

The Needs of Public Green Structure in the City of Banda Aceh

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Abstract

Banda Aceh was badly damaged by the earthquake and tsunami that occurred on December 26, 2004. After post disaster reconstruction in year 2005–2009, various changes happened in usage of urban spaces in the city of Banda Aceh, including its green open spaces. This study aims to analyze and describe the existence of public green structure or green open space of Banda Aceh, especially urban park and urban forest in terms of distribution and sufficiency. The benefits and practical contribution of this research is to provide information regarding the existence and needs of public park and urban forest in the city of Banda Aceh, so it can be considered in meeting the needs of public green open space in the future planning of Banda Aceh as sustainable city. The result shows the public green open space requirement as public park and urban forest based on city wide and population number mostly can be fulfilled by all districts.

Keywords : green open space, sustainable, urban forest, public park.

Introduction

Planning approach with attention to the existence of the environment, or better known by the term sustainable planning has become a major current issue in the urban planning (Budihardjo, 2005). Therefore approach to environmentally sustainable urban planning will be the wise concept for future planning of Banda Aceh which was badly damaged by the earthquake and tsunami that occurred on December 26, 2004. The wide of damage was nearly 50 % of the city area, tsunami had destroyed infrastructure in most part of the city including residential area and protected area, ranging from area near the coast to most of the downtown area (BRR, 2009).

Planning Banda Aceh as sustainable city is expected to reflect the principles which include compliance with tropical climate, energy efficiency and minimum resource usage and give the smallest possible impact on the environment. As part of urban natural component, the existence of green open space becomes important element to support sustainable city. And also existence of urban green open space is important to control and preserve urban environment quality (DKK, 2014).

The presence of green spaces in the city helped shape the structure of city. This opinion is in line with Sinulingga (1999), where the structure of urban space is an arrangement of settlements, network of infrastructure systems and facilities. The elements that make up the structure of urban space consisting of (a) a collection of services including trade, finance, government which tend to distribute in groups in the service center, (b) collection of secondary industry (manufacturing), warehouses and wholesale trade which tend to congregate in one place, (c) residences and green spaces, and (d) transport network connecting the three places above.

According to Chen (2004), Pauliet and Kaliszuk (2005), green open spaces as urban green structures act to support sustainable urban life, hence the existence of the natural environment and green open spaces are important to consider in order continuing to support human needs and urban development in the future.

Urban green open space as urban green structure can be defined as space in the city or in the wider region in the form of area or region as well as in the form of elongated area or path which is more open in its use and without buildings. Green open space can present as parks, urban forests, sports fields and recreational area, cemeteries, green belts and green yards. While the ownership can be public green open space and private green open space (DPU, 2008).

This study aims to analyze and describe the existence of public green open space of Banda Aceh, especially urban park and urban forest in terms of distribution and sufficiency. The benefits and practical contribution of this research is to provide information to the city regarding the existence and needs of public

park and urban forest in the city of Banda Aceh, so it can be considered in meeting the needs of green open space in the future planning of Banda Aceh as sustainable city.

Methods

This research uses quantitative approach to measure the urban space usage in Banda Aceh and the potential adequacy of green open space in the city. The analysis technique used is the land use analysis of urban space through land use data, to get a picture of urban land use and the distribution of built up space and open space in the city. Land use data of Banda Aceh in 2010 is provided by Bappeda (2009) and BPS (2011).

Land use analysis will obtain information about the land usage in the city. Information obtained in the form of distribution of built up and open space in each district, especially as open and green space. Information of open space is to determine the adequacy of green space required to meet the minimum standard requirements of public park and urban forest as part of green open space based on city area and population.

Furthermore, to determine the adequacy level of public green open space in the city of Banda Aceh, it need to conducted extensive comparisons of urban green open space to the land use results. Minimum green open space requirements based on city area and population will be calculated to meet the minimum standard requirements of public park and urban forest. This research refers to the minimum standards of public green open space requirement in the Regulation by the Minister of Public Works No. 5/PRT/M/2008, about guidelines for the provision and use of green open space in urban area.

This study also used secondary data as support material, collected from several government offices such as Master plan of Banda Aceh 2009–2029 by Bappeda, Banda Aceh in figure 2015 by BPS, management document of public green open space of Banda Aceh in 2014 from the Department of Sanitation and Beauty of the city of Banda Aceh. The data is to be advocates in assessing the use of green open space in the city of Banda Aceh. It also made direct observations on the use of space on the pitch which is equipped recording images as the primary data. Other secondary data also collected from variety of related literature.

