 532.72 hectares or 0.93% of the Salatiga City area.

Tabel 2 Existing Park Condition

Number	Sub-districts	District Park (m^2)	Sub-districts Park (m^2)	City Park (m^2)	RTs Park (m^2)	RWs Park (m^2)	Grand Total (m^2)	Grand Total (ha)
			Argomulyo District					
1	Cebongan		12275	2211			14486	1,45
2	Kumpulrejo		11888	26446			38334	3,83
3	Ledok		8998				8998	0,90
4	Noborejo		25419				25419	2,54
5	Randuacir	1473	96053				97526	9,75
6	Tegalrejo		39390		8995	18521	66906	6,69
			Sidomukti District					
7	Dukuh						0	0,00
8	Kalicacing		7972	17154			25126	2,51
9	Kecandran		13884	9793			23677	2,37
10	Mangunsari	2869	36009	21662	79	359	60978	6,10
			Sidorejo District					
11	Blotongan		4590				4590	0,46
12	Bugel		2718				2718	0,27
13	Kauman Kidul		4594				4594	0,46
14	Pulutan		24355				24355	2,44
15	Salatiga		25420	608	7932	1733	35693	3,57
16	Sidorejo Lor		5992		892	217	7101	0,71
			Tingkir District					
17	Gendongan		90				90	0,01
18	kalibening		9793	1132			10925	1,09
19	Kutawinangun Lor		800				800	0,08

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20	Kutawinangun Kidul		3800		1700		5500	0,55
21	Sidorejo Kidul	1966	14495	11468	2054		29983	3,00
22	Tingkir Lor		10129		827	335	11291	1,13
23	Tingkir Tengah		672	348	22649	4437	28106	2,81
24	Grand Total	6308	359336	90822	45128	25602	527196	**52,72**
			Percent of Area (%)					**0,93**

- Comparison between Needs and Provision

The calculation of park needs based on population up to the projection of the next 20 years using the standards of Statewide et al., 2016 states that none of the sub-districts in Salatiga fulfills these standards. Meanwhile, according to the standards in the Regulation of Minister of Public Works Number 5 of 2008 with the needs of 2.3 meters per person, the calculation states that there are 9 sub-districts that have a minus value as shown in Table 3.

