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Proposal for International Workshop on  
Defining and Measuring Metropolitan Regions

Japanese Government

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## 1. Introduction

Definition of metropolitan area might be more difficult in Japan than any other country. In Tokyo metropolitan area, the largest metropolitan area in the world, residential suburbs extend 50 - 60 km from central districts. Tens of thousands of people commute to Tokyo central districts from further suburbs through express trains called *Shinkansen*. Boundaries between urban areas and rural areas are generally not distinct. For example, small scale residential developments are often scattered and can be surrounded by rice fields or forest area, road side commercial developments are seen in many places, isolated from surrounding land use. To get a grasp of a regional structure like this, we have used statistics in many ways.

In Japan, many statistics have been collected mainly based on administrative unit. However, administrative boundary does not necessarily mean the boundary of urban area and rural area. Japanese “city” often includes rural area in it. Discrepancies between administrative areas and functional areas are often pointed out.

In general, which statistics will be used should be chosen depending on the purpose.

For example, when analyzing the economic performance of the area such as the gross regional product or the volume of financial transactions, the definition based on the administrative boundary is useful enough, because the performance of rural area in the administrative “city” is usually negligible. Comparing the cost of collecting and editing data with the benefit for analyzing result, it is efficient to use the data.

While the data based on administrative unit will be useful for analyzing economic performance, the data will have problem in dealing with spatial structure of the metropolitan area, such as land use or traffic structure. When analyzing spatial structure inside the metropolitan area, we need more detailed sub set of data.

Depending on the purpose of analysis and easiness in collecting/editing data, Japanese Government defined and measured metropolitan area in some ways. In this opportunity, we would like to introduce how we define and measure our metropolitan area.

## II. Definition and Measurement of Metropolitan Area in Japan

Many Statistics in our country are collected based on administrative boundary as we mentioned. We would like to explain Japanese administration system very briefly and then introduce representative definitions of metropolitan and urban area, basically on the characteristics, the contents of definition, the background and political/social significance.

### 0. Japanese Administration System

- National government: 1
- Prefecture government (called *To-dou-fu-ken*):47 (as of Oct.2006)
  - City\*/ward/town/village government (called *Shi-ku-cho-son*) : 1,817 (as of Oct. 2006)
    - \*“city” used to be designated if the population was more than 50,000 and it satisfied the other conditions. In recent years, to foster city mergers, the condition to be a city was temporally relaxed to have more than 30,000 in population and no other conditions.
    - \*\* Ordinance designated city (called *Seirei shitei toshi*):15(as of Oct.2006). Cities that have a population of more than 0.8 million are usually designated and given authority of prefecture government in some fields.

Each prefecture and city is established based on the historic and social context. Therefore, they have a wide range of population and area. For example, while *Kumamoto* city at *Kumamoto* prefecture has about 670,000 of population, *Utashinai* city at *Hokkaido* has only about 5,200 of population. While *Takayama* city at *Gifu* prefecture has about 2,200 km<sup>2</sup> of area, *Warabi* city at *Saitama* prefecture has only about 5 km<sup>2</sup> of area. The size of prefectures is variable, as it is with all cities.

In addition, while prefectures have had no change since 1890, cities have experienced drastic mergers until today, leading the decrease of city from 3,200 to 1,800 in current years. Accompanying the merger, the area of city tends to extend and the population density tends to go lower.

In Japan, many data are collected based on city boundary, therefore it is essential to define metropolitan area using these data.

However, when we deal with statistics based on the administrative unit such as city, we need to take this diversity and effect of city merger into consideration, depending on the purpose.

*(Examples of metropolitan and urban area definition)*

#### 1. Definition for Regional Plans

In our spatial plans such as Comprehensive National Land Development plan and National Land Use Plan, we analyzed the area centering around Tokyo, Osaka and Nagoya as three metropolitan areas and regarded the other areas as other regional areas.

The basic concept of three metropolitan areas is the commute area to the central city such as Tokyo and Osaka. Statistically, the areas are analyzed using prefecture level data. Tokyo metropolitan area consists of Tokyo, Kanagawa, Saitama and Chiba prefecture. In the same way, Osaka metropolitan area consists of 3-4 prefectures.

