Data that supports urban planning and their application
Toward building new urban visions

YAMASHITA Koichi,
Director of the Urban Planning Department

Keywords: Urban planning basic survey, geographical information system, geospatial data, aging society

1. Introduction

In a sense, urban planning is the work of creating a future vision for a particular region. Thus, the conventional approach to urban planning involves predicting the future based on vast amounts of data, and then forming plans with the intention of promoting or controlling urban and social conditions that are drawn from this prediction.

So then, what kinds of data are required? Article 6 of the City Planning Act sets forth stipulations concerning urban planning basic surveys. The act establishes that prefectures must conduct basic surveys for urban planning every five years or so. These surveys must cover current conditions and future estimations of population size, employed workforce, urban area, land use, and traffic volume among other items. Conducting such surveys requires the collection of vast amounts of data. However, because such data are usually available only in paper form, their application can be problematic.

2. Maintaining and applying geospatial data

In urban planning, it is important to consider how to link numerical information (e.g., number of enterprises, number of households, etc.) with spatial information (e.g., topography, roads, administrative boundaries, etc.). It is here that recent advancements in the geographical information system (GIS) deserve attention. A survey on how past geospatial data are maintained revealed that less than 40% of prefectures and municipalities operate GIS, and of these, only approximately 50% maintain geospatial data that are linked to urban planning[1].

This situation makes promoting the maintenance of urban data (geospatial data) using GIS an urgent issue. Particularly important in making geospatial data applicable to various aspects of urban planning is the incorporation of building attributes and land use attributes. Building attributes include use, structure, number of stories, and total floor area. Currently, these items must be inputted individually on the basis of onsite surveys. Land use attributes are land use classifications. They are categorized as public land, commercial land, residential land, industrial land, and agricultural land among others.

3. Steps toward realization of urban simulation

Even if population, traffic volume, and other information are maintained as geospatial data, it remains unclear how this alone can contribute to policy. Data must be further processed and developed to serve policy objectives. The following presents examples of geospatial data application that are taken from the various research themes being tackled by the Urban Planning Department. The results are in themselves urban data, and can be described as "secondary data" resulting from the processing of so-called "primary data" to meet policy objectives.

(1) Simulation of fire spread in an urban area[2]

A simulation program developed by a General Technology Development Project titled "Development of Assessment and Countermeasure Technologies for. Disaster Prevention in Town Planning" (1998 to 2002) predicts the spread of fire in buildings during a major post-earthquake fire in an urban area (Figure 1). Fundamentally required data are buildings' locations, sizes, and structures as pertain to fire resistance. In addition, the program can add data that infer the locations and shapes of openings that are needed to predict fire spread from general examples.

Once building data are established, the program can easily conduct simulations that consider higher fire resistance resulting from partial redevelopment of the relevant region or the effect that building of roads or parks has. The program can present the effects of urban development in both quantitative and visual forms.

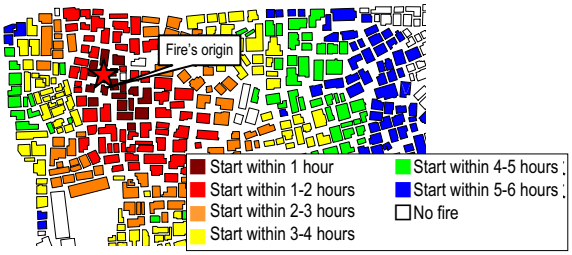

Figure 1: Fire spread by time of fire start in areas around the fire's origin

(2) Heat island simulation[2]

This simulation program was developed through a General Technology Development Project titled "Development of Synthetic Evaluation Technologies for Improving Urban Thermal Environments" (2004 to 2006). It presents temperature and wind direction and speed in external spaces that are influenced by the urban heat island phenomenon in the form of a map (Figure 2). Data required here are building location and size as well as building purpose and traffic flow, which are needed to input exhaust heat volume.

Like the fire spread simulation, once building data are established, the program can calculate changes in heat island effect that arise from redevelopment, road construction, or other activity with relative ease. It is being used in studies of redevelopment near Tokyo Station and construction of an urban plan-authorized road (Kanjo Route No. 2) near the Shimbashi district.

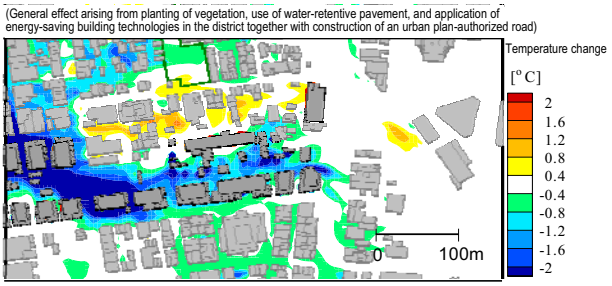

Figure 2: Temperature differences caused by execution of heat island countermeasures (estimation of effects arising from construction of an urban plan-authorized road, etc.)

4. New directions for data maintenance

The above-mentioned simulation programs are effective in tackling individual concerns, such as fire prevention in urban areas and urban environments. However, today the question of how cities should function for Japan's aging society is taking on increasing importance. Given this, there is a need for comprehensive data to help in formulating an accurate vision of how cities will look in the future and studying necessary policies.

The Urban Planning Department is developing a program for predicting urban structures from the standpoints of population, traffic, land use, and other factors in a project titled "Research on Assessing the Future of Urban and Outlying Regions during a Period of Population Decline" (2008 to 2010). This program will perform simulations predicating population distribution in individual municipality zones (in general, neighborhood districts) by treating various forms of data (traffic data, etc.) as variables. As a result, a number of outputs—including costs that correspond to urban policies—will be produced in visual form.

We are also about to start a study on methods for data maintenance that will allow land use oriented toward more compact urban areas as well as on methods for its evaluation. This effort will part of a new research topic to start in FY2011 called "Research on Technologies for Land Suitability Evaluation for Strategic Land Use Management in Urban Planning." Here, we will be seeking to develop a method for indicating latent land-use suitability as quantitative data and, further, to conduct evaluations of this suitability in line with policy objectives, based on various forms of land attribute data.

5. Conclusion

Returning to the topic of urban planning basic surveys, MLIT is proceeding with a review toward improving these surveys. The review is being conducted with focus on linkage with personal information, use of geospatial information, current conditions surrounding overseas urban databases, and other related items. We know that great amounts of time and labor are required to maintain data pertaining to urban areas. Nonetheless, we believe that an important mission of the Urban Planning Department is to clarify the process from data maintenance to data application in response to policy objectives through research, as this represents a step forward in creating urban visions that will satisfy the demands of the times.

References

1) "*2009-nen 2-gatsu Jiten de no Chiho Kokyo Dantai no Toshi Keikaku Bunya ni okeru Kukan Deta no Seibi Jokyo*": Tomohiko Sakata and Akihiro Teraki, Reports of the City Planning