The Quantitative and Qualitative Plans of an Urban Park in the Landscape Ecological View

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ABSTRACT

The purpose of this study is to carry out the quantitative and qualitative analysis of an urban park in the landscape ecological view and to provide the important basic data in the urban development process. The results of this study are as follows.

First, in the case of disposition distance analysis in quantitative plans, very necessary regions of the children park are turned out to be 24 sites, of the neighboring park are turned out to be 30 sites, and walking park are turned out to be 22 sites. Second, in the case of undevelopment neighborhood park analysis, priority orders are Daebong Park, Suseong Park. Third, in the case of area, shape, and isolation in qualitative plans, interior area of Bummul park is larger than that of Chimsan park and isolation of Bummul park higher than that of Chimmsan.

Key Words : LanDscape Ecology, Urban Park, Disposition Distance, Undevelopment Neighborhood Park, Shape, Isolation

I. INTRODUCTION

By means of excess urban development and prompt urbanism, the requirement of the urban park plan in the quantitative and qualitative side is enlarged. The purpose of the study is to analyze the quantitative and qualitative plans of the landscape ecological view in Daegu and to provide the important basic data in the urban development process. Disposition distance and undevelopment neighborhood park in the quantitative side especially and area, shape, isolation in the qualitative side are investigated.

II. SCOPE AND METHOD

1. Scope of Study

The basic data analysis and field surveys are accomplished during the ten months from April to October 2003 and from April to June 2004. The content scope is limited to disposition distance and undevelopment neighborhood park in the quantitative side, and area, shape, isolation in the qualitative side. The regional scope is limited to urban parks in Daegu.

2. Selection of Study Area

In the case of study area for disposition distance, children park and neighborhood park except Dalsung-Gun in Daegu are selected. In the case of study

Table 1. Classified indicator study area

Classification	Quantitative side		Qualitative side
	Disposition distance	Undevelopment neighborhood park	Area, shape, isolation
Study area	· Daegu Metropolitan City (Children Park, Neighborhood Park)	· Daebong, Suseong, Dusan, 2.28, Kyungnam, Suchang, Donjiam, Janggi, Dongin 1st, Bokheon, Galsan, Mancheon, Gususan	· Bummul Park · Chimsan Park

areas for undevelopment neighborhood park, 13 sites except Seo-Gu, Dalsung-Gun are selected. In the case of area, shape, isolation, Bummul park and Chimsan park are selected.

3. Quantitative and Qualitative Character Analysis of Urban Parks

1) Quantitative Analysis of Urban Parks

Table 2. Classified indicator standard

Classification	Indicator	Grade	Value	Weight	Content	Classification	Indicator	Grade	Value	Weight	Content
Physical analysis	Altitude	1	4	6.7	less than 40m	Using radius analysis	Land using pattern	1	3	7.7	residential district
		2	3		40~80m			2	2		commercial district
		3	2		80~120m			3	1		industrial district
		4	1		above 120m		User number of using radius	1	3	9.4	above 50,000 persons
	Gradient	1	4	7.5	less than 5°			2	2		30,000~50,000 persons
		2	3		5°~15°			3	1		less than 30,000 persons
		3	2		15°~25°		Park area per population in administrative district	1	3	7.9	less than 3㎡
		4	1		above 25°			2	2		3~6㎡
	Gross rate	1	4	8.0	above 15%			3	1		above 6㎡
		2	3		10~15%		Inexecution term	1	3	7.6	above 8 years
		3	2		5~10%			2	2		4~8 years
		4	1		less than 5%			3	1		less than 4 years
Economic analysis	Estimated compensation	1	4	9.0	0 won	Balance analysis	Park area per population in autonomous district	1	3	8.4	less than 2㎡
		2	3		1~30,000 won			2	2		2~4㎡
		3	2		30,000~60,000 won			3	1		above 4㎡
		4	1		above 60,000 won		Park rate per area in autonomous district	1	3	7.2	less than 2%
	Unpurchased land rate	1	3	8.4	0%			2	2		2~4%
		2	2		70~80%			3	1		above 4%
		3	1		above 80%		Population increasing rate in autonomous district	1	4	9.0	above 3%
	Pccupied facilities rate	1	3	7.2	less than 10㎡			2	3		3~0%
		2	2		10~60㎡			3	2		0~-3%
		3	1		above 60㎡			4	1		less than -3%

(1) Disposition Distance Analysis

First, the location, area and number of urban parks re inspected and additionally satellite data analysis is onducted. By means of disposition distance radius, hildren parks are marked on 250m, neighboring parks re marked on 500m, and walking parks are marked n 1,000m. Second, the population density analysis is onducted. Third, the analysis results are made out by aps which are set up by Vidar Truscan 800 Scanne, uto CAD 2000, and Arc View.

