

Geographic Analyses of the 1 : 200,000 Land Use Map of the National Capital Region

Yasuo MASAI*

This paper is a summary of the present writer's research on the analyses of the 1 : 200,000 Land Use Map of the National Capital Region (*Shutoken*) published by the *Shutoken Seibi Inkai* in 1964. The map was chiefly made by Dr. Masami ICHIKAWA, of Department of Geography, Tokyo Kyoiku University and the present writer with valuable cooperations of the staff members of the National Capital Region Research Group.

1. Making of the 1 : 200,000 Land Use Map of the National Capital Region

In making the 1 : 200,000 Land Use Map of the National Capital Region, a considerable device was necessary in selecting color tones, so that the map could become more artistic and distinguishable. After discussing the matter with Dr. Masami ICHIKAWA and the other fellow researchers, the general tone of the map was made more limpid, primarily because of the artistic viewpoint.

Some important land uses such as urban commercial, tea field, or orchard were shown in more or less confusing colors with other land uses on the draft map. To correct these flaws, color tones of these land use items were made clearer with heavier tones than on the draft map. As a result, the finished map shows well the distribution of major urban places quite evenly

* Assistant Professor of Ochanomizu University

apaced in the plains area as if the central place theory would be applicable to a great degree, and that of orchards specifically located on the composite fans festooning the Kofu Basin, and also in maritime regions of Kanagawa and Chiba Prefectures with their own characteristic natural conditions. Although not widely distributed, a number of small orchards are scattered around Tokyo's built-up areas, showing the nature of urban market-oriented suburban farming areas with recreational purposes. Tea fields presented in dark green are clearly seen around the Sayama Hills northwest of Tokyo and a few other localities.

2. Qualitative Analyses

The writer conducted a few field surveys in the National Capital Region in order to ascertain the land uses shown on the 1:200,000 Land Use Map and to make some qualitative understandings.

On the Segamihara Diluvial Upland, urbanization has been phenomenal and, on the contrary, agricultural lands have been decreasing in area very rapidly. In terms of land use, mulberry fields which were very characteristic of the region for many years have been decreasing, and most mulberry trees are now to be found on the margins of ordinary fields growing vegetables and cereals, although there still remain compact mulberry fields scatteredly. On the land use map, however, mulberry tends to be exaggerated in area. A similar situation is true with practically all the areas containing mulberry trees.

Suburban sprawl was another important topic of the field surveys. The most striking patterns of this phenomenon of sprawl is to be seen in the western suburbs of Tokyo along the Chuo Railroad, as repeatedly described and explained by many researchers. But only on this kind of land use map showing all the land uses, not restricting to urban, in and around

Tokyo in a fairly detailed fashion, actual situations of suburban sprawl can be recognized as a reality.

Compared with the suburban areas along the Chuo Railroad, urban expansion along the Tokaido Railroad is considerably different, with larger patches of urbanized sections. Toward north or east of Tokyo, urbanization takes a still further different type with least sprawling for Japanese urbanization. This is mainly because of the natural condition of low marshy terrain and the less developed railroad network on the Shimoosa Upland.

Location of rural villages was considered relative to physical conditions. Many agglomerated rural settlements in the heart of the Kanto Structural Basin tend to be located in a particular condition, that is, they are located on natural levees or inland sanddunes or other naturally higher lands than the immediately surrounding alluvial lowlands. Linear settlements along the coast of Kujukurihama are another example of rural settlements with a close relation to natural environments. The well-known fact that the coast has seen successive retreats of shoreline in the past is now represented by the settlement form. Strassen-dorf-type villages on the Musashino Upland are also clearly shown on the map as a distinct pattern of *shinden*.

Distribution of forests in the National Capital Region involves another problem. Overwhelmingly dominant distribution of forests in the mountainous areas is a common nature of Japan, but the plains area shows an interesting pattern. As is well known, this is the only part of Japan that contains a considerably large area of plain forest excepting Hokkaido. Forests here are mostly located on diluvial uplands, especially on the flanks sloping fairly steeply in general, resulting in the distribution pattern of a meticulous patchwork with a close relation to landforms. Future development of the National Capital Region should be planned in consideration of the existing forests which tend to be cut very fast in large numbers because of

urbanization and industrialization as well as of expansion of farmland. Future land use of the region should contain a sizable area of forest in plains area so as to be used as parks or picnic grounds and as amenities of residential circumstances.