Tabel 3 Comparison between Park Needs and Provision

Number	Sub-district	Population					Provision	2020		2025		2030		2035		2040	
		2020	2025	2030	2035	2040		Needs	GAB	Needs	GAB	Needs	GAB	Needs	GAB	Needs	GAB
Argomulyo District																	
1	Cebongan	5156	5870	6683	7608	8661	0,014	0,012	0,003	0,014	0,001	0,015	-0,001	0,017	-0,003	0,020	-0,005
2	Kumpulrejo	8296	8535	8781	9034	9294	0,038	0,019	0,019	0,020	0,019	0,020	0,018	0,021	0,018	0,021	0,017
3	Ledok	11099	11810	12567	13372	14229	0,009	0,026	-0,017	0,027	-0,018	0,029	-0,020	0,031	-0,022	0,033	-0,024
4	Noborejo	6732	7377	8083	8857	9705	0,025	0,015	0,010	0,017	0,008	0,019	0,007	0,020	0,005	0,022	0,003
5	Randuacir	6655	7464	8372	9390	10532	0,098	0,015	0,082	0,017	0,080	0,019	0,078	0,022	0,076	0,024	0,073
6	Tegalrejo	12323	12288	12253	12218	12184	0,067	0,028	0,039	0,028	0,039	0,028	0,039	0,028	0,039	0,028	0,039
Sidomukti District																	
7	Dukuh	13948	13632	13324	13022	12728	0,000	0,032	-0,032	0,031	-0,031	0,031	-0,031	0,030	-0,030	0,029	-0,029
8	Kalicacing	6100	4809	3792	2990	2357	0,025	0,014	0,011	0,011	0,014	0,009	0,016	0,007	0,018	0,005	0,020
9	Kecandran	6840	6905	6971	7038	7105	0,024	0,016	0,008	0,016	0,008	0,016	0,008	0,016	0,007	0,016	0,007
10	Mangunsari	17274	16308	15396	14535	13722	0,061	0,040	0,021	0,038	0,023	0,035	0,026	0,033	0,028	0,032	0,029
Sidorejo District																	
11	Blotongan	13270	13897	14554	15242	15962	0,005	0,031	-0,026	0,032	-0,027	0,033	-0,029	0,035	-0,030	0,037	-0,032
12	Bugel	3462	3595	3733	3876	4025	0,003	0,008	-0,005	0,008	-0,006	0,009	-0,006	0,009	-0,006	0,009	-0,007
13	Kauman Kidul	4252	4163	4076	3991	3908	0,005	0,010	-0,005	0,010	-0,005	0,009	-0,005	0,009	-0,005	0,009	-0,004
14	Pulutan	4587	5003	5457	5953	6493	0,024	0,011	0,014	0,012	0,013	0,013	0,012	0,014	0,011	0,015	0,009
15	Salatiga	14629	13911	13228	12579	11961	0,036	0,034	0,002	0,032	0,004	0,030	0,005	0,029	0,007	0,028	0,008
16	Sidorejo Lor	14522	14769	15021	15277	15538	0,007	0,033	-0,026	0,034	-0,027	0,035	-0,027	0,035	-0,028	0,036	-0,029
Tingkir District																	
17	Gendongan	5443	5083	4747	4433	4140	0,000	0,013	-0,012	0,012	-0,012	0,011	-0,011	0,010	-0,010	0,010	-0,009
18	Kalibening	2261	2563	2905	3294	3734	0,011	0,005	0,006	0,006	0,005	0,007	0,004	0,008	0,003	0,009	0,002
19	Kutowinangun Lor	13244	13662	14093	14537	14996	0,001	0,030	-0,030	0,031	-0,031	0,032	-0,032	0,033	-0,033	0,034	-0,034
20	Kutowinangun Kidul	8257	7812	7391	6993	6616	0,006	0,019	-0,013	0,018	-0,012	0,017	-0,011	0,016	-0,011	0,015	-0,010
21	Sidorejo Kidul	7280	8216	9272	10465	11810	0,030	0,017	0,013	0,019	0,011	0,021	0,009	0,024	0,006	0,027	0,003
22	Tingkir Lor	5067	5973	7041	8300	9784	0,011	0,012	0,000	0,014	-0,002	0,016	-0,005	0,019	-0,008	0,023	-0,011
23	Tingkir Tengah	5385	5727	6092	6479	6891	0,028	0,012	0,016	0,013	0,015	0,014	0,014	0,015	0,013	0,016	0,012
Total (km^2)		196082	199374	203832	209482	216374	0,527	0,451	0,076	0,459	0,069	0,469	0,058	0,482	0,045	0,498	0,030
Total (ha)							52,72	45,10	7,62	45,86	6,86	46,88	5,84	48,18	4,54	49,77	2,95
Percent of Area (%)							0,93	0,79	0,13	0,81	0,12	0,83	0,10	0,85	0,08	0,88	0,05

According to Table 3, the orange color is a sign where a sub-district is experiencing insufficient park provision that does not conform to the population in the park with a projection calculation for the next 20 years. The sub-district will have a minus value if it refers to the existing condition, while the light orange color in the Cebongan and Tigkir Lor Sub-Districts are the sub-districts which in 2020 as the base year, park provision remains capable of fulfilling the needs of the population in 2020. However, in 2025, Tingkir Lor Sub-District has a minus value and Cebongan Sub-District has a minus value in 2020. The minus values are dominantly generated in Tingkir and Sidorejo Districts, if you look at the characteristics of land use, these two districts are the districts with medium to high density class settlements. A spatial description of the gap in park needs and availability using the standards of Ministerial Regulation No. 5 of 2008 can be seen in Figure 3.