Results and Discussion

Built Up and Open Space Distribution

Land use analysis in this study is intended to determine the widespread and the availability of green open space, location and distribution, for subsequent use as a reference in the analysis of urban green open space needs. Based on the interpretation of the results of the secondary data obtained from land use data of Banda Aceh from BPS (see Table 1). From the total area of the city of Banda Aceh which is 6,135.9 hectares, the city has area of 3,789.19 hectares as built up space (61.75 %) and area of 2,346.71 hectares as open space (38.25 %).

Table 1. Built up and open space distribution in the city of Banda Aceh

No	District	Built up Space			Open Space	
		Area Wide (Ha)	Building & Landscape Ha	%	Park, Urban Forest, etc Ha	%
1	Meuraxa	725.80	402.00	55.3	323.80	44.6
2	Jaya Baru	378.00	303.10	80.1	74.90	19.8
3	Banda Raya	478.90	256.89	53.6	222.01	46.3
4	Baiturrahman	453.90	377.00	83.0	76.90	16.9
5	Lueng Bata	534.10	402.00	75.2	132.10	24.7
6	Kuta Alam	1,004.70	781.00	77.7	223.70	22.2
7	Kuta Raja	521.10	78.00	14.9	443.10	85.0
8	Syiah Kuala	1,424.40	864.00	60.6	560.40	39.3
9	Ulee Kareng	615.00	325.20	52.8	289.80	47.1
	Total	6,135.90	3,789.19	61.7	2,346.71	38.2

The open spaces consist of farm, grass, ponds, forests and other fields (see Table 2). Type of open spaces in the city divided into 6 parts:

- Farm, has shapes character and clustered patterns, spread lies between built up and open space, sometimes mixed with residential areas in almost all districts except Baiturrahman and Kuta Alam, in the area of approximately 464.30 hectares.
- Grass areas are among the farms, settlements and facilities that spread in the district Meuraxa, Lueng Bata and Ulee Kareng in the area of approximately 9.0 hectares.
- Ponds and other water area, spread in almost all districts except Jaya Baru, Lueng Bata and Ulee Kareng, in the area of approximately 649.94 hectares.
- Protected forest area, in the elongated form and clustered pattern, large in size, found only in Syiah Kuala and Meuraxa districts in the area of approximately 6.0 hectares.
- Rice fields spread in almost all districts except Kuta Raja, in the area of approximately 512.0 hectares.
- Parks and other open spaces, spread in almost all districts except Jaya Baru, Banda Raya and Ulee Kareng, in the area of approximately 705.47 hectares.

Table 2. Type of open space in the city of Banda Aceh

District	Open Space (Ha)					
	Farm	Grass	Pond	Forest	Rice Field	Parks
Meuraxa	19.4	7.0	82.0	2.0	62.5	150.7
Jaya Baru	11.4	–	–	–	63.5	–
Banda Raya	25.0	–	0.1	–	197.0	–
Baiturrahmann	–	–	1.3	–	26.5	49.0
Lueng Bata	24.0	1.0	–	–	23.5	83.6
Kuta Alam	–	–	204.3	–	4.0	15.4
Kuta Raja	55.5	–	74.1	–	–	313.3
Syiah Kuala	145.1	–	288.0	4.0	30.0	93.3
Ulee Kareng	183.8	1.0	–	–	105.0	–
Total	464.3	9.0	649.9	6.0	512.0	705.4

Areas with lots of vegetation commonly found in area that have less dense settlements. The vegetation are still possible in some area because of the development of the city mostly is dense in the city center. Settlements in the district bordering the city center, are dense and tend to follow the shape and the pattern of existing settlements which are clustered in the city center and spread to other area.

Green Space Needs

Based on data from the Department of Sanitation and Beauty of the city of Banda Aceh (DKK, 2014), known public green open space which has area of 668.948 hectares was managed scattered throughout the city of Banda Aceh (see Figure 1). Amount of public green open space ranged 11% of the city (see Table 3).

