An Analysis on the Status of Parks and Open Space Development by Housing Development Plans

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ABSTRACT

This study focused on 15 parks to investigate the actual developmental conditions for preservation type parks and artificial type parks in the 9 residential land development sites managed by the Korea Land Corporation in Daegu and Gyeongsangbukdo area from 1994 to 2002. Emphasis is placed upon the types of land use, park arrangements, park facilities, types of planted trees and landscaping expense, with a view to discovering ways of improving the efficiency of future park development.

Key Words : Park and Open-space System, Park Arrangement, Park Facilities, Preservation Type Park, Artificial Type Park

I. INTRODUCTION

1. Goals and Objectives

Urban development in Korea can be classified into two types: public development and private development. Only the former type was observed until the year 2000, after which the latter type entered the scene. Though both types coexist at present, the predominant model is still the public type, led by the state or local governments or public enterprises such as the Korea Land Corporation and the Korea Housing Corporation. Two types of parks are developed depending on the conditions of the parkland provided, in particular, its natural forestation. The first group is the preservation type parks, which preserves the plant and animal life of the area with minimal addition of park facilities to the site. The second one is the artificial type, planned and created on artificially levelled or sloped grounds according to the overall land use plans.

Studies of housing development plans and park and open space development can be found in Ko (1997), Kim and Lim (1998,1999), Woo (1999), Kim (2000), Kim (2001) and Park (2002), among others. These works centered around the location, arrangement, priorities and problems of park development. The present research is intended to compare two types of parks with distinct characteristics, which we hope will lead to a discovery of important data concerning plans for future parklands, land use plans, plans for park facilities and landscaping expense.

This study will examine 15 parks located in the nine housing development sites managed by the Korea Land Corporation in Daegu and Gyeongsangbukdo area, focusing on the types of land use, park arr-

angements, park facilities, types of planted trees and landscaping expense. The primary objective is to find factors relevant to the efficiency of park development. We hope the findings of the research will help develop a more efficient way of planning land use and park development of the future.

2. Scopes and Methodology

This study is intended to analyze practices and problems involved in the types of land use, location of the parks within the city, utilization of the parkland, park facilities, planted trees and landscaping expense, in an attempt to provide a better way of planning parks and open space. The time period dealt with in this paper has been limited to the period between 1994 and 2002, mainly because relatively accurate

Table 1. Land use form by region

Division \ Region		Daegu Chilgok2	Andong Jungsang	Gimchun Gyodong	Gimchun Bugok	Gyeongsan Sadong	Gyeongsan Limdang	Daegu Dongho	Daegu Chilgok3	Daegu Seongseo	Average
Area(1000㎡)		682	525	252	213	605	427	634	2,228	3,145	968
House building area	Sub-total	50.7	35.4	42.0	56.0	40.7	48.0	48.8	43.1	42.6	45.24
	Individual house	14.5	14.6	16.3	17.2	13.8	36.0	11.4	10.7	12.1	16.29
	Apartment house	35.7	20.8	25.7	36.5	23.8	10.3	36.3	31.6	29.4	27.79
	Neighborhood facility	0.5			2.3	3.0	1.7	1.1	0.8	1.1	1.50
Commercial district		1.8	5.6	6.3		2.2	2.3	5.7	6.8	3.3	4.24
Public facilities area	Sub-total	47.5	59	51.7	44	56.6	49.7	43.9	50.1	54.1	50.68
	Road	28.7	28.5	22.4	23.9	31.6	26.5	23.2	26.0	25.7	26.28
	Park	6.3	10.5	8.0	9.0	9.9	5.8	5.0	5.1	11.0	7.84
	Greens	3.8	5.8	1.4	3.3	3.5	4.0	5.2	5.1	1.2	3.70
	School	7.5	2.6		5.7	8.0	6.0	7.9	6.5	8.0	6.53
	Public Government Building	0.3	5.8	17.4	1.1	2.5	0.2	0.2	1.9	1.4	3.42
	Business Center	0.5	3.6			0.5		1.6		0.8	1.40
	Parking lot	0.5	0.6	0.7	1.0	0.6		0.7	0.7	0.6	0.68
	Square	0.1					0.1		3.0	0.1	0.82
	Religious Buildings		0.4	0.8		0.5	0.2	0.4	0.3	0.8	0.49
	Water service		0.8	0.6			0.2		0.4	0.6	0.52
	Gas station		0.4					0.2	0.2	0.1	0.23
	Kindergarten			0.4			0.2	0.4			0.33
	Public open area						5.8			0.1	2.95
	etc.						0.7	0.7	1.0	2.3	1.18

