In Pacione, Michael ed.: *Changing Cities International Perspectives.* 2004. IGU Urban commission, Monitoring cities of tomorrow, and Strathclyde University Publishing, Glasgow, UK. pp. 351-356.

Integrating macro and micro data by GIS in the urban land-use analysis

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Abstract

Given general observations on land-use studies, macro and micro levels of viewpoints are identified. It's very important we have to emphasize on achieving a proper balance between different viewpoints and scales, although we still have some of the difficulties in processing data that had plagued previous studies.

In this presentation, the author pays great attention to an easy availability of GIS. Recently, some local governments are able to provide real-time geographical dataset that allows us to analyze urban structural change. The author tries to introduce some advanced case studies. Geographers should pay greater attention to integrate both viewpoints by GIS.

Keywords : GIS, land-use, a proper balance of micro/macro viewpoints

Introduction

Given a rapid diffusion of easy availability of GIS, it is no longer a rare case that researchers can get some GIS readable dataset very easily at a municipal office, for example digital boundary data or general statistics data based on various census. In most cases, dataset are usually saved in a suffix of '.shp', '.mif' or '.dxf' format directly readable on major GIS software. With these data, it can be considered that researchers' backbreaking works of collecting and compiling data are gone. At this stage, what should urban geographers do? Is it allowed that urban geographers remain tamely as just users of such data? Is there nothing for urban geographers to do?

Some problems of data available at municipal offices

In recent days, some municipal offices are ready to provide real-time GIS readable dataset (ex. .shp or .mif files) which allows us to analyze urban structural change easily. However, it can be said that the data available at municipal offices are too general because they are prepared for public access. Aggregated data of

population census are good example. On the other hand, too detailed data also can be found, but no one can access to such sensitive data. Generally speaking, it's very difficult to find out suitable dataset which meets researchers' academic purposes.

From the academic viewpoint, a proper balance between macro and micro data in the analysis of urban structural change is very important. For example, when the percentage of particular type of use for every buildings in the CBD, the distribution of Chinese restaurants in the whole city, and the growth rate of Asian immigrants to a particular district are ready, these kinds of dataset should be considered not only at a micro level viewpoint, but also should be considered comprehensively with the growth process of the whole city.

In this presentation, the author pays a great attention to a rapid diffusion of easy availability of GIS. With the assistance of GIS, urban geographer can have a possibility to integrate macro and micro data in the urban land-use analysis. In the next section, the author introduces advanced cases of data provision in Matsuyama (Japan) and Melbourne (Australia).

Advanced example of data provision by a local municipality – Matsuyama, Japan

Matsuyama city is located in the Shikoku island, south-western part of Japan. The city is the capital of Ehime prefecture and has almost a half million inhabitants. Several years ago, the Ministry of Land, Infrastructure and Transport Government of Japan (formerly called as The National Land Agency) aided the city to equip the comprehensive GIS inside of the city office. Now all divisions in the city, urban planning, property tax, sewage system, welfare affairs, and more…, share the same data of the comprehensive GIS. The system of Matsuyama city might be one the most advanced case of GIS readable data provision in Japan. When the author asked an officer for a paper-based general map, he left his seat immediately and came back with a printer-processed A3 sized map! There is no traditional paper-based map in the city office.