Table 3. Types of public green space in Banda Aceh

No	Public Green Space	Area (ha)
1	Park, Garden	49.454
2	Urban Forest	28.596
3	Sport Field	20.350
4	Street Green Line	548.000
5	Cemetery	7.978
6	Riparian Green Line	14.570
	Total	668.948

Public green open space as element of open space also functions as one component of the ecosystem which balances the urban life of the city. Urban ecological balance is necessary for the physical development of the city which continues to increase. To determine the adequacy of green open space as a requirement for stabilizing the city, the results of the land use analysis of the existing green open spaces of Banda Aceh will be compared to government standard. Analysis of the needs of public park and urban forest as part of urban green space will be calculated based on city area and population.

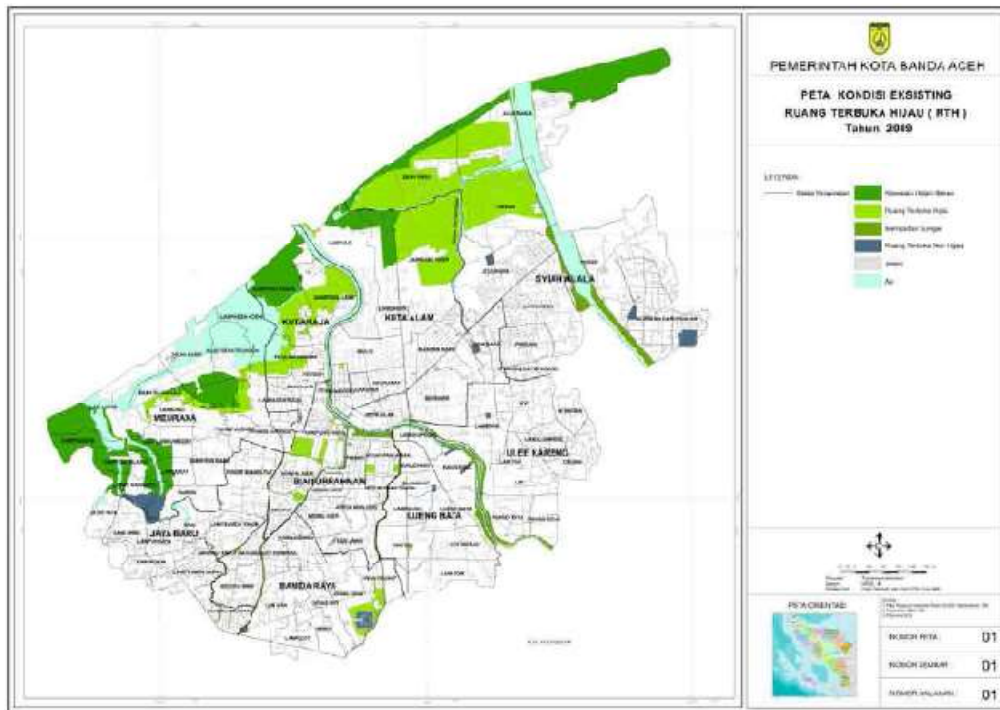


Figure 1. Existing green open space in Banda Aceh.

Public Green Open Space Needs Based on City Area

Regulation No. 05/PRT/M/2008 of Minister of Public Work, about the arrangement of green open space in urban areas, stipulate that at least 20% of the area of the city is public green open space. To provide balance in all area of the city, green open space requirement for each district is presented in Table 4.

Table 4. Public Green Open Space (GOS) needs

No	District	Area (Ha)	% GOS	GOS Needs (Ha)
1	Meuraxa	725.80	20%	145.16
2	Jaya Baru	378.00	20%	75.60
3	Banda Raya	478.90	20%	95.78
4	Baiturrahman	453.90	20%	90.78
5	Lueng Bata	534.10	20%	106.82
6	Kuta Alam	1,004.70	20%	200.94
7	Kuta Raja	521.10	20%	104.22
8	Syiah Kuala	1,424.40	20%	284.88
9	Ulee Kareng	615.00	20%	123.00
Total		6,135.90		1,227.18

The proportion of green open space in the city should be 30% of city area which consist of the amount of 20% as public green open space and 10% as private green open space. This minimum proportion size to ensure the balance of the city ecosystem and the equilibrium of microclimates in hydrological system, as well as other ecological systems that may increase the availability of clean air, community needed and at the same time can increase the aesthetic value of the city. Based on the regulation standard, minimum area of public green open space of 1,227.18 hectares should be established by the city of Banda Aceh (see Table 4). In accordance with the objectives, standards of green open space are used for the purpose of :

- a. improve the environmental quality of urban living in healthy, comfortable, fresh, clean and safe environment.
- b. create the harmony of the natural environment and the built environment useful for the public interest.