Sapporo, Sendai, Hiroshima and Fukuoka have more than 1 million of population in central city and a few million in the commute area, next to three metropolitan areas in terms of population scale. However, in spatial planning, those cities have been regarded as core cities of each regional bloc. The reason is the huge gap between three metropolitan areas and these areas in terms of population scale, volume of migration during high growth period, industrial accumulation, etc.

Next thing, we have three acts for planned development of three metropolitan areas. Accompanying rapid economic growth since 1950's, population and industries accumulated drastically in metropolitan areas such as Tokyo and Osaka. As a result, urban problems such as traffic congestion and environmental problems got worsened and the urban area expanded at a fast pace. To solve the urban problems and achieve a planned development from a regional perspective, in 1960's, three metropolitan area planning acts were established, and within three metropolitan areas, the built urban areas and neighboring development areas were designated by national government. The basic idea is to control over accumulation in the central district designated as built urban area and achieve planned development in the surrounding area designated as neighboring development area.

#### 1-a. Built Urban Area and Neighboring Development Area

##### **【Characteristics】**

- set by national government for planned development in three metropolitan areas

##### **【Definition】**

- Built urban area: the area where over-concentration of industries and population should be prevented.
- Neighboring development area: 1) the area near the built urban area, where planned development should be achieved to prevent disordered urbanization (in Tokyo and Osaka metropolitan area), 2) the area where the degree of industrial development is advanced, economic development is expected, and planned infrastructure development should be achieved to actualize urban function fully depending on the level of development there (in Nagoya metropolitan area).
- Built urban area and neighboring development area are designated from comprehensive standpoints based on the factors such as population, population density, traffic condition etc.

##### **【Background and Significance】**

- In built urban area, the policies restricting new location and expansion of factories and universities had been achieved. Now the

policy was deregulated.

- In neighboring development area, financial supports for local governments to foster infrastructure development have been given.
- In addition, these areas need to have relationship with metropolitan plans, zoning of city plans, housing policies and so on.

#### **【Coverage】**

- According to 2000 national census, built urban areas and neighboring development areas are 17,309 km<sup>2</sup> (4.6% of national territory) and population living in those areas is about 5441 million (42.87% of total population). In Tokyo metropolitan area, built urban area and neighboring development area cover 50 to 60 km from central districts.

## 2. Statistical and Functional Area

In this section, we would like to introduce some definitions set by more statistical standpoint.

We discuss about a) Densely Inhabited Districts by Ministry of Internal Affairs and Communications (MIAC), b) Major Metropolitan Area and Metropolitan Area by MIAC, c) Functional Urban Region by Ministry of Land, Infrastructure and Transport, and d) Urban Employment Area by Tokyo University. We also mention a different kind of statistics, grid statistics.

### 2-a. Densely Inhabited District (DID)

#### **【Characteristics】**

- Population based
- Part of National census compiled by Statistics Bureau, Ministry of Internal Affairs and Communications

#### **【Definition】**

- Statistics bureau subdivided each administrative city into many sub-areas and set the unit for research, called basic unit area. Basic unit area is generally set at residential block and stable.
- DID is basically the area where i) basic unit areas which have

generally more than 4,000/km<sup>2</sup> of population density abut, and ii) those area has more than 5,000 of population in total.

- DID is set in each administrative city, therefore, even if basic unit areas of different cities abut and satisfy the condition, these areas cannot be regarded as DID.

#### **【Background and Significance】**

- After the Second World War, the authorities of local governments were broadened and that required the local governments to have more financial capacity. Therefore, in 1950's, to increase the size of local governments, drastic mergers of cities/towns/villages were fostered. The number of local government had decreased from 9,868 in 1953 to 3,472 in 1961. Because of this merger, the area of cities went larger, including rural area. Until then, generally city and ward were regarded as urban area and town and village were regarded as rural area. However, "City" no longer meant urban area directly. Therefore, at 1960, DID was newly introduced to national census to clarify the characteristics of urban area.
- DID is linked to some national policies. For example, when local governments report their required administrative expenditures to national governments to ask for national grants, they adjust the expenditures if they have DID in them. In other case, people or companies who sold some kind of real estates can get income tax reduction if those estates are in DID.
- DID shows urban accumulation in the narrowest term. In our country, sprawling and suburbanization has developed urban area with low density. Therefore, the urban area not covered and analyzed by DID has expanded.