The others : The communication facilities, Social welfare, Disposal of wasted matter system, General medical facilities, Electric providing facilities, etc.

data on the status and conditions of the parks are available for this period. A total of 15 parks have been divided into two groups, 8 artificial type parks and 7 preservation type parks, and for each of them, a comparative analysis has been made of the area for park facilities, the variety and number of planted trees, and landscaping expense. The data used in this research is collected from a variety of literature, construction approval forms, completion of construction reports, landscape work order forms, layout modification forms and other business papers.

II. TYPES OF LAND USE

1. Types of Land Use

Table 2. Neighboring Parks in the Research Area

City	Project zone	Park's name	Park's division	Type of the park		Area(㎡)		Period
				Created	Preserved	Created	Preserved	
Daegu-Bukgu	Chilgok2	Neighbor hood park	neighborhood zone of life	○		25,700	-	1994
Daegu-Dalseogu	Seongseo 2-dangae	The 1st neighborhood	neighborhood zone of life		○	-	72,119	1996~1997
		The 2nd neighborhood	neighborhood zone of life		○	-	114,494	〃
		The 3rd neighborhood	neighborhood zone of life	○		15,000	-	〃
		The 4th neighborhood	neighborhood zone of life		○	-	15,000	〃
		The 5th neighborhood	neighborhood zone of life		○	-	14,068	〃
Gimchun	Bugok	Neighbor hood park	neighborhood zone of life	○		13,196	-	1997~1998
Gimchun	Gyodong	Neighbor hood park	neighborhood zone of life		○	-	17,144	〃
Gyeongsan	Limdang	Neighbor hood park	neighborhood zone of life	○		11,628	-	〃
Daegu-Bukgu	Chilgok 3	The 1st neighborhood	walking zone	○		46,910	-	1999
		The 2nd neighborhood	neighborhood zone of life	○		12,147	-	〃
Gyeongsan	Sadong	Neighbor hood park	neighborhood zone of life		○	-	12,147	2000
Andong	Jungsang	Neighbor hood park	neighborhood zone of life		○	-	45,503	〃
Daegu-Donggu	Dongho	The 1st neighborhood	neighborhood zone of life	○		11,105	-	2002
		The 2nd neighborhood	neighborhood zone of life	○		10,003	-	〃
Total		15		8	7	145,689	290,475	
Average						18,211	41,496	

The types of land use in large-scale housing developments in Korea are summarized in Table 1 below. As shown in the table, 45.2% of the land is used for housing, 4.2% for business, and 50.6% for public facilities. A large portion (26.3%) of the public facilities area is taken up by roads, 7.8% by parks, and only 3.7% by green areas.

This result is presumably brought about by the Residential Site Development Promotion Act, which demands a 6㎡-per-person requirement for parks and open space in accordance with the Urban Development Act and the Urban Park Act. Public development of large-scale housing complexes has several advantages from the contractor's perspectives, such as an opportunity to purchase a large area of land at a reasonable cost and simplified processes through a series of red tape including construction approvals, housing distribution etc. Despite such advantages, public development has been criticized for not allowing for sufficient space for parks and open space. Another factor contributing to this tendency is the fact that most areas for housing development lie on the outskirts of the city, so that the contractors are tempted to regard the natural forest land of the area as part of the parks and open space required by law.

2. Location of Neighboring Parks

The number of neighboring parks in the area under investigation totals 15, located in 9 business districts in 4 cities within the Gyeongsangbukdo area.

As for the size of the parks, 14 of them are located within less than 500m of the population center of the region and have an area of over 10,000m^2. Most of the park users are residing within walking distance of the parks. One of these parks has an area exceeding 30,000m^2. Of the 15 parks, 8 are the artificial type and 7 are the preservation type, exhibiting an even distribution of the two types. The average park size is 18,211m^2 for the artificial type and 41,496m^2 for the preservation type, and the period of park construction ranges from 1994 to 2002, again showing an even distribution within this period.

