The outline of the CMS in the Population Census of Japan

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I The CMS in the Population Census

Preface

The Geographic Information System (GIS) in the Population Census of Japan is called Census Mapping System (CMS). The boundary lines of the enumeration districts are digitized and stored in the CMS. The Statistics Bureau developed the Census Mapping System to utilize the GIS technology to enable more sophisticated use of the statistical data and the geographical information. The CMS will contribute in the field of the management of the enumeration districts, processing the small area statistics such as the grid square statistics, and providing the enumeration district information for the other censuses. This paper describes the outline of the Census Mapping System in the Population Census of Japan.

1. The major functions of the CMS are to store and maintain the information of the boundary line position of the Basic Unit Block and the Enumeration District. The boundary lines were digitized from the maps of the Enumeration Districts by using the hand-digitizer during the year of 1991 to 1993.

2. The Enumeration District (ED) is established to define the area location of the assignment of the district to the enumerators in the Population Census. The Enumeration District is designed to contain the appropriate number of the households in the range of 40 to 70. The Enumeration District is also designed to be the primary geographical unit of the Censuses. In the 1990 Population Census, the Basic Unit Block (BUB) is established as the permanent geographical unit of the Censuses.

3. The total number of the Enumeration Districts in Japan is about 882 thousand and the total number of the Basic Unit Blocks is about 1.7million in the 1995 Population Census (Table1.). The largest number of the Enumeration Districts in the prefecture is about 98 thousand and the largest number of the Basic Unit Blocks is about 144 thousand both in Tokyo (Table2.). The largest number of the Enumeration Districts in a municipality of Tokyo prefecture is about 10 thousand in Shibuya-ku. The smallest number of the Enumeration Districts in a municipality of Tokyo-prefecture is 350 in Chiyoda-ku.

II The structure of the CMS

4. The hardware of the CMS consists of the EWS (Engineering Work Station), the Hand Digitizer, the Color plotter, and the other devices. (Figure1.)

1) EWS (IBM RISC System 6000 Power2 Station 7013-58H) for GIS
2) EWS (IBM RISC System 6000 PowerPC601 Station 7011-25T) for GIS
3) EWS (IBM RISC System 6000 PowerPC601 Station 7011-25T) for the back up
4) Digitizer (NS Calcomp 3436SER)
5) Color Plotter (NS Calcomp X2020)
6) X terminal (IBM 7010-120) with the printer device (IBM Proprinter 4208-8502)
7) Color Printer (Phaser 380) and the printer device (IBM 5577-K02)
8) Other devices (MT, MO, CD-ROM etc.)

5. The software of the CMS consists of AIX for the OS, ARC/INFO for the GIS, and AML (ARC/INFO Macro Language) for the programming language. The FORTRAN is also used in the programming. The data formats provided by the CMS are the ARC/INFO coverage, the ARC/INFO export file, and DSF etc.

1) OS : AIX
2) GIS utility : ARC/INFO
3) Programming languages : AML and FORTRAN

6. The data stored in the CMS consists of the Feature data and the Attributive data.

[Feature data]
i) Shapes and position coordinates of BUBs/Eds
ii) Shapes and position coordinates of the river, the lake, and the pond
iii) Central point position coordinates of BUB population distribution

[Attributive data]
i) Tabulation results of the 1995 population census by BUBs.
ii) Data on BUBs including ED identification codes, BUB identification codes.

7. The output data from the CMS consists of the statistical data and the geographic data.

[Statistical data]
i) Basic Unit Block statistics
iii) Segments and Block statistics
iii) Grid square statistics

[Geographic data]
i) Basic Unit Block boundary line
ii) Basic Unit Block center point data
iii) Cho-aza boundary line
iv) DID (Densely Inhabited District) boundary line

III Sample CMS Data of Chiyoda-ku

7. Figure2 is a sample map Enumeration Districts for Chiyoda-ku in Tokyo. It shows the boundary lines of the enumeration districts in Chiyoda-ku. Figure3 is the a magnified with the boundary lines of the enumeration districts, the Enumeration District Code, and the number of the population.

