Performance of Practices for Linked Parks on New Sub-center Development Axis in Past Decade in Kyoto Southern District

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1. Research Motif and Snapshots on Academic Streams of Green Landscape Planning

The mega-city region of Osaka-Kyoto-Kobe is characterized by population-dense business districts associated with newly developed green urban cores. The Osaka municipal office has appealed amenities and attractiveness of garden city development for utilizing empty lots in freight station in downtown Osaka, while the Kobe municipal has retained initiatives to upraise accessibility and connectivity to green corridors in the restoration program after Great Kobe Earthquake. The authors clarified improved degrees of citizens' opportunity of walking through parks and pedestrian passages with trees along rivers with green promenade renovated in a typical project related to along Blue-Green Corridor in Kobe[1)]. The Kyoto city government, while performing distinct efforts of conservation of urban historic zones, has the experiences of fostering park systems in developing sub-urban area in the west hillsides by means of town development projects and in land readjustment practices in southern agricultural farmlands.

This paper deals with performances of various land development approach towards accessible and highly qualified green park systems in a newly emerging sub-center so called as Rakunan (Southern Kyoto) Sub-center in general tendency of limited provisions of number or volume of new parks or green gardens in sub-urban areas under the pressures of urban sprawling.

In the review study in Japanese journal "city planning review" (Vol.56/No.5, 2007), Dr. Nagino classified into four streams with typical steps of green landscape planning in Japan[2)]. The authors would agree with his general implications in green or park system in the modern age.

1) In the first stage, from 1950's to1960's, the government has instituted fundamental laws of green landscape planning named as Urban Green Space Conservation Law and Urban Park Law, in the manner of separate policy orientation of conservation of special valuables even on private lands apart from public-owned parks in new urban development.

2) In the second stage, from 1970's to1980's, green landscape planning has worked closely with the hierarchical systematized combination of skeleton (master) and detailed (site-based) in urban planning. The government instituted Green Master Plan and Guideline.

3) In the third stage, from 1990's to2003, green landscape planning has based on the law in planning and practices. Not national but local governments instituted New Green Master Plan.

4) In the fourth stage, up to the present from 2003, park planning and green space planning have been practiced in collaboration. Green Master Plan was amended and should be implemented in concordance with the set of three laws related to green landscape being instituted in law.

As reviewed from 1970's, green landscape planning has changed in about ten-years intervals.

In the same Japanese journal, Dr. Yanai categorized the recent studies of green landscape planning which was published after 2005[3)] .

1) Adaptation for climate change and heat island

2) Ecological network

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3) Environmental management of farmland, agricultural land, water basin and waterfront
4) Valuating performance of park-system and management
5) Historical and cultural landscape of green spaces
6) Partnership of private and public in green environment
7) Education and communication in green works
8) Policy for green spaces environment
Studies of evaluating the performance of accessibility and connectivity to parks are categorized into 'Valuating performance of park-system and management'.

2. Research Target and Method

The target of this study is to evaluate the performance of accessibility and connectivity to parks produced by land readjustment projects, and find out the most effective allocation of the parks.
This study has the following three steps.
1) Categorizing parks produced by urban development projects
We accounted the number and lots volume of parks in ten-years intervals in each project category in the citywide in period of 1970-2011 based on park inventory system. The items of projects are shown in Table-1(Project Type and Land Acquisition System for Park).
2) Classifying parks produced by land readjustment projects
Focusing on land readjustment projects[4] in the citywide in period of 1970-2011, which is founded to be major driving force as in 3. , the authors examine where parks with areas of a quarter hectare or one hectare size were allocated in each ward called as 'ku' in Japanese.
3) Evaluating the performance of accessibility and connectivity to parks
We proposed the index which measures accessibility and connectivity to parks. The index is defined as equation (1).

$$Pc = NCP / NAP \qquad (1)$$

,where Pc, NCP and NAP denote the degree of accessibility and connectivity in imaginary behavior along green corridor, number of parks where a service radius overlaps, and number of all parks, respectively.
We understood that degree of accessibility and connectivity is highly regarded when the circles overlap each other. According to The Guidebook of Parks and Open Space Administration 2010[5], the service radius of children's-park and adjacent-park are set with 250-500m, respectively. Similarly, in this paper, the service radius of park-ways which produced trees and plants by the road improvement projects are set with 250m. We accounting the index of the multiple routing and round walking along the parks by assuming service radius of parks developed in hundreds hectare area using GIS.
Kyoto city government in this study area is characterized in the following three points.
1) Kyoto city government is proud of being one of Environmental Model City in Japan.
2) Kyoto city government has made efforts of conservation of urban historical and cultural landscape, appealed attractiveness of the city, named as Wooden-City.
3) Kyoto city government has been pioneering a walkable-city in Japan as in Toronto and NYC.
Rakunan Sub-center is characterized in the following three points.
1) Rakunan Sub-center is developed by seven land readjustment projects.
2) Rakunan Sub-center is under the mixed use of business, commercial and residential activities.
3) In Rakunan Sub-center new development scheme is applied for stimulating development by private sectors, producing open spaces in private-owned lots as in building front.