III. LOCATIONS AND PROBLEMS OF THE PARKS AND OPEN SPACE

1. Locations of the Parks and Open Space

Master plans for the 9 districts under consideration are mostly composed of plans for the open space system, neighboring parks, children's parks and green belts, as schematically represented in Figure 1 below:

Open space system plans are designed to make the best use of the neighboring hills and mountains, streams and rivers, parks and green areas in the vicinity, and the natural terrain of the area. Parks and open space are grouped into neighboring parks, children's parks, pedestrian streets and roadside green areas, forming the parksand open space system for the entire district.

Five rules are observed in the planning of neighboring parks. First, the location, facilities and size of neighboring parks should guarantee easy access and convenient use of the residents of the neighborhood unit. Second, they should be at a safe, pleasant, and convenient location from the neighborhood unit, the

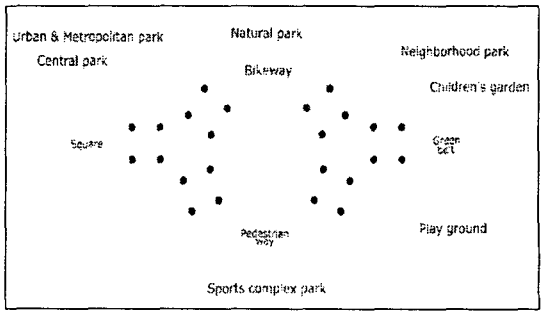

Figure 1. Park and Open-space System

standard being 500m from the residential center. Third, neighboring parks should be planned according to their distance, those within 500m of the neighborhood unit, those within 1,000m, those without a limit on the distance within the urban planning area, and those in the wider metropolitan area. Fourth, neighboring parks should be planned in a way to maximize their positive effect on the environment by carefully designing their location in harmony with the neighborhood unit. Fifth, relations between the park areas should be taken into consideration in determining their location to ensure maximal availability of recreational activities by planning areas with similar functions in the same location and separating those with incompatible functions.

Also, the following five rules are applied to the planning of children's parks. First, children's parks are required to be located within a 250~300m radius of the residential area to facilitate daily access by children. The size must be not less than 1,500m^2 at a rate of 0.6m^2 per child. Their locations are to be appropriately distributed based on the scale of park facilities and the estimated number of users.

It is required by the Residential Site Development Promotion Act to secure at least 15% of forested area within a housing complex. Green areas are also required along the trunk roads and large walls. In particular, the construction of a buffer green zone is encouraged along particularly noisy trunk roads, a facilities green zone along main roads adjacent to educational facilities as a means of ensuring safety through separation of structures, and a scenic green zone around public squares and parking lots.

2. Characteristics and Problems of Park Locations

1) Locational Characteristics

Residential land development projects are concentrated in areas where the cost of land is relatively cheap, because it is easier to deal with the compensation problems and to secure enough land in such areas. Given the predominantly mountainous terrain of Korea, housing developments are more often distributed in forested areas than on farm lands. Accordingly, the boundaries for residential land developments are often natural forests.

Also, higher priority is given to meeting the legal requirement for green areas than to accessibility of the residents. Thus, parks come after residential and commercial areas on the priority list, occupying what is left of the available land. This accounts for their location on the periphery of the city and the consequent low rate of park use. In addition, many streams and rivulets have been reclaimed or artificially purified to an excessive degree in an effort to maximize the usable land, resulting in the loss of the naturalness of the land.

2) Utilization of Parklands

Residential land developments are justifiable in that they are in the interest of the public, which is to say that they provide relatively inexpensive land and quality residential environment. However, because residential developments are planned on the basis of compensation for what is supplied whereas parks and green areas are not, the compensation-free parks and green areas are pushed out to the periphery of the district, resulting in poor efficiency and low functional capacity. Even when they are located within rich natural forests, their functions as parks are considerably decreased due to the construction of artificial structures within the compound, such as roads and drainages.

Also, the steep slopes along the outer edges of the parkland formed during the construction of the parks make access more difficult, causing further problems for the park use.