(2) Undevelopment Neighborhood Park Analysis

For undevelopment neighborhood park analysis, the idicators are classified into physical analysis, using adius analysis, economic analysis, and balance nalysis. First in the case of physical analysis, altitude, radient, and gross rate are selected, in the case of sing radius, land using pattern, user number of using adius, park area per population in administrative istrict, and inexecution term are selected. And in the ase of economic analysis, estimated compensation,

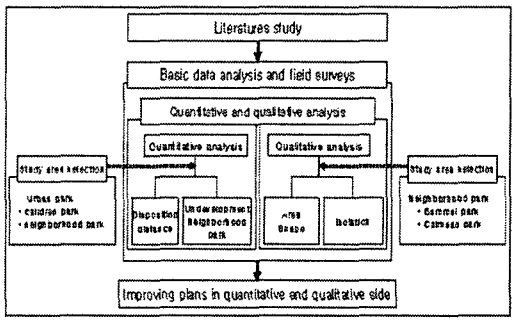


Figure 1. Study flow chart

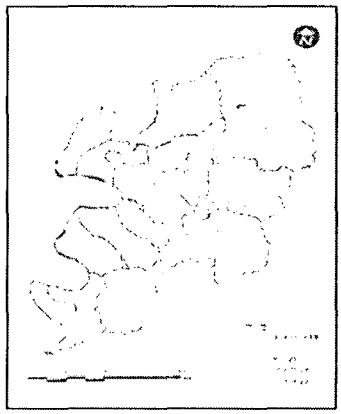


Figure 2. Disposition distance analysis

able 3. Landscape ecological character

Analysis indicator		Analysis content and method	Reference
Area		Total area	Forman(1995)
Shape	Elongation	Major axis length : perpendicular width	Davis(1986)
	Convolution	Convolution number (standard : convolution 〉 internal touch maximum radius)	Forman(1995)
	Interior · exterior region	Interior region area : internal touch maximum radius in patches Exterior region area : total patch area - interior region area	Forman(1995)
	Perimeter	Survey instrument use	
	Patch pattern diversity	Rate between patch perimeter and patch area $D=\frac{P}{2\sqrt{\pi A}}$ (P = patch perimeter, A = patch area)	Patton(1975)
Isolation		Distance among the near patches i) distance among the near high value biotope patches ii) distane among the near high value biotope patches over 10,000㎡ $r_i=\frac{1}{n}\sum_{j=1}^{n} d_{ij}$ (n = number of the near patches , d_{ij} =distance between patch i and near patch j)	Forman & Godron (1986)

unpurchased land rate, and occupied facilities rate are selected. Then the grade of each indicator is measured by indicator standard and priority order of undevelopment neighborhood park decided.

2) Qualitative Analysis of Urban Parks

First, for the shape analysis, elongation, convolution, interior exterior region, perimeter, and patch pattern diversity are performed. Specially, elongation is ana-

Table 4. Disposition distance analysis in autonomous district

Park		District	Very Necessary Region	Necessary Region	Proper Region
Children Park		Jung-Gu	Dongin, Daesin, Nansan, Samduk, Daebong, Dalseong	-	-
		Dong-Gu	Sincheon, Bangcheon, Sknpeong, Yonggea	Heumok, Bongmu, Sinam	Ulha, Singi
		Seo-Gu	Ihen, Bisan, Wondae	Jungri, Pungri	Naedang
		Nam-Gu	Icheon, Bongduk	Daemung	-
		Buk-Gu	Dacheon, Chilsung, Nowon, Gosung	Sangeuk	Taejun, Dongcheon, Guam, Bukheon
		Suseong -Gu	Pa, Jung, Sang , Bumae	Suseong	Whanggm, Dusan, Gisan, Bummul, Mancheon
		Dalseo -Gu	Janggi	Sungdang, Galsan, Jukjun	Bon, Sangin, Dowon, Walsung, Sindang
Urban Park	Neighboring Area	Jung-Gu	Daesin, Nansan, Daebong	Samduk, Dalseong	Dongin
		Dong-Gu	Heumok, Bangcheon, Bulro, Sinam. Sincheon, Ulha	-	Singi, Dongho
		Seo-Gu	Ihen, Jungri, Pungri, Bisan, Naedang, Wondae	-	-
		Nam-Gu	Icheon, Bongduk, Daemung	-	-
		Buk-Gu	Dacheon, Chilsung, Nowon, Gosung, Sangeuk	Gumdan, Bukheon	Dongcheon, Guam
		Suseong -Gu	Mancheon, Suseong, Jung, Sang, Gisan, Bummul	Bumae, Dusan, Whanggm,	Bummul, Maeho, Gosan
		Dalseo -Gu	Sungdang	Janggi, Walsung	Sangin, Bon, Galsan, Sindang
	Walking Area	Jung-Gu	Daesin, Nansan	-	Samduk, Dalseong, Bongsan, Dongin
		Dong-Gu	Bangcheon, Singi, Sincheon, Ulha	Sinam	Yonggae
		Seo-Gu	Bisan, Wondae	Wondae, Naedang	Ihen, Jungri, Pungri
		Nam-Gu	Bongduk, Daemung	-	Icheon
		Buk-Gu	Dacheon, Chilsung, Nowon	Gumdan	Gosung, Dongcheon, Bukheon
		Suseong -Gu	Suseong, Jung, Sang, Pa, Gisan, Bummul, Dusan	-	Mancheon, Bumae, Whanggm
		Dalseo -Gu	Sindang, Gincheon	Sungdang, Walsung, Bon	Janggi, Galsan, Yeongsan