Table-1 Number and lots volume of parks developed by categorized urban development projects in Kyoto citywide in period of 1970-2011

Project Type	Land Acquisition System for Park	1970's		1980's		1990's		2000-2011		Total (1970's-2011)	
		Number	Area[ha]	Number	Area[ha]	Number	Area[ha]	Number	Area[ha]	Number	Area[ha]
District-wide Development	Full-scale Land Acquisition Development	170	20.84	89	30.64	72	8.75	100	3.05	431	63.3
	Land Readjustment	42	14.93	29	13.79	13	5.72	14	1.94	98	36.4
Roads Improvement	Pocket Open Spot on Town Street					1	0.02			1	0.0
	Associated Open Space with Road Betterment					1	0.11			1	0.1
Riparian Works	Waterfront development in River Authority Management Zone	4	11.64			3	15.70	2	2.28	9	29.6
Park Improvement Works	Stand-alone for Park Improvement	6	0.68	5	1.05	6	2.73	16	*135.57	33	*140.0
Renovation Works	Renovation	4	0.47	4	0.51	1	0.09	3	0.30	12	1.4
	Horikawa Stream-side Environmental Renovation							10	1.08	10	1.1
Site-District-Development	Open-to-Public Space Design			2	0.33					2	0.3
	Ownership Management, Donation	1	0.03	2	0.04	1	0.03	3	2.71	7	2.8
Others	Modification of Governing Authority	6	0.93	1	0.05	8	0.63	7	1.94	22	3.5
	Open Space on Rented Ground	7	0.73			3	0.54	2	8.72	12	10.0
										638	289

※ 135.57ha = unexpected value: Oharano Forest Park Project(134.08ha)

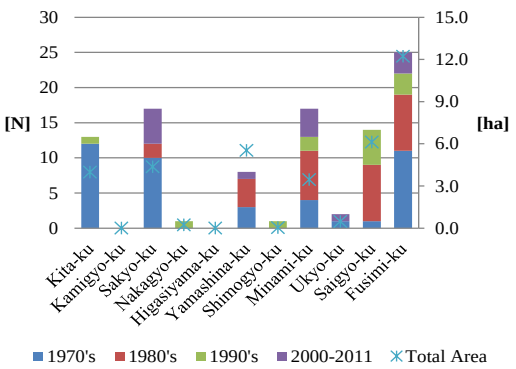

Figure-1 Number and lots volume of parks produced by land readjustment project in the Kyoto citywide in each ward

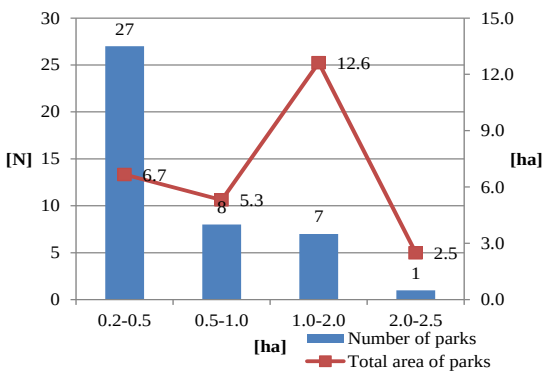

Figure-2 Number and lots volume of parks produced by land readjustment project in the Rakunan Sub-center in each scale of the park

3. Results

The results in this paper are summarized as follows.

1) The land readjustment and other area-wide land development projects (District-wide Development) are found to be the most dominant in terms of number and volume among various types of projects produced parks. These projects have provided additional 529(431+98) parks with 99.7(63.3+36.4) ha, which accounts for 82% of total new parks produced in past 40 years (1970-2011) in Kyoto citywide, and 35% of total parks lot volume of 289ha as in Table-1.

2) In Minami-ku and Fushimi-ku, where Rakunan Sub-center locates, land readjustment projects have supplied additionally 42(17+25)parks with 15.7(3.5+12.2)ha as the maximum record, which accounts for 43% of total new parks produced in past 40 years in Kyoto citywide, and 43% of total parks lot volume of 36ha as in Figure-1. This remarkable dominant ratio in various types of district-level town development in Rakunan district is expected to contribute to better performance of accessibility and connectivity to parks in once used as agricultural farmlands.

3) New 43 parks with total lots volume of 27ha start recreation services and opportunity of access to green spaces. As showing Figure-2, 27 parks with 0.2-0.5ha are the most dominant in number of all parks. A relative few number of parks with larger spaces of 1.0-2.0 ha contribute quantitative expansion of park spaces. We clarifies that the index of accessibility and connectivity along green corridor have been upgraded up to 65% considerably enriched from the 17% through carrying out interrelated seven land readjustment projects. This high performance is judged to be gained by suitable allocation of the sequential parks with 1.0-2.0 ha spaces arranged along two skeleton streets as in Figure-3.

Figure-3 Performance of accessibility and connectivity to parks in Rakunan Sub-center

4. Conclusion

1) First, in the urban area, it's difficult that producing new parks with large lots volume, but allocating small parks with lots volume of 0.5-2.0ha as close to each other as possible along the main street regarded as urban development axis enhances high performance of accessibility and connectivity to parks.

2) Second, in field survey, the authors recognized distinct various varieties of convenient facilities for daily shopping, community service, and health care should stimulate opportunity walking and communication among citizens in those parks and street.

3) Third, typical large buildings have buildings-side spaces should be accessible for everyone, are constructed in the setback manner under the guideline of design along the main street. These buildings-side spaces enable citizens to walk more frequently.

***Keywords**:*

Park System, Urban Development, Land Readjustment Projects, Accessibility, Connectivity

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