3) Ecological Aspects of Parks and Open Space

Because meeting legal requirements for parks and green areas, such as their sizes and distance from the residential area, is a predominant concern at the planning stage, it is often the case that parks and green areas exist in isolation from each other within the complex with no connecting passages between them. Excessive alteration of the natural terrain to serve the developer's economic purposes also results in harmful ecological effects, including artificialization of

Table 3. Present condition of land use

Classification			Road and square	Landscape architecture facilities	Recreation facilities	Sports facilities	Cultural facilities	Convenience facilities	Entertainment facilities	Management facilities	Sub-tota of facilities	Greens	Total (park area)
Created Neighborhood Park	Daegu Chilgok	neighborhood	6,157	364	44	3,155	2	-	-	60	9,782	15,918	25,700
	Daegu Seongseo 2dan-gae	3rd neighborhood	3,296	239	31	1,991	1	-	-	120	5,678	9,322	15,000
	Gimchun Bugok	neighborhood	3,288	94	33	1,644	-	2	-	24	5,085	8,708	13,793
	Gyeongsan Limdang	neighborhood	2,183	101	24	1,120	285	347	224	121	4,405	7,223	11,628
	Daegu Chilgok 3	1st neighborhood	10,814	538	55	3,361	328	7	-	151	15,254	31,656	46,910
		2nd neighborhood	3,609	97	14	678	-	1	-	146	4,545	7,602	12,147
	Daegu Dongho	1st neighborhood	3,159	78	116	1,078	-	-	-	2	4,433	6,672	11,105
		2nd neighborhood	3,548	64	240	24	30	-	-	50	3,956	6,047	10,003
Total			36,054	1,575	557	13,051	646	357	224	674	53,138	93,148	146,286
Average			4,507	197	70	1,631	129	89	224	84	6,194	11,644	18,286
Preserved Neighborhood Park	Daegu Seongseo 2Dan-gae	1st neighborhood	2,157	135	41	1,410	-	-	-	24	3,767	68,352	72,119
		2nd neighborhood	3,552	110	52	2,283	-	1	-	47	6,045	108,449	114,494
		4th neighborhood	1,206	110	31	200	-	-	-	41	1,588	15,373	16,961
		5th neighborhood	964	211	49	1,344	-	1	-	82	2,651	11,417	14,068
	Gimchun Gyodong	neighborhood	808	-	8	120	-	-	-	1	937	16,207	17,144
	Gyeongsan Sadong	neighborhood	1,982	81	7	687	-	-	-	52	2,809	37,944	40,753
	Andong Jungsang	neighborhood	2,015	38	24	832	-	1	-	22	2,932	45,508	48,440
Total			12,684	685	212	6,876	-	3	-	269	20,729	303,250	323,979
Average			1,812	114	30	982	-	1	-	38	2,961	43,321	46,283

the soil. Serious consideration of the urban ecological environment is called for in designing parks and open space in the future.

Ⅳ. CHARACTERISTICS OF THE TWO TYPES OF PARK

Table 4. Present condition of site use

classification			Tall trees			Shrub			Flowering Plant	Bryology	
			Ever green	Deciduous	Sub-Total	Ever green	Deciduous	Sub-Total		level-sod	line-sod
Created Neighborhood Park	Daegu Chilgok2	Neighbor hood	140	159	299	200	2,662	2,862	-	15,233	-
	Daegu Seongseo 2Dangae	3rd Neighbor hood	374	925	1,299	2,350	3,305	5,655	8,200	8,098	-
	Gimchon Bugok	Neighbor hood	240	475	715	2,600	7,002	9,602	-	7,780	2,551
	Gyeongsan Limdang	Neighbor hood	290	406	696	2,945	976	3,921	1,400	6,701	-
	Daegue Chilgok3	1st Neighbor hood	330	979	1,309	1,450	2,162	3,612	9,710	509	28,550
		2nd Neighbor hood	118	340	458	100	1,162	1,262	1,920	-	6,911
	Daegue Dongho	1st Neighbor hood	167	230	397	685	2,140	2,825	2,710	5,341	-
		2nd Neighbor hood	134	267	401	430	1,630	2,060	6,710	5,097	-
Average			224	473	697	1,345	2,630	3,975	5,108	6,966	12,671
Preserved Neighborhood Park	Daegu Seongseo 2Dangae	1st Neighbor hood	1,277	157	1,434	600	2,,020	2,620	-	1,423	-
		2nd Neighbor hood	223	227	450	250	1,690	1,940	6,290	430	-
		3rd Neighbor hood	87	468	555	880	4,532	5,412	1,400	1,554	-
		4th Neighbor hood	376	1,330	1,706	1,200	6,839	8,039	3,400	2,391	-
	Gimchun Gyodong	Neighbor hood	-	-	-	-	-	-	-	-	-
	Gyeongsan Sadong	Neighbor hood	88	207	295	300	225	525	-	-	446
	Andong Jungsang	Neighbor hood	56	124	180	-	25	25	-	-	2,390
Average			351	419	770	538	2,555	3,094	3,697	1,450	1,418