lyze by Davis(1986) method, patch pattern diversity is analyze by Patton(1975) method.

Second, for the isolation analysis, distance among the near high value patches and distance among the patches over 10,000㎡ are measured. The isolation is analyze by Forman & Godron(1986) method(Isolation of a patch). The process of this study is as follows.

III. RESULTS AND CONSIDERATION

1. Quantitative Analysis of Urban Park

1) Disposition Distance Analysis

In the case of disposition distance analysis, very necessary regions of the children park, neighboring park and walking park are turned out to be 24 sites, 30 sites, and 22 sites respectively. In the case of population density analysis(Ryu et al., 2002), most region are appeared to be above middle density. Finally, the disposition distance should be considered as the quantitative plans of urban development and specially very necessary regions and high density regions preferentially should be improved.

2) Undevelopment Neighborhood Park Analysis

In the case of undevelopment neighborhood park analysis, the priority order of Daebong park is appeared to be 1 order, Suseong park to be 2 order, and Dusan park to be 3 order in the total 13 sites. For the quantitative maintenance of urban parks, the negligence and conversion of undevelopment park (Daegu, 2002) are serious, however it is very difficult to build up the urban park due to limited budget. Therefore the study can be solution and used as important basic data.

2. Qualitative Analysis of Urban Parks

1) Area and Shape Analysis

Table 5. Neighborhood park priority order

Indicator \ Park		Daebong	Suseong	Dusan	2.28	Kyungnam	Suchang	Donjiam	Janggi	Dnginlst.	Bokheon	Galsan	Mancheon	Gususan
Physical analysis	Altitude	20.1	20.1	20.1	20.1	6.7	20.1	13.4	13.4	20.1	13.4	13.4	6.7	6.7
	Gradient	22.5	22.5	22.5	22.5	7.5	22.5	15.0	7.5	22.5	7.5	7.5	7.5	7.5
	Gross rate	32.0	24.0	32.0	16.0	32.0	16.0	32.0	32.0	8.0	32.0	32.0	32.0	32.0
Using radius analysis	Land using pattern	30.8	30.8	30.8	23.1	30.8	23.1	7.7	7.7	23.1	7.7	15.4	7.7	7.7
	User number of using r	47.0	37.6	18.8	18.8	28.2	37.6	9.4	28.2	28.2	18.8	18.8	18.8	9.4
	Park area per population	31.6	31.6	31.6	31.6	31.6	7.9	31.6	23.7	15.8	31.6	15.8	31.6	23.7
	Iexecution term	22.8	7.6	7.6	7.6	22.8	7.6	22.8	22.8	7.6	15.2	22.8	15.2	7.6
Economic analysis	Estimated compensation	36.0	36.0	36.0	36.0	9.0	36.0	27.0	27.0	36.0	18.0	27.0	18.0	9.0
	Unpurchased land rate	25.0	25.2	25.2	25.2	8.4	25.2	8.4	16.8	25.2	8.4	8.4	8.4	8.4
	Occupied facilities rate	21.6	21.6	21.6	14.4	21.6	7.2	21.6	21.6	7.2	21.6	21.6	21.6	21.6
Balance analysis	Park area per population	21.3	14.2	14.2	21.3	14.2	21.3	21.3	7.1	21.3	14.2	7.1	14.2	14.2
	Park rate per area	20.7	20.7	20.7	13.8	20.7	13.8	20.7	6.9	13.8	20.7	6.9	20.7	20.7
	Population increasing rate	6.6	19.8	19.8	6.6	19.8	6.6	13.2	26.4	6.6	19.8	26.4	19.8	19.8
Total		338.2	311.7	300.9	257.0	253.3	244.9	244.1	241.1	235.4	228.9	223.1	222.2	188.3
Priority order		1	2	3	4	5	6	7	8	9	10	11	12	13

In the case of area and shape, the area of Bummul park and Chimsan park appeared to be 7,158㎡ and 291,080㎡. Then interior area of Bummul park is larger than that of Chimsan park. Finally, Chimsan park has more ecological possibility than Bummul park. Therefore it is necessary to promote the additional urban park planning of quantitative side in the landscape ecological view.