Based on the calculation of urban green space according to government regulation No. 05/PRT/M/2008 of Minister of Public Work, then it will be compare to existing green spaces in all districts. The comparison showed that there were districts that meet the needs of green open space which are Meuraxa, Banda Raya, Lueng Bata, Kuta Alam, Kuta Raja, Syiah Kuala and Ulee Kareng. While Jaya Baru and Baiturrahman not yet qualified public green space of at least 20% of the total area (see Table 5).

Table 5. Difference in public Green Open Space (GOS) needs to the existing condition

No	District	GOS area	GOS needs (ha)	Difference (ha)
1	Meuraxa	323.80	145.16	178.64
2	Jaya Baru	74.90	75.60	-0.70
3	Banda Raya	222.01	95.78	126.23
4	Baiturrahman	76.90	90.78	-13.88
5	Lueng Bata	132.10	106.82	25.28
6	Kuta Alam	223.70	200.94	22.76
7	Kuta Raja	443.10	104.22	338.88
8	Syiah Kuala	560.40	284.88	275.52
9	Ulee Kareng	289.80	123.00	166.80
	Total	2,346.71	1,227.18	1,119.53

There is a tendency that the lack of green open space in Baiturrahman dan Jaya Baru district which are in the center of the city of Banda Aceh. Urban development activities still leads in the city center, where district area is relatively small but the density of public activity and residential area located almost in the center of city. This condition make difficult of getting more open space that can be developed as green open space.

Public Green Open Space Needs Based on Population

Minimum area of green open space as public urban park based on the number of populations in the district will follow standard 0.3 square meter per capita and minimum area requirements of urban forest will follow the standard 4.0 square meter per capita (DPU, 2008). Existing condition shows the distribution of the population in the city of Banda Aceh has not been evenly distributed to each district. Green open space requirement as public urban park for each district is presented in Table 6 .

Table 6. Public park needs based on population

No	District	Population	Min. Std (m ²)	Min. Public Park (m ²)	Min. Public Park (ha)
1	Meuraxa	18,979	0.3	5,693.70	0.57
2	Jaya Baru	24,481	0.3	7,344.30	0.73
3	Banda Raya	22,961	0.3	6,888.30	0.69
4	Baiturrahman	35,249	0.3	10,574.70	1.06
5	Lueng Bata	24,581	0.3	7,374.30	0.74
6	Kuta Alam	49,545	0.3	14,863.50	1.49
7	Kuta Raja	12,831	0.3	3,849.30	0.38
8	Syiah Kuala	35,702	0.3	10,710.60	1.07
9	Ulee Kareng	25,170	0.3	7,551.00	0.76
	Total	249,499		74,849.70	7.48

Table 7. Difference in the needs of public park to the existing condition

No	District	Exist. Urban Open Space (ha)	Min. Public Park (ha)	Difference (ha)
1	Meuraxa	323.8	0.57	324.37
2	Jaya Baru	74.9	0.73	75.63
3	Banda Raya	222.0	0.69	222.70
4	Baiturrahman	76.9	1.06	77.96
5	Lueng Bata	132.1	0.74	132.84
6	Kuta Alam	223.7	1.49	225.19
7	Kuta Raja	443.1	0.38	443.48
8	Syiah Kuala	560.4	1.07	561.47
9	Ulee Kareng	289.8	0.76	290.56
	Total	2,346.71	7.48	2,354.19

In general, the minimum requirements are met. The needs of urban green space as public park based on number of population shows the biggest is in the Kuta Alam district which has population of 49,545 people, thus require minimum of 1.49 hectares of green open space. While the needs of green open space as public park in the district of Kuta Raja is the smallest area in 0.38 ha with population of 12,831 people. Suitability of green space as public park based on number of population with the condition of the existing green space is presented in Table 7.

In Table 8 and 9 below, result of calculation shows the existing condition of green open space in all districts meet the minimum standard of the needs of the urban forest based on population number. Kuta Alam district should provide the biggest space for urban forest, which is about 19.82 hectares. In the existing, only two districts which are Meuraxa and Syiah Kuala have protected forests, but the wide of the area still not fulfilled in accordance with the standards.