1. Park Facilities

We have classified park facilities based on the Enforcement Ordinance Article 2 of the Urban Park Act, and referred to the final park facilities protocol to estimate the area for each park facility. For the park facilities whose actual areas were not indicated on the protocol, we did the calculation ourselves to obtain the actual figures.

The area for park facilities in preservation type parks is only half that of artificial type parks, while the green area is four times larger in the latter type than in the former. This is because only minimal facilities such as pavilions are constructed in preservation type parks to protect the natural forest of preservation parks, in contrast to the diverse facilities built in artificial type parks.

Thus, park facilities in preservation type parks are much more limited than in artificial type parks. A variety of benches are installed in both types of parks, but outdoor tables are found mostly in preservation type parks, mainly for the families picnicking in the parks. Sports facilities that requires wide space, such as multipurpose playgrounds, basketball or badminton courts etc., are mostly found in artificial type parks, whereas most physical training facilities are found along the trails of preservation type parks. Cultural facilities such as small-scale outdoor stages and bleachers are found only in artificial type parks, presumably because in preservation parks, construction of such facilities would require major alterations of the land features and it is difficult to secure enough space. The majority of maintenance offices and rest rooms are in artificial parks, to ensure easy access and effective management.

2. Planted Trees

As for the trees planted in the parks investigated, 97 species have been identified, including 49 species of tall trees, 32 species of shrubs, 25 species of flowering plants, and 1 species of ground cover.

Little difference has been observed in the distribution of tall trees in the two types of parks, but a wider variety of flowering plants are planted in artificial type parks. There are 3.5 times as many evergreens planted as deciduous trees. It thus seems desirable to introduce an increased variety of evergreens. The only ground cover planted in the parks is the lawn, calling for more diversity in the future depending on the conditions of the parkland.

More tall trees are planted in the artificial type parks than in the preservation type parks, for a quick formation of the green area, and about 2½ times as many evergreen shrubs such as royal azaleas are planted in preservation type parks as they are in artificial type parks. The bulk of the evergreen shrubs seem to have been planted at a single time for beautification purposes.

3. Construction Cost

Table 5 illustrates the construction cost for each type of landscape work.

The average park construction cost was about 2.3 times higher for the artificial type parks than it was for the preservation type parks. In particular, the cost was 10 times higher for paving and drainage works, 4.7 times for civil engineering works, 2.2 times for tree planting, and 1.2 times for facilities. The differences are due primarily to the fact that paving is minimized in preservation type parks to preserve their natural settings. The natural drainage system of the land can also reduce the need for artificial drainage work. Earthwork is also minimized in preservation type parks, further reducing the construction cost.

The figures for 1995~1996 in Table 6 are cited from the Korea Land Corporation's official documents,

Table 5. Construction Cost for Landscape Work Type (unit: 1000won)

classification			Engineering works	Planting works	Trans plantation	Facilities works	Pavement works	Water works	Construction works	Total
Created Neighborhood Park	Daegu Chilgok2	Neighbor hood	7,722	82,082	-	72,325	15,940	4,967	-	183,036
	Daegu Seongseo 2Dangae	3rd Neighbor hood	6,435	204,546	-	156,344	76,718	20,628	43,424	508,095
	Gimchon Bugok	Neighbor hood	1,124	130,940	25,303	68,690	44,694	25,263	-	296,014
	Gyeongsan Limdang	Neighbor hood	4,992	141,407	-	144,234	42,764	28,339	29,498	391,234
	Daegue Chilgok3	1st Neighbor hood	19,996	264,266	27,580	304,223	195,283	98,771	57,595	967,717
		2nd Neighbor hood	7,073	72,506	9,561	65,185	57,332	28,601	54,668	294,926
	Daegue Dongho	1st Neighbor hood	6,364	116,687	-	75,957	140,787	34,390	-	374,185
		2nd Neighbor hood	5,744	124,961	-	100,831	199,043	25,584	48,738	504,901
Average			7,431	142,174	20,815	123,474	96,570	33,318	46,785	440,014
Preserved Neighborhood Park	Daegu Seongseo 2Dangae	1st Neighbor hood	1,337	34,548	-	67,071	4,673	7,171	-	114,800
		2nd Neighbor hood	1,844	80,247	-	353,451	8,603	2,010	-	446,155
		3rd Neighbor hood	1,090	84,919	-	193,151	10,612	1,072	-	290,844
		4th Neighbor hood	2,004	130,461	-	86,194	7,204	1,344	-	227,207
	Gimchun Gyodong	Neighbor hood	-	-	-	20,840	1,933	-	-	22,773
	Gyeongsan Sadong	Neighbor hood	-	38,837	8,289	39,430	12,684	6,311	40,277	145,828
	Andong Jungsang	Neighbor hood	-	22,783	-	29,813	21,430	4,537	-	78,563
Average			1,569	65,299	8,289	112,850	9,591	3,741	40,277	189,453