#### **【Coverage】**

- According to 2000 national census, DID area is 12,457.4 km<sup>2</sup> (3.3 %of national territory) and population living in DID is about 82.8 million (65.2% of total population).

## 2-b. Major Metropolitan Area and Metropolitan Area (1.5% urban area)

### 【Characteristics】

- Population and commute based
- Part of National census compiled by Statistics Bureau, Ministry of Internal Affairs and Communications.

### 【Definition】

- Major metropolitan area and metropolitan area consist of central city and the surrounding cities.
- “Central city” of major metropolitan area means Tokyo 23 wards and ordinance designated cities. If the multiple central cities are close to each other, those are combined to one.
- “Central city” of metropolitan area means city that has a population of more than 0.5 million and not included in the major metropolitan areas.
- “Surrounding city” means cities where proportions of (the commuters over the age of 15 to central city) to (population of the city) is more than 1.5% and it abuts central city. Even if the proportion is less than 1.5%, when the city is surrounded by “surrounding cities”, this city is included in the “surrounding city”.

### 【Background and Significance】

- Major metropolitan area and metropolitan area was established in national census in 1960, to describe characteristics of wide urban area. The word “7 metropolitan areas”, that is three metropolitan areas (Tokyo, Osaka and Nagoya) plus Sapporo, Sendai, Hiroshima, and Fukuoka, is often used to describe Japanese regional structure. But this statistics is not linked to any regional policies officially.

### 【Coverage】

- Number of major metropolitan area is 7 (Sapporo, Sendai, Tokyo-Chiba-Yokohama-Kawasaki, Nagoya, Kyoto-Osaka-Kobe, Hiroshima, Fukuoka-Kitakyushu) and number of metropolitan area is 5 (Niigata, Hamamatsu, Okayama, Kumamoto and Kagoshima).
- According to 2000 national census, major metropolitan area and metropolitan area is 64,037.8km<sup>2</sup> (17% of national territory) and

population living in major metropolitan area and metropolitan area is about 80.8 million (63.6% of total population).

2-c. Functional Urban Region (FUR) (5% urban area)

**【Characteristics】**

- Population and commute based
- When central cities are close to each other, they can be united based on objective condition. Therefore, urban areas that have multiple central cities can be defined. This is reasonable because metropolitan areas such as Tokyo tend to have multiple cores in the area.
- Based on National Census compiled by Statistics Bureau, Ministry of Internal Affairs and Communications and arranged by Ministry of Land, Infrastructure and Transport (MLIT)

**【Definition】**

- Urban regions consist of central city and the surrounding cities.
- “Central city” of urban region means the city that has a population of more than 0.1 million and where a proportion of daytime population to nighttime population is more than 1.
- “Surrounding city” means cities where proportion of (the commuters to central city) to (all commuters) is more than 5% or the commuters to central city are more than 500.
- If multiple central cities coexist within 20km, then they are combined into one urban region.

**【Background and Significance】**

- MLIT has data on functional urban region since 1960 to analyze detailed regional structure.
- But this statistics has been used only for analyzing regional structure and not linked to any regional policies officially.

**【Coverage】**

- According to 2000 national census, number of functional urban region is 85. Functional urban region is about 16,699km<sup>2</sup> (4.4% of national territory) and 112 million people (about 90% of total population) live in functional urban region.

## 2-d Urban Employment Area (10% urban area)

### **【Characteristics】**

- Population and commute based
- Based on National Census compiled by Statistics Bureau, Ministry of General Affairs, arranged by prof. Kanemoto at Tokyo University and prof. Tokuoka at Doshisha University, and provided by Center for Spatial Information Science at Tokyo University.