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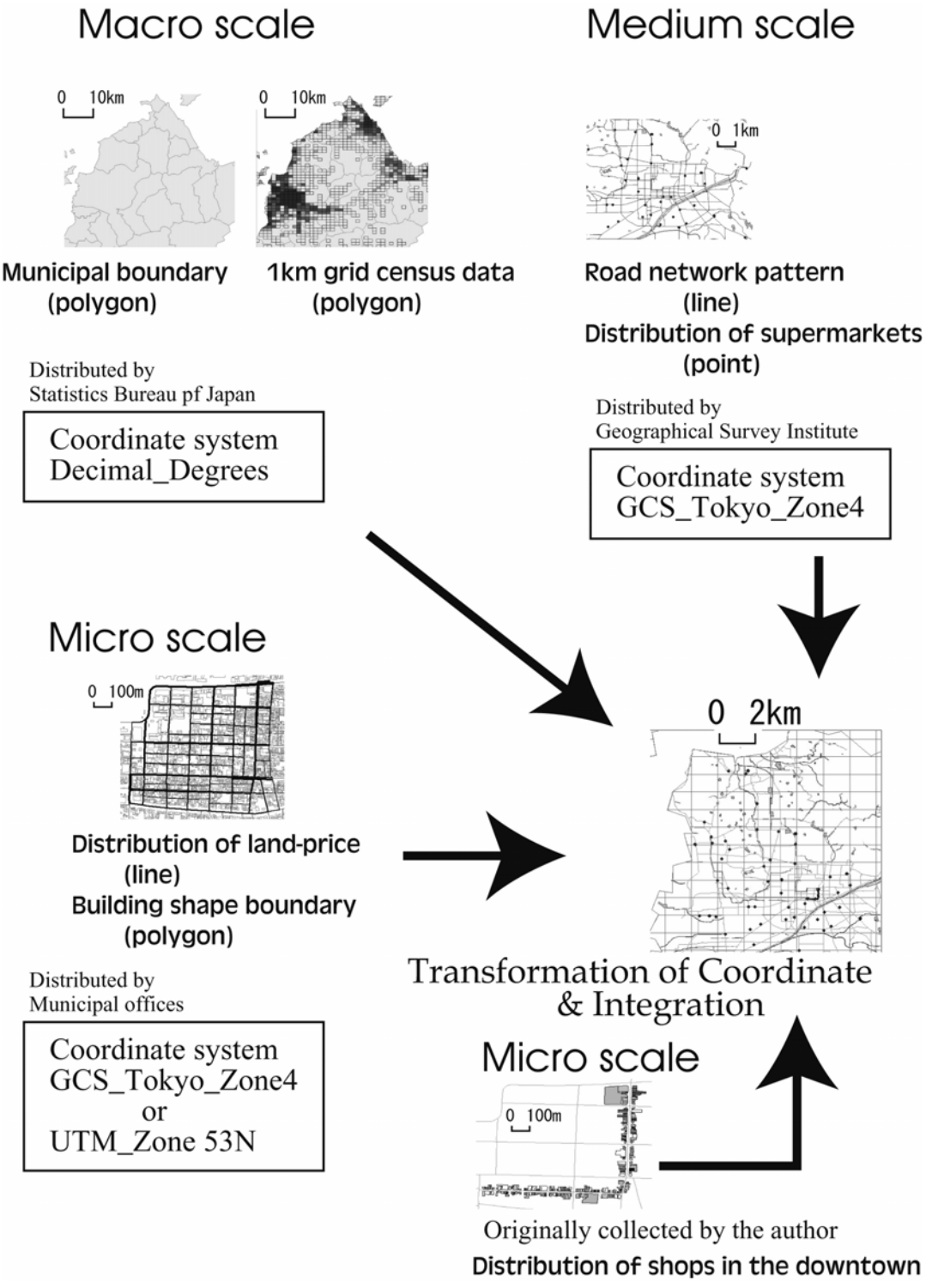

Figure 1 Process of coordinate system transformation and integration of different scale data: A case of Matsuyama, Japan

Figure 1 is a good illustration of the integration of different scale data in

Matsuyama. Macro level data like the road network system for the whole city are obtained from the national geographical survey institute, and micro level data like property boundary data for the CBD are provided from the city office. Only the attribute data of land-use for each building are obtained by the author's field survey. These data are easily joined with the ID codes on the GIS software.

Unfortunately, this advanced system is not open to the citizens. The system is used only for administrative or academic purposes.

Advanced example of data provision by a local government – Melbourne, Australia

Melbourne city is located in the south-eastern part of Australia. The city is the capital of Victoria State and has over three million populations. In general, Australia is one of the advanced countries in servicing GIS readable data to the citizens. For example, at the web site of ABS (Australian Bureau of Statistics: http://www.abs.gov.au/), we can download many kinds of socio-economic data aggregated in both macro and medium leveled census tracts and saved in Microsoft Excel readable format. The office of ABS also provides the digital boundary data distributed in a CD-ROM. With these data and GIS, we can draw many kinds of socio-economical maps for the major cities of Australia immediately.

In addition, Melbourne City Council provided the author with the GIS attribute data that enabled him to consider the detailed process of the city growth. The data included an array of information about the building shape, building height, built year and total floor size of each building, and so on. Of course all the data are saved in '.shp' format which is readable in ArcView, most popular GIS software in the world.