and the rest of them are obtained by dividing the parkland into the facility region and the preserved region and calculating the construction cost for each.

The construction cost per unit based on a nation-

Table 6. Average Park Construction Cost

Year	Average unit construction cost for national business site of neighborhood parks(Won/m^2)			
	Created	Preserved	Facility Region	Preserved Region
1995	24,100	3,600	-	-
1996	28,000	3,700	-	-
1997	31,200	4,200	-	-
1998	33,500	4,900	-	-
1999	31,800	9,300	-	-
2000	-	-	26,700	800
2001	-	-	29,800	900
2002	-	-	31,300	1,100
2003	-	-	25,800	1,700

wide survey was 24,100~31,800 won for artificial type parks and 3,600~9,300 won for preservation type parks, showing that the cost was 3.4~6.75 times higher for the former type. In particular, when the parkland was divided into the facility and preserved regions for a more accurate comparison, it turned out that the cost was 21~33 times greater for the former type, showing a much wider gap between the two types of parks.

The construction cost for the types of landscape work and the unit construction cost cited above can be used as important indices in estimating construction costs for land use plans and proper facilities arrangements. A comparison of the construction costs for the two types of parks also indicates that preservation type parks are a more economical option for future neighboring parks in the residential land development sites. Also, in laying out land use plans for the residential land development sites, it should be taken into consideration that preservation type parks serve to preserve the natural forest of the region.

V. CONCLUSION

This paper has examined the current status and problems of urban parks based on an analysis of the distribution of parks and land use types in nine residential land development sites in Daegu and Gyeongsangbukdo area. A total of 15 parks have been studied, including 8 artificial type parks and 7 preservation type parks. An attempt has been made to discover certain factors that can contribute to the enhancement of efficiency in the planning and development of parks and open space. The results of the study can be summarized as follows:

1. Types of land use in residential land development areas: residential area 45.2%, commercial area 4.2%, and public facilities 50.6%. Of the public facilities area, the largest proportion, or 26.3%, is assigned to roads, with only 7.8% reserved for parks and 3.7% for green areas.
2. The area for park facilities in the preservation type parks is only half that of the artificial type parks, whereas the green area is four times larger in the latter type than in the former. Park facilities are fewer in number and less varied in the artificial type parks.
3. Of the trees planted in the parks, there are 3.5 times as many evergreens as deciduous trees. Introduction of an increased variety of evergreens seems desirable, together with a variety of ground covers. More tall trees are planted in the artificial type parks than in the preservation type parks, for a quick formation of the green area. About 2½ times as many evergreen shrubs such as royal azaleas are planted in the preservation type parks as they are in the artificial type parks.
4. The overall cost of park construction was about 2.3 times higher for the artificial type parks than it was for the preservation type parks. In particular, the cost was 10 times higher for the pavement and drainage works, 4.7 times higher for earthwork, 2.2 times higher for tree planting, and 1.2 times higher

for facilities. The number of plan modifications and the subsequent increase of cost for the artificial type parks nearly doubled those for the preservation type parks. The construction cost per unit based on a nationwide survey was 24,100 to 31800 won for artificial type parks and 3,600 to 9,300 won for preservation type parks, showing that the cost was 3.4 to 6.75 times higher for the former type. In a comparison of construction costs for the facilities and preserved regions, it turned out that the cost was 21 to 33 times greater for the former type.

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