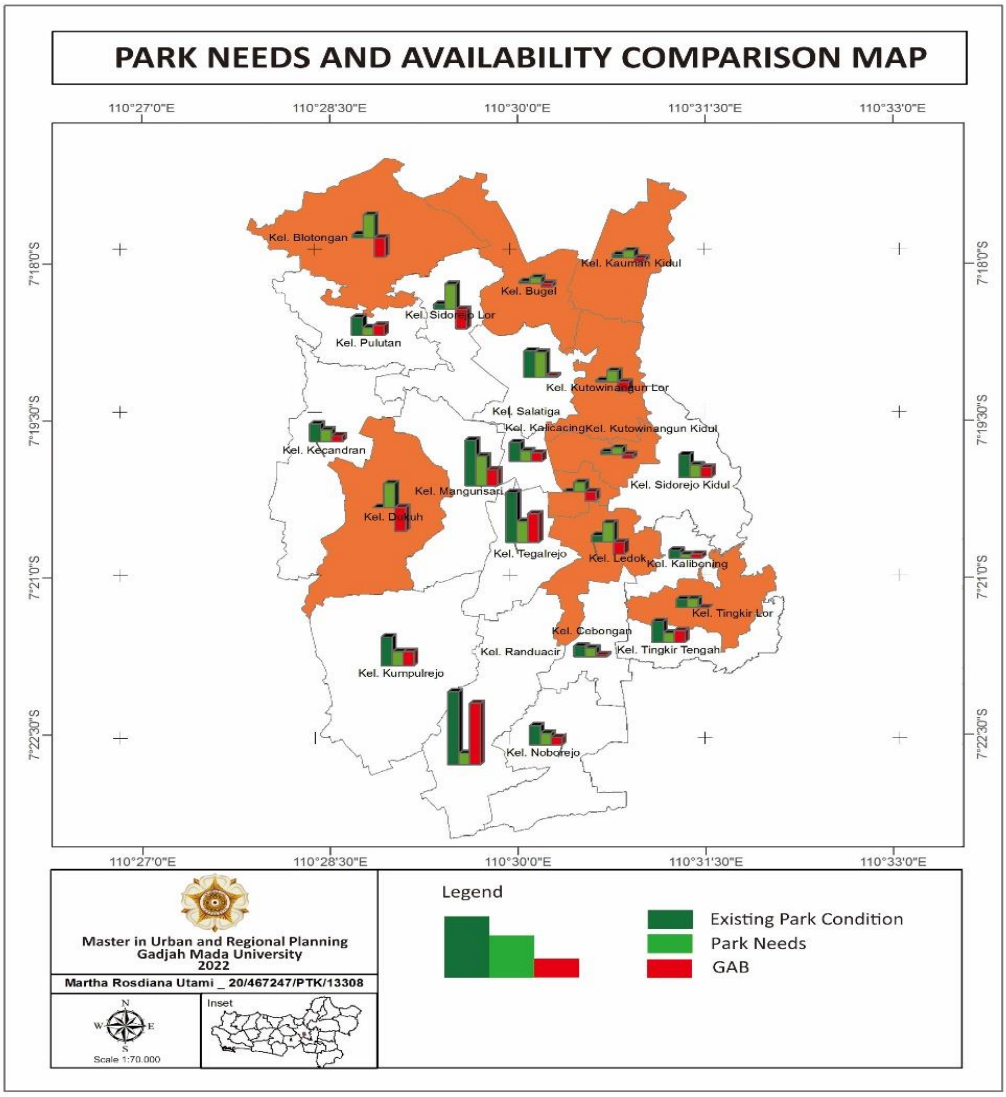

Figure 3. Park needs and availability comparison map

2. **Measuring Park Service Affordability**

According to the calculation of network analysis data, there are four active parks managed by Salatiga City government. The parks fulfill the criteria for a park that can be used for recreational physical activities. The researcher found that the areas that had just been covered by a maximum park affordability radius is 57.53% while the remaining 42.47% had not been covered. According to Table 4, it can be seen that the zone radius is divided into three recommended classes (Byrne & Sipe, 2010) as follows:

1) Zone one of 400-meter distance, is the maximum distance that can be covered physically by adults with unhealthy conditions, old age, and unable to walk within 10 minutes can afford the total 97.75 hectares or 1.7% of Salatiga City area.
2) Zone two of 800-meter distance, is the maximum average distance that can be covered by a healthy adult who can walk for 10 minutes can afford the total 247.8 hectares or 11.6% of Salatiga City area.
3) Zone three of 2500-meter or 2.5-km distance, is the maximum average distance a physically fit adult can expect to cycle over the same period of time can afford the total 2929.98 hectares of 51.5% of Salatiga City area.

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Table 4 Service Affordability Area of Each Park

Number	Park	Park Service Affordability	Total (Ha)	Percent of Area(%)
1	Pancasila Park	Pancasila Park : 0 - 400	49,791	0,9%
		Pancasila Park : 400 - 800	98,856	1,7%
		Pancasila Park : 800 - 2500	1219,401	21,5%
2	Bendosari Park	Bendosari Park : 0 - 400	5,926	0,1%
		Bendosari Park : 400 - 800	44,475	0,8%
		Bendosari Park : 800 - 2500	464,287	8,2%
3	Sidomukti Park	Sidomukti Park : 0 - 400	17,079	0,3%
		Sidomukti Park : 400 - 800	27,196	0,5%
		Sidomukti Park : 800 - 2500	356,218	6,3%
4	Tingkir Park	Tingkir Park: 0 - 400	24,962	0,4%
		Tingkir Park: 400 - 800	77,299	1,4%
		Tingkir Park: 800 - 2500	881,086	15,5%
Grand Total			**3266,576**	**57,53%**

The calculation between the built-up land area in Table 5 interpreted as population spatialization land shows an orange color as a sub-district not affordable at all with a service radius, namely in Kauman Kidul and Noborejo Sub-Districts. Table 5 have a minus value GAB which means that some of the built-up areas have not been affordable with the service area. Figure 4 shows that there are only 9 out of 23 sub-districts in Salatiga that generate positive values, meaning that most of the built-up areas have not been fully covered by park services.

Table 5. Service affordability area of park against built-up area

Number	Sub-District	Built-up Area	Radius Area	GAB
1	Blotongan	170,521	203,5	32,973
2	Bugel	68,534	4,5	-64,077
3	Dukuh	224,878	447,5	222,616
4	Kalicacing	469,864	511,7	41,791
5	Kauman Kidul	74,975	0,0	-74,975
6	Kecandran	157,036	185,8	28,758
7	Cebongan	102,563	12,0	-90,524
8	Gendongan	105,725	211,4	105,725
9	kalibening	32,404	32,3	-0,055
10	Ledok	119,336	113,4	-5,921
11	Tegalrejo	145,571	138,9	-6,623
12	Kumpulrejo	171,121	134,5	-36,627
13	Kutowinangun Kidul	145,943	284,9	139,002
14	Kutowinangun Lor	269,700	433,9	164,239
15	Mangunsari	164,716	223,4	58,659
16	Noborejo	226,261	0,0	-226,261
17	Pulutan	61,534	5,3	-56,253
18	Randuacir	221,945	2,22	-157,346
19	Salatiga	66,320	64,6	82,020
20	Sidorejo Kidul	128,321	148,3	-66,900
21	Sidorejo Lor	137,912	61,4	-94,080
22	Tingkir Lor	93,111	43,8	-90,077
23	Tingkir Tengah	60,260	3,0	-57,226
Total		3418,551	3266,575	