Figure 2 is a good illustration of the integration of different scale data in Melbourne. Macro level data like the socio-economical features aggregated in the census tracts are obtained on the web site of ABS, and micro level data like property boundary data for the CBD are provided from the city council. Same as the case study in Matsuyama, the attribute data of land-use for each building are obtained by the author's field survey. These data are also easily joined with the ID codes on the GIS software.

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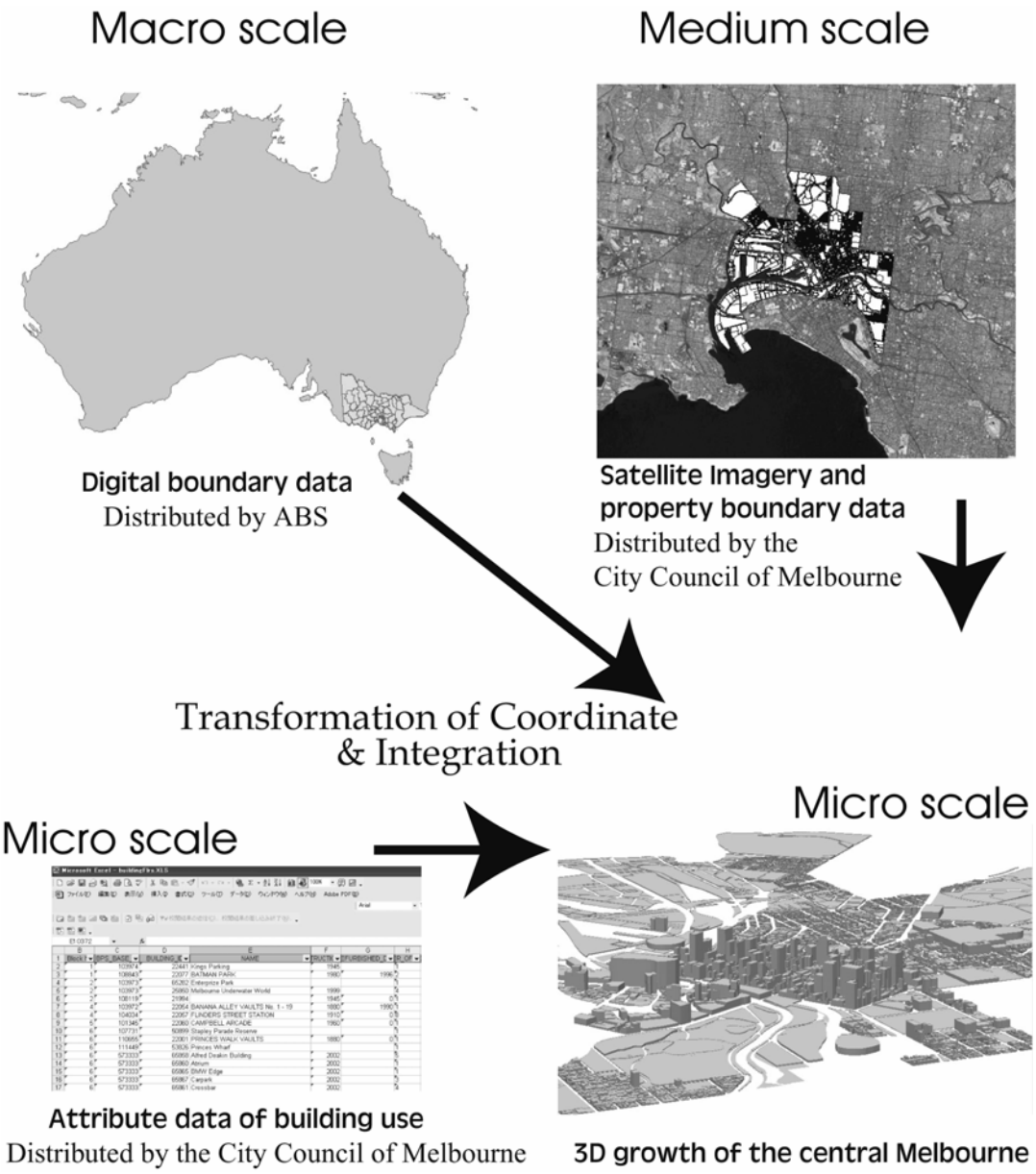

Figure 2 Process of coordinate system transformation and integration of different scale data: A case of Melbourne, Australia

A framework to achieve a proper balance between micro/macro different scales

In relation to a proper balance between different viewpoints and scales, even though their main purposes were not land-use analyses, some good examples are found in North American (especially in Canada) literatures. Most of these studies

analyze land-use issues in a chain of land-development stages from rural to urban. These studies are categorized in 'land conversion studies', and many related issues has been under study since the late 1980s (Pierce, 1981; Gore and Nicholson, 1991; Pond and Yeates, 1993; 1994a; 1994b; Ganderton, 1994). From this point of view, the detailed data obtained by the author's field survey should be considered at micro level at first, and then they are analyzed again synthetically at a macro-level like the whole process of urban development from rural to urban.