### **【Definition】**

- Urban employment area consists of central city and the surrounding cities. Urban employment area is classified into metropolitan employment area and micropolitan employment area.
- Metropolitan employment area has central city, DID population of which is more than 50,000. Micropolitan employment area has central city, DID population of which is more than 10,000 and less than 50,000.
- “Central city” satisfies either of two following conditions. 1) DID population is more than 10,000 and it is not surrounding cities of other central city. 2) it is a surrounding city but (a) proportion of workers in the city to workers living in the city is more than 1 and (b) DID population is more than one third of the central city or more than 100,000.
- The first rank “Surrounding city” is that commuting rate to central city is more than 10%. When commuting rate for other specific surrounding city is more than 10% and there is no stronger destination, then the city is regarded as second rank “surrounding city.” There are four other accompanying conditions regarding surrounding cities.

### **【Background and Significance】**

- At first, this definition is different from 2-b and 2-c described above, by taking DID population instead of city population into consideration. This is because city population no longer tends to show urban accumulation, reflecting the effect of city merger and accompanying administrative city area extension.
- Secondly, this definition had advantage, in terms of detailed urban

structures, by setting first rank and second rank surrounding cities. However, there are many conditions for setting the area, accompanying much data processing. Therefore, it has disadvantages in terms of collecting and editing data.

- Thirdly, threshold of 10% commute rate is said to be high because our metropolitan and urban structures has been more complicated.
- This definition and the data analysis using this definition has been only used for research and not linked to any regional policies yet.

**【Coverage】**

- According to 2000 national census, the number of urban employment area is 269 and about 117 million people (92.2% of total population) live in urban employment area.  
\*We could not get information on how large urban employment area was.

2-e. Grid Statistics

**【Characteristics】**

- Area set by grid (standard 1km or 500m grids).
- Grid called mesh was standardized by Ministry of Internal Affairs and Communications (MIAC) in 1973 and defined as one of Japanese Industrial Standards in 1976.

**【Definition】**

- Japanese territory is divided into 1km grids and 500M grids, called regional mesh.
- This grid is linked to the gratitude and latitude.
- Number of 1km grid is 386,877

**【Background and Significance】**

- Main advantages of grid statistics are a) each grid is roughly the same size and shape, making the comparison easy, b) each grid is fixed and not exposed to the change of administrative boundary and research unit, making time-series comparison easy, c) each grid can be summed up and divided easily using computers, making the arrangement of data easy, and d) location and size of each grid is

clearly set, making distance analysis easy.

- Currently this grid statistics are compiled for many statistics such as national census (MIAC), national office statistics (MIAC), national survey for environmental conservation (Ministry of Environment), Census for Agriculture and Forestry (Ministry of Agriculture, Forestry and Fisheries), Industrial and commerce census (Ministry of Economy, Trade and Industry), survey for residential use (MLIT) and national spatial digital information-land use-(MLIT).
- Because many data are provided as mentioned, it is more feasible to analyze region in a comprehensive way using Geographic Information System (GIS).

### III. Background of Indicators

Definitions of metropolitan area and urban area are set reflecting each country's regional and industrial structure that has been formed taking long time. Especially factors such as the degree of urbanization, motorization, and commute mode affect how such a definition was employed.

For example, in defining FUR, central city is set to have a population of more than 0.1 million. In Japan, with 0.1 million of population as threshold, population density and key industrial indicators show drastic change. That is a rationale to make 0.1 million of population threshold for central city.

Population threshold to be central city is much higher in Japan compared to the CBSA in the USA, where the threshold is 10,000. We think this is a reflection of different political and social interests in both countries. These differences of interests might be related with different regional structures that has been historically constructed

Also, commute rate to central city is often used as a condition for surrounding city. For example, in defining FUR, surrounding city is set to have more than 5% of commute rate to central city. This is a reflection of the following analysis. If we use 5% commute rate for defining surrounding city, then about 70 % of commute inflow to central city is covered in the

urban area. If we use 10% commute rate instead, only about 60% is covered in the urban area, which means about 40% of commute inflow to central city lives outside the urban area.