8. The CMS data is in the Arc-Info coverage format. The CMS is constructed using the GIS techniques of the Arc-Info (a trade mark of the ESRI company). The CMS data could also be browsed by the Arc-Explorer, the freeware on the internet for viewing the GIS data.

IV The CMS utilization

9. The CMS is utilized and contributing to the production of the Grid-Square Statistics. It speeds up the compilation of the Grid-Square Statistics by almost six months. The Grid-Squares are the 1km square area defined by the longitude and the latitude lines. The Grid-Square Statistics are compiled by making correspondence of

each Enumeration District to the Grid-Squares automatically by the CMS. It requires a great deal of the manpower if it was done manually as before the development of the CMS.

10. The CMS is also contributing to sharing the Enumeration District information with other censuses such as the Establishment and Enterprise Census. The enumeration district of the Establishment and Enterprise Census is designed and based on the Basic Unit Blocks of the Population Census. The combined use of the statistics of these censuses will enhance the utility of the small area statistics.

11. The CMS is also designed to contribute to the following tasks.

a) Maintenance of the Basic Unit Blocks
b) Computerized compilation of the Enumeration District Lists
c) Demarcation of the Densely Inhabited Districts
d) Comparison of boundaries of the Enumeration Districts among the censuses
e) Production of the Enumeration Summary Map
f) Automated production of the Enumeration District Maps
g) Dissemination of the small area statistics

Table1. The number of the Enumeration District and the Basic Unit Block (1995)

Area		Households	Population	Basic Unit Blocks	Enumeration Districts	Enumeration Districts without Population
Japan		44,107,856	125,570,246	1,742,557	881,851	15,270
All Shi		35,772,224	98,009,107	1,411,122	698,860	6,736
All Gun		8,335,632	27,561,139	331,435	182,991	8,534
01	Hokkaido	2,187,000	5,692,321	108,879	45,947	544
02	Aomori-Ken	482,731	1,481,663	19,303	9,362	144
03	Iwate-Ken	453,722	1,419,505	19,829	9,584	212
04	Miyagi-Ken	776,944	2,328,739	36,378	14,873	486
05	Akita-Ken	374,821	1,213,667	15,096	7,754	497
06	Yamagata-Ken	360,178	1,256,958	16,607	7,323	217
07	Fukushima-Ken	653,814	2,133,592	26,367	13,441	540
08	Ibaraki-Ken	922,745	2,955,530	45,987	18,286	438
09	Tochigi-Ken	625,174	1,984,390	23,338	11,888	192
10	Gumma-ken	650,836	2,003,540	27,586	13,234	591
11	Saitama-Ken	2,289,138	6,759,311	81,516	44,799	204
12	Chiba-Ken	2,015,296	5,797,782	76,103	39,540	314
13	Tokyo-To	4,998,492	11,773,605	144,232	98,168	329
14	Kanagawa-Ken	3,093,998	8,245,900	109,129	61,167	275
15	Niigata-Ken	757,341	2,488,364	40,259	16,031	831
16	Toyama-Ken	337,290	1,123,125	15,458	6,434	77
17	Ishikawa-Ken	390,212	1,180,068	16,105	7,797	152
18	Fukui-Ken	246,911	826,996	13,402	5,247	223
19	Yamanashi-ken	292,336	881,996	10,707	5,698	168
20	Nagano-Ken	713,414	2,193,984	29,960	13,993	314
21	Gifu-Ken	645,341	2,100,315	33,757	13,705	584
22	Shizuoka-Ken	1,204,189	3,737,689	45,092	23,407	628
23	Aiichi-Ken	2,358,519	6,868,336	95,247	46,044	369
24	Mie-Ken	596,909	1,841,358	17,448	11,827	215
25	Shiga-Ken	394,848	1,287,005	19,437	7,741	166
26	Kyouto-Fu	966,598	2,629,592	34,055	19,669	509
27	Osaka-Fu	3,300,335	8,797,268	120,041	65,900	409
28	Hyogo-Ken	1,871,922	5,401,877	73,108	39,470	1,298
29	Nara-Ken	456,849	1,430,862	20,691	9,247	65
30	Wakayama-Ken	366,141	1,080,435	14,432	7,576	182
31	Tottori-Ken	189,405	614,929	5,992	3,951	58
32	Shimane-Ken	246,476	771,441	7,840	5,414	118
33	Okayama-Ken	659,078	1,950,750	24,595	12,767	192
34	Hiroshima-Ken	1,049,588	2,881,748	54,168	21,226	593
35	Yamaguchi-Ken	564,210	1,555,543	27,089	11,370	165
36	Tokushima-Ken	274,953	832,427	8,929	5,729	125
37	Kagawa-Ken	346,147	1,027,006	14,072	6,598	120
38	Ehime-Ken	541,701	1,506,700	21,731	10,517	315
39	Kochi-Ken	304,237	816,704	12,227	6,494	265
40	Fukuoka-Ken	1,782,911	4,933,393	84,637	35,041	388
41	Saga-Ken	267,862	884,316	8,675	5,227	42
42	Nagasaki-ken	529,872	1,544,934	20,180	10,536	121
43	Kumamoto-Ken	618,211	1,859,793	22,969	12,323	423
44	Oita-Ken	435,040	1,231,306	17,726	9,019	323
45	Miyazaki-Ken	421,222	1,175,819	16,236	8,458	194
46	Kagoshima-ken	688,646	1,794,224	30,275	14,034	455
47	Okinawa-ken	404,253	1,273,440	15,667	7,995	200