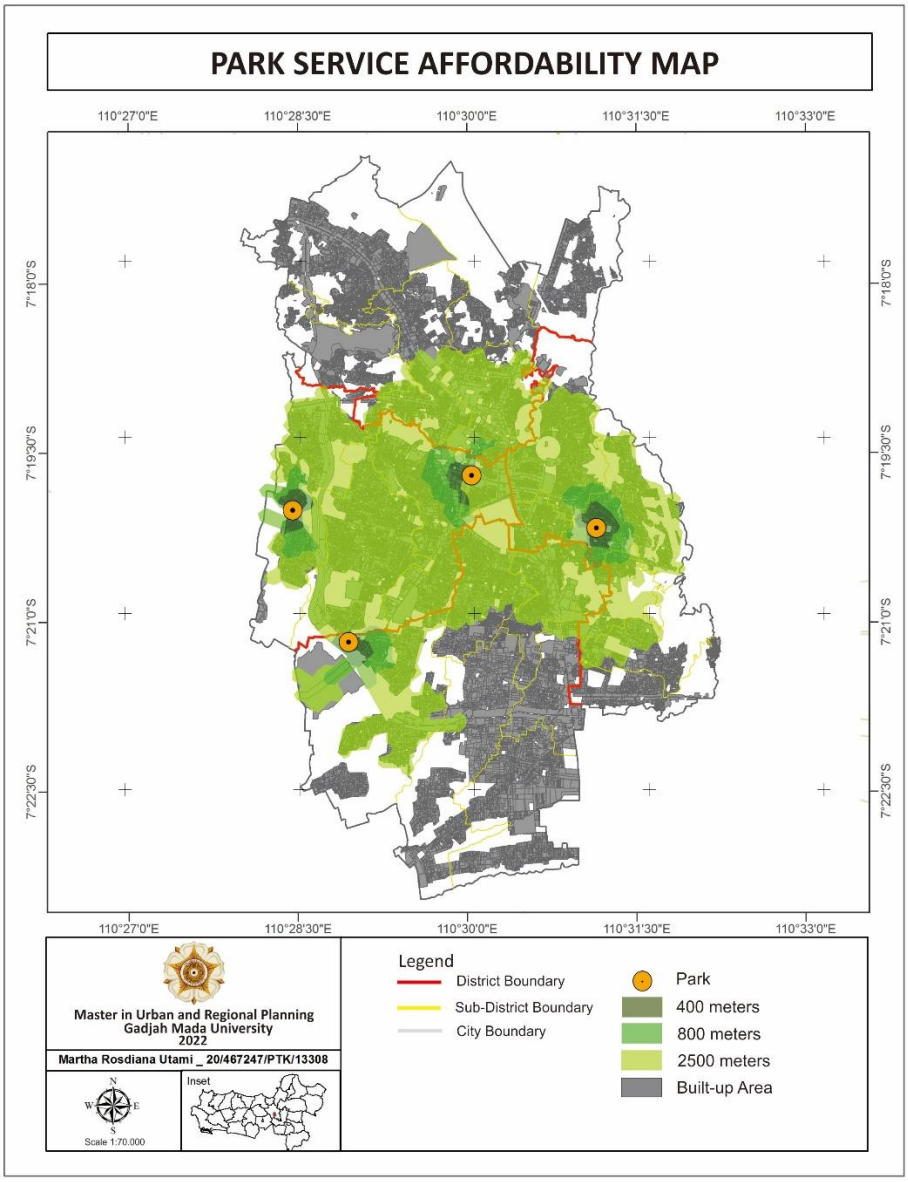

Figure 4. Park service affordability map

CONCLUSION

Given the importance of park as a public space, this study found that the current park availability was not fully capable of serving in terms of park needs and park service affordability. The calculation of comparison between needs and availability sFhows that there are 9 sub-districts that have minus values, namely Ledok, Dukuh, Blotongan, Bugel, Kauman Kidul, Sidorejo Lor, Gendongan, Kutowinangun Lor, and Kutowinangun Kidul. The analysis of park service affordability using the network analyst tool found that 57.53% of the Salatiga City area was covered by parks and the remaining 42.47% had not been served. Broadly speaking, only the built-up areas in the 9 sub-districts have been fully covered by park service affordability. The results of this study serve as input for the government in considering future park development with the main priority to build parks for areas that have minus values or gap between needs and existing conditions and to prioritize areas that have not been covered with park services.

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