An assignment given to urban geographer

Most of urban geographers may know the importance of a proper balance of several viewpoints. However there has remained a big problem for a long time; a vast data for analysis when they process several kinds of data at once.

In the past decade, GIS has been spread so rapidly in Japan. However both hardware and software of GIS has been promoted by urban planners, geomatics researchers and quantitative geographers who usually stand at the macro level viewpoint of analysis. During the same period most of urban geographers are still engaged in a detailed own example area at the micro level viewpoint of analysis without using GIS.

Like the advanced examples of Matsuyama and Melbourne shown above, we urban geographer should pay much more attention to a proper balance of viewpoints with using GIS.

Concluding remarks

A few years ago, it's true that there have been some difficulties in handling different scale data at once in the analysis of urban structural change. Most of these problems might be derived from the difficulties in transforming the XY coordinates in each digital map. For example, three major coordinates are used differently in Japan: urban planners of local government use meter-based public coordinates (ex. GCS Tokyo), the national geographical survey institute uses UTM coordinates to compile and distribute topographic maps, and geographers usually use longitude-latitude degree based coordinates (decimal degrees). However these difficulties are no longer an obstacle to transform data each other due to the development of good transformation software.

From now on, urban geographer, urban planner and geomatics researchers

should develop mutual relationship each other. In considering a proper balance of several viewpoints, GIS can be a common platform among the disciplines.

References

Bryant, C.R., Russwurm,A.G.,and McLellan,A.G. (1982) *The city's countryside, land and its management in the rural-urban fringe.* London: Longmans.

Ganderton, P. (1994) Modelling the land conversion process: a realist perspective. *Environ. and Plann. A* **26**: 803-819 .

Kikuchi, T. and Tsutsumi, J. (1998) Sustainability and changeability of agricultural land use in the peri-urban environment: A case study in a sericulture region in Maebashi city, central Japan. *Quarterly Journal of Geography* **50**: 1-16. (JE)

Lewis, G.J., Maund, D.J. (1976) The urbanization of the countryside: A framework for analysis. *Geografiska Annaler B* **58**: 17-27.

Pond, B. and Yeates, M. (1993) Rural/urban land conversion I: Estimating the direct and indirect impacts. *Urban Geography* **14**: 323-347 .

Pond, B. and Yeates, M. (1994a) Rural/urban land conversion II: Identifying land in transition to urban use. *Urban Geography* **15**: 25-44 .

Pond, B. and Yeates, M. (1994b) Rural/urban land conversion III: A technical note on leading indicators of urban land development. *Urban Geography* **15**: 207-222.

Tsutsumi, Jun (1996) Land transaction and following land use change in the central area of Nagano city, Japan. *Annals of the Japan Associ. of Econ. Geographers* **42**: 118-131. (JE)

Tsutsumi, Jun (1999) Land Conversion due to Decision Agents in an Urban Land

Market—A Case Study of Maebashi City, Japan. *Geographical Review of Japan Ser.B*, **72**: 23-47.

TSUTSUMI, Jun (2002) Land-use decisions and following land conversion process in a medium-sized city in Japan. In Kim, I., Nam, Y. and Choi, J., eds.: *Diversity of Urban Development and Urban Life*. Seoul National University Press, 164-179.

TSUTSUMI, Jun (2003a) The land conversion process and landowners' land-use decisions in the rural-urban fringe of Maebashi city. *Geographical Review of Japan Ser.B*, **76**, 101-118.

TSUTSUMI, Jun (2003b) Regional characteristics of building supply in a newly developed city in Japan. In IGU Urban commission, *Monitoring cities of Tomorrow*, Ljubljana University Press, Now Printing.

Papers written in Japanese only are shown with the letter (J).