Recent land use changes may be summarized as follows:

Lowland	{	Around Tokyo	Paddy → Urban
	{	Others	{Paddy (no change) Hatake → Paddy
Upland	{	Around Tokyo	{Hatake → Urban Forest → Urban, hatake
	{	Others	{Hatake (no change) Forest → Hatake
Hill, mt. foot	{	Around Tokyo	{Hatake → Urban, golf-links Forest → Urban, golf-links
	{	Others	{Hatake (no change) Forest → Hatake
Mountain	{	Around Tokyo (not applicable)	
	{	Others	{Hatake (no change) Forest (no change)

(*Hatake* means a dry cultivated field(s) where wheat, potato, vegetables, fruits, and others except paddy are grown.)

3. Quantitative Analyses

It is a very difficult but very necessary problem to scrutinize the land uses of the National Capital Region in terms of a quantitative approach. However, such a meticulous patchwork of land use as represented on the map cannot be understood easily unless quantitative analyses are made along with the qualitative ones.

The method used for the analyses is as follows: first, a mesh at 500 m. intervals was optionally overlaid on the 1:200,000 land use map and then all land uses located at all the intersections of the mesh were counted by items of land use, so that the general pattern could be represented. By counting such a great number of land uses... some 80,000 localities,

minor variances in land uses that failed to be counted because of the only count of those at intersections, would be overlooked in this case. All the land uses at intersections were then plotted in different colors on a large sheet of tracing paper partitioned into hundreds of sub-regions and sub-divisions as described below. In doing so, cumulative totals can easily be measured according to the purposes such as the consideration of concentric or radial patterns or that of the relationships to natural conditions.

Second, the National Capital Region was divided into some 400 sub-regions and sub-divisions by drawing concentric circles at 10km. intervals, and also drawing radiating straight lines mutually with the angle of 18° , both of which are centered on Tokyo Station. Prefectural boundaries and the divides of major watersheds which appear on the land use map were also considered for the making of the sub-regions. Finally, all the land uses counted by the above-mentioned method were tallied for each sub-region.

The ultimate objective of the writer's research was to comprehend the general pattern of the land uses within the National Capital Region in a close relationship to water use. To attain this, the writer intended to make a table showing the area of each land use item, e. g., urban commercial, paddy, or forest, by sub-regions established by the above-mentioned method, and also to make a generalized land use map divided into many homogeneous land-use regions. These homogeneous land-use regions were constructed by combining all the land uses in the same categories located at the intersections of the 500m.-interval mesh, on condition that the land uses at intersections are not intervened or separated by any other land uses. These data are printed in *Shuto-ken no Mizu-shigen Kaihatsu*, edited by Prof. M. ROYAMA and Prof. T. ICHINOSE (Publisher: University of Tokyo Press, 1968).

The table described above is thought to be very useful for the quantitative comprehension of land use patterns around the great metropolis. Land uses around Tokyo show a somewhat concentric zonal structure as revealed by totaling all land uses of each concentric zone. Sector analysis is also to be made by summing up land uses of each sector shown in the table. Actual land use of each prefecture or watershed can also be understood in the same way. If a watershed basin is complete in water balance, present and future water use may be attained relatively easily by measuring the volume of water needed for each land use item whose total area is known. In actuality, however, water balance, both physical and human, is incomplete within the watershed basin, and interregional systems of water use are common. The most striking of these is the much debated relation of the Tama River basin, upon which Tokyo has long depended to a great degree, with the Tone River basin, which is one of the largest drainage in Japan. Newly completed Tone Aqueduct is a good example of the interregional cooperation. For such a project, the table would be very useful, if scientific and unprejudiced judgments are rendered.

Urbanization of the National Capital Region is a phenomenal geographic fact to be noticed as mentioned above. Ever-increasing urban population will need much more land for urban purposes and inevitably will be confronted with much harder conflicts with agriculture. Analysis of the table shows that the first 10km. concentric zone of Tokyo is almost thoroughly urbanized by 1964, the percentage of urbanized area being 90.7 as shown in Table 1. Urbanization is still conspicuous in the second concentric zone, that is, 10—20 km. from Tokyo's center, being 47.9%. Urbanization ratio decreases toward periphery until 40km. circle around Tokyo, whereas in a few radial sectors it is relatively high until 50 km. from Tokyo's center as shown in Table 2.