While CBSA in the USA sets 25% of commute rate to central county as threshold to be surrounding city, Japanese FUR sets 5% of commute rate to central city as the threshold, as described above. The reason of these differences might be the difference of central area coverage between American county and Japanese city. The other reason might be the difference on how to define denominator of commute rate, especially how labor markets are in both countries.

In this way, each definition is set taking many important factors into consideration. Therefore, when we use statistics of metropolitan area for international comparison, we need to be very careful. We should keep in mind where the definition comes from.

#### IV. Recommendation

To enable international comparison of regional structure, we propose that TDPC construct a database of OECD member countries' metropolitan area, clarifying the definition of the area. We also propose that not only the summed data of metropolitan area but also data of county and city that constitute metropolitan area should be registered in the database.

Lastly, we propose that this database be open to governments and academics to facilitate further urban and regional studies. Especially it is important to clarify the definition of data and the points to be careful about, and provide the original data from sub data level so that users can process data freely depending on the purposes.

Table1: Definition of metropolitan and urban area in Japan

	Built Urban Area and Neighboring Development Area *1-a	Densely Inhabited District (DID) *2-a
Definition	<ul style="list-style-type: none"> <li>- Built urban area: the area where over-concentration of industries and population should be prevented.</li> <li>- Neighboring development area: 1) the area near the built urban area, where planned development should be achieved to prevent disordered urbanization (Tokyo and Osaka), 2) the area where the degree of industrial development is advanced, economic development is expected, and planned infrastructure development should be achieved to actualize urban function fully depending on the level of development there (Nagoya).</li> <li>- Built urban area and neighboring development area are designated from comprehensive standpoints based on the factors such as population, population density, traffic condition etc.</li> </ul>	<ul style="list-style-type: none"> <li>- Statistics bureau subdivided the administrative city into many areas and set the unit for research, called basic unit area. Basic unit area is generally set at residential block and stable.</li> <li>- DID is basically the area where i) basic unit areas which have generally more than 4,000/km<sup>2</sup> of population density about, and ii) those area has more than 5,000 of population in total.</li> </ul>
Area	17,309 km <sup>2</sup> (4.6% of national territory)	12,457.4 km <sup>2</sup> (3.3 %of national territory)
Population	5,441 million (42.87% of total population)	82.8 million (65.2% of total population)

		Major metropolitan area *2-b	Functional Urban Region(FUR) *2-c	Urban Employment Area *2-d
D E F I N I T I O N	Central city	Major metropolitan area: Tokyo 23 wards and ordinance designated cities. Metropolitan area: city that has more than 0.5 million of population and not included in the major metropolitan areas.	The city that has more than 0.1 million of population and has a proportion of daytime population to nighttime population is more than 1. If multiple central cities coexist within 20km, then they are combined into one urban region.	Satisfies either of two following conditions. 1) DID population is more than 10,000 and it is not surrounding cities of other central city. 2) it is a surrounding city but (a) proportion of workers in the city to workers living in the city is more than 1 and (b) DID population is more than one third of the central city or more than 100,000. Metropolitan employment area: DID population is more than 50,000. Micropolitan employment area: DID population is more than 10,000 and less than 50,000.
	Surrounding area	Cities where proportions of (the commuters over the age of 15 to central city) to (population of the city) is more than 1.5% and it abuts central city.	Proportions of (the commuters to central city) to (all commuters) is more than 5% or the commuters to central city are more than 500.	The first rank "Surrounding city": commuting rate to central city is more than 10%. When commuting rate for other specific surrounding city is more than 10% and there is no stronger destination, then the city is regarded as second rank "surrounding city."

	Major metropolitan area *2-b	Functional Urban Region(FUR) *2-c	Urban Employment Area *2-d
Number of area (2000 census)	Major metropolitan area:7 Metropolitan area:5	85	269
Area	64,037.79km <sup>2</sup> (17% of national territory)	16,699km <sup>2</sup> (4.4% of national territory)	-
Population	80.77million people (63.6% of total population)	112.57 million people (88.9% of total population)	117 million people (92.2% of total population)