Table2. The number of the Enumeration District and the Basic Unit Block in Tokyo (1995)

Area		Households	Population	Basic Unit Blocks	Enumeration Districts	Enumeration Districts without Population
Tokyo(prefecture)		4,998,492	11,773,605	144,232	98,168	329
All shi(municipality)		4,966,273	11,680,296	142,969	97,452	274
All gun		32,219	93,309	1,263	716	55
Ku-area		3,514,469	7,967,614	96,750	69,329	132
01	Chiyoda-Ku	14,507	34,780	1,269	350	1
02	Chuo-Ku	28,268	63,923	1,708	641	2
03	Minato-Ku	66,362	144,885	2,393	1,482	8
04	Shinjuku-Ku	140,393	279,048	2,974	2,924	4
05	Bunkyo-Ku	77,959	172,474	2,343	1,492	8
06	Taito-Ku	67,902	153,918	2,979	1,399	2
07	Sumida-Ku	87,749	215,681	3,187	1,807	3
08	Koto-Ku	147,495	365,604	3,398	3,075	5
09	Shinagawa-ku	149,466	325,377	3,591	3,038	21
10	Meguro-ku	116,528	243,100	2,992	2,258	7
11	Ota-Ku	276,436	636,276	6,503	5,156	9
12	Setagaya-ku	365,041	781,104	9,864	7,091	14
13	shibuya-Ku	94,421	188,472	3,448	2,113	0
14	Nakano-ku	154,518	306,581	3,889	3,040	0
15	Suginami-Ku	251,837	515,803	5,236	4,684	3
16	Toshima-Ku	125,563	246,252	3,412	2,561	0
17	Kita-Ku	146,865	334,127	3,758	3,017	6
18	Arakawa-Ku	73,039	176,886	2,562	1,508	3
19	Itabashi-Ku	225,655	511,415	5,712	4,201	7
20	Nerima-Ku	264,086	635,746	7,058	5,038	6
21	Adachi-Ku	239,164	622,270	7,504	4,562	6
22	Katsushika-Ku	166,665	424,478	5,382	3,303	0
23	Edogawa-ku	234,550	589,414	5,585	4,586	14
Boundaries not determined				3	3	3