Table 1. Concentric Zone Structure of Urbanization in the National Capital Region.

Concentric zone	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
Distance from Tokyo's center (km.)	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110
Urbanization ratio in land use (%)	90.7	47.9	15.4	9.1	3.3	2.1	1.0	1.6	0.8	1.6	1.2
Of which,											
commercial	32.0	5.2	2.5	1.7	1.1	0.9	0.6	1.0	0.5	1.0	0.5
residential	50.0	36.8	9.9	3.8	1.4	0.6	0.2	0.2	0.1	0.3	0.4
industrial	3.4	3.3	1.4	1.8	0.6	0.4	0.2	0.4	0.2	0.2	0.2
public	5.3	2.6	1.6	1.8	0.2	0.2	0.01	0.04	0.01	0.07	0.07

Table 2. Urbanization Ratio of the National Capital Region by Concentric Zones and Radial Sectors (%)
 (Figures in brackets are units containing sea or areas outside National Capital Region, that are excluded in percentage calculation.)

Concentric zone (km)	Radial sector										
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
	0~10	10~20	20~30	30~40	40~50	50~60	60~70	70~80	80~90	90~100	100~110
1	(100.0)	(100.0)	—	(13.7)	(1.7)	(0.2)	(0.7)	(4.2)	(2.3)	—	—
2	(100.0)	—	—	(6.5)	0.2	0.3	0.2	(2.3)	—	—	—
3	(100.0)	—	—	(1.9)	0.2	0.4	0.7	(2.1)	—	—	—
4	(92.9)	(0.0)	—	(15.3)	0.2	2.8	(0.8)	(0.0)	—	—	—
5	97.2	(18.9)	(38.4)	(13.0)	0.7	0.9	(1.1)	(0.0)	—	—	—
6	82.7	(34.7)	(11.9)	0.7	1.9	0.7	0.6	(1.1)	(0.8)	(10.2)	—
7	90.7	34.9	6.1	1.6	1.8	0.4	1.1	1.2	(0.6)	—	—
8	82.7	30.7	9.2	3.2	1.9	5.2	0.5	1.4	(0.4)	(9.5)	(5.5)
9	98.7	9.9	3.5	1.8	1.4	2.3	0.0	1.2	1.4	0.6	0.5
10	87.5	17.5	5.4	3.4	1.9	1.2	1.3	3.6	2.0	5.0	(0.9)
11	84.3	20.6	0.3	3.6	1.2	4.6	0.6	3.2	0.3	0.8	0.2
12	100.0	58.8	33.8	7.5	2.3	3.0	3.7	5.2	1.6	0.3	(0.2)
13	95.5	50.3	3.5	9.1	1.6	2.0	2.2	0.8	2.7	3.2	(1.2)
14	95.5	53.0	8.6	7.1	2.8	0.3	0.5	0.7	0.2	0.0	(0.1)
15	93.9	90.0	30.9	23.6	3.7	0.1	0.4	0.0	0.0	(0.3)	(0.0)
16	66.8	56.7	19.1	10.9	2.6	0.6	0.0	0.7	0.8	0.3	(2.7)
17	93.2	56.7	3.5	14.1	0.7	0.1	0.6	(0.2)	(2.6)	(0.0)	—
18	97.1	48.1	3.2	13.8	4.6	(13.3)	(4.0)	(6.1)	(3.9)	—	—
19	98.7	76.7	(57.6)	20.4	(21.3)	(50.0)	—	—	—	—	—
20	(93.5)	(74.6)	(100.0)	(66.7)	(23.0)	(5.5)	(12.0)	—	—	—	—

4. Prospect

Urban-industrialization of the National Capital Region will proceed at an accelerated rate in the near future, resulting inevitably in both further fragmentation and further consolidation of land use. Land for public uses may increase along with the establishment of many recreational facilities. A serious problem will arise as to the evaluation of rural landscape as amenities. Need of irrigation of water for *hatake* may provoke debates that have been almost non-existent so far. Golf-links are large water-consumers and they will increase in number and area. All of these are closely related to water use. Assuming that the possibility of fresh water acquirement has a limit in the foreseeable future, and that the fresh water requirement increases rapidly, it is an urgent subject of all sciences that concern regional development to grasp the actual and future situations of land use.