Table 6. Area and shape analysis

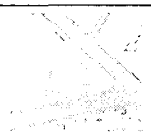
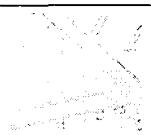
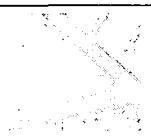
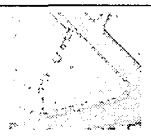
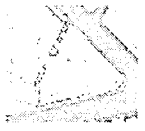
Indicator \ Study area		Bummul Park		Chimsan Park	
		Measure	Remark	Measure	Remark
Area		7,158㎡		291,080㎡	
Shape	Elongation	major axis length : perpendicular width = 176m : 98m E = 98/176 = 0.56		major axis length : perpendicular width = 1020m : 350m E = 350/1020 = 0.34	
	Convolution	2		1	
	Interior . exterio region	interior region area = 5,538㎡ exterior region area = 1,620㎡		interior region area = 57,227㎡ exterior region area = 233,853㎡	
	Perimeter	508.8m		2,590.7 m	
	Patch pattern diversity	$\frac{508.8}{2\sqrt{\pi \times 7,158}}$		$\frac{2,590.7}{2\sqrt{\pi \times 291,080}}$	

Table 7. Isolation analysis

Standard \ Study area	Bummul Park		Chimsan Park	
	High value biotope	Measure	High value biotope	Measure
Isolation among the near high value biotope patches	Children park	308.5m	School	647.1m
	School	468.5m	Government office	904 m
	Children park+school	388.5m	School+government office	704.2m
	Children park+school+neighborhood park	411.5m	School+government office+neighborhood park	726.6m
	Children park+school+neighborhood park+forest	429.7m	School+government office+neighborhood park+river	718.2m
Isolation among the patches over 10,000㎡	Children park+school+neighborhood park+forest	495.6m	School+government office+neighborhood park+river	708.2m

2) Isolation Analysis

First, in the case of distance among the near high alue patches(school), Bummul park and Chimsan ark appeared to be 468.5m and 647.1m. Second in ıe case of distance among patches over 10,000㎡, ummul park and Chimsan park appeared to be)5.6m and 708.2m. Therefore the general isolation of himsan park is higher than that of Bummul park. ntil now, pretty many plans in the urban park anning of quantitative side have been proposed but ıe planning in the landscape ecological view is very sufficient. So, based on landscape ecological view, ıore discussion should be accomplished.

V. CONCLUSION

The purpose of this study is to carry out the uantitative and qualitative analysis of an urban park ı the landscape ecological view. The results of this udy are as follows.

. In the case of disposition distance analysis, very necessary regions of the children park, neighboring park, and walking park are turned out to be 24 sites, 30 sites, and 22 sites. Specially very necessary regions and high density regions preferentially should be improved.

2. In the case of undevelopment neighborhood park analysis, the priority order of Daebong park is appeared to be 1 order, Suseong park to be 2 order, and Dusan park to be 3 order in the total 13 sites. the early vitality of undevelopment neighborhood park has been carried on importantly, however it is very difficult to build up the urban park due to limited budget. Therefore the study can be solution and used as important basic data.

3. In the case of area and shape, the area of Bummul park and Chimsan park appeared to be 7,158㎡ and 291,080㎡. Then interior area of Bummul park is larger than that of Chimsan park. Finally, Chimsan park has more ecological possibility than Bummul park.

4. First, in the case of distance among the near high value patches(school), Bummul park and Chimsan park appeared to be 468.5m and 647.1m. Second in the case of distance among patches over 10,000㎡, Bummul park and Chimsan park appeared to be 495.6m and 708.2m. Until now pretty many problems in the urban park planning have been indicated, but the planning in the landscape ecological view is very insufficient. So based on landscape ecological view, more discussion should be accomplished.

5. This study is to propose the quantitative and qualitative plans of an urban park in the landscape ecological view. But the indicators of this study have been limited to four indicators of the quantitative and qualitative sides. So the study which reflects additional indicators should be carry out constantly.

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