Figure1. The hardware of the CMS

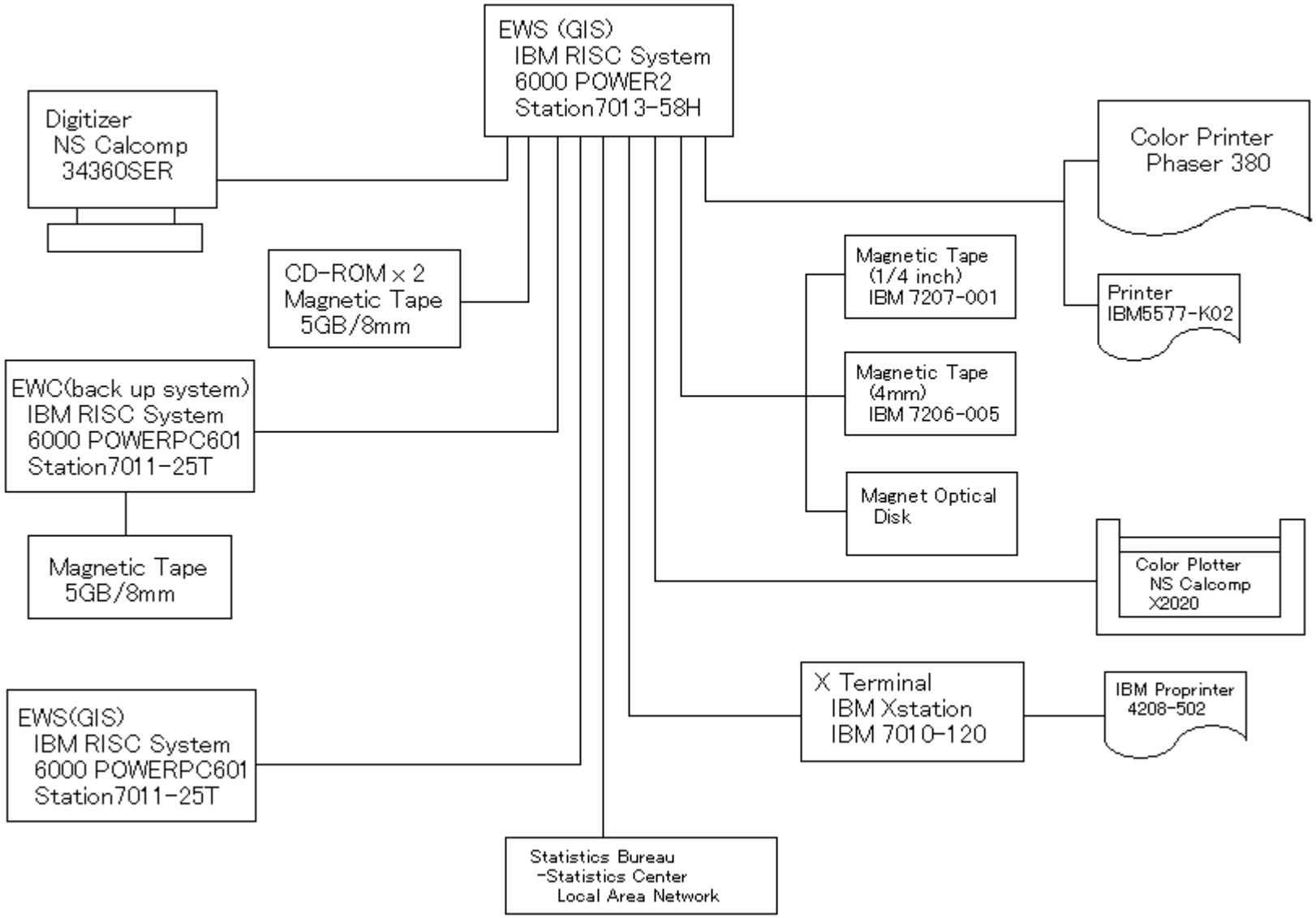

Figure2. The sample CMS data of Chiyoda-ku in Tokyo

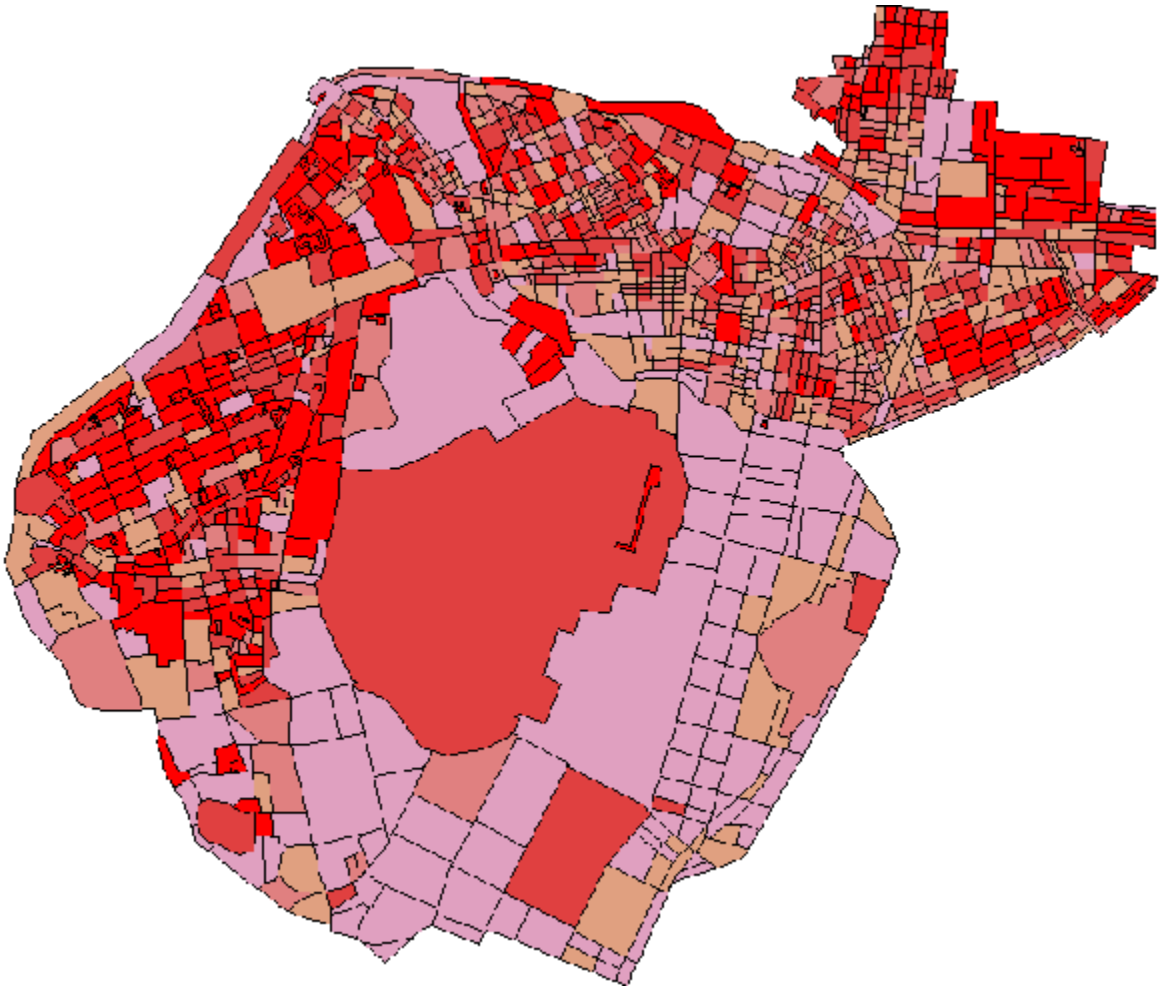

Figure3. The sample Enumeration Districts of Chiyoda-ku