Table 8. Urban forest needs based on population

No	District	Population	Min. Std (m ²)	Min. Urban Forest (m ²)	Min. Urban Forest (ha)
1	Meuraxa	18,979	4.0	75,916.00	7.59
2	Jaya Baru	24,481	4.0	97,924.00	9.79
3	Banda Raya	22,961	4.0	91,844.00	9.18
4	Baiturrahman	35,249	4.0	140,996.00	14.10
5	Lueng Bata	24,581	4.0	98,324.00	9.83
6	Kuta Alam	49,545	4.0	198,180.00	19.82
7	Kuta Raja	12,831	4.0	51,324.00	5.13
8	Syiah Kuala	35,702	4.0	142,808.00	14.28
9	Ulee Kareng	25,170	4.0	100,680.00	10.07
Total		249,499		997,996.00	99.80

Table 9. Difference in the needs of urban forest to the existing condition

No	District	Exist. Urban Open Space (ha)	Min. Urban Forest (ha)	Difference (ha)
1	Meuraxa	323.8	7.59	316.21
2	Jaya Baru	74.9	9.79	65.11
3	Banda Raya	222.0	9.18	212.83
4	Baiturrahman	76.9	14.10	62.80
5	Lueng Bata	132.1	9.83	122.27
6	Kuta Alam	223.7	19.82	203.88
7	Kuta Raja	443.1	5.13	437.97
8	Syiah Kuala	560.4	14.28	546.12
9	Ulee Kareng	289.8	10.07	279.73
Total		2,346.71	99.80	2,246.91

Discussion

As part of the component in the concept of ecological sustainable city, the existence of urban green structure or green open space in the city became important element supporting the creation of sustainable city. However, the existence of public green open space in the city of Banda Aceh is in the area of 668.948 hectares or 11 % of the area of the city (DKK, 2014). This amount does not yet meet the 20% provisions in the proportion of the public urban green open space to the urban area according Indonesia Spatial Planning Act No. 26 of 2007 (DPU, 2008).

In line with Irwan (2005), the presence of green space is important in controlling and maintaining the integrity and quality of the environment. Control of urban development should be done properly and in balance between development and environmental functions. According to Hakim (2007) and Chiesura (2004) to get green open space deliver its functional and aesthetic characteristics to the city, then the area in minimum size, pattern and structure, as well as the shape and distribution should be taken into consideration in planning and developing it.

Public park and urban forest as part of public green open space is contrast to other public space and open space which in the form of open land and without any plants yet to be built. Public green open space has green elements (vegetation) in any form. Public park and urban forest as public spaces can be enjoyed by the whole community, while the non public or private owned green open spaces and other open spaces are not always able to be used and enjoyed by the whole community.

The result of calculation of public green structure or green open space requirement as public park and urban forest based on city wide and population number mostly can be fulfilled by all districts in the city of Banda Aceh. Public park and urban forest as public green structure requires better planning to keep the balance of urban environmental quality. This is in line with Purnomohadi (2008) and Newman (2008), green open space has primary function as ecological functions and complementary function as the function of social, economic and architectural. As the ecological functions ensure the sustainability of the city, then green open space must be located, sized, and shaped in definite area of the city, such as urban forest to support human life and network of wildlife habitat. Some ecological function of green open space in the city,

among others, are water catchment area, produce oxygen, reduce noise, filter of solid particles that pollute the city's air, absorbing greenhouse gases or acid rain, windbreaks, prevent seawater intrusion, amelioration climate and soil water conservation.

Conclusions

Based on the analysis of urban land use of Banda Aceh in 2010, the results obtained that the city has built up spaces area of 3,789.19 hectares (61.75 %) and the unbuilt spaces or open spaces area of 2,346.71 hectares (38.25 %). Types of land use in the open space that could potentially become as green open space are protected forests, riverside green lines, rice fields, farms, roadside green lines, parks and cemetery with total area of 1,696.77 hectares or about 27.65% of the city area. These amounts are combination of public and private green open spaces.

The result calculations of public green open space requirement as public park and urban forest based on city wide and population number mostly can be fulfilled by all districts. Green open space needs as public park based on population with minimum of 0.3 m²/capita are met by 7 of 9 districts. However, the requirement for minimum of 4 m²/capita green space for urban forest can be fulfilled by all 9 districts. The sufficiency of public green open space and balanced composition of the size and distribution of green space in each district should be maintained to provide the optimum benefits to the city.

Acknowledgements

The author would like to thank the funding bodies of this research: Ministry of Education and Culture, under Research Grant No. 035/SP2H/PL/ Dit.Litabmas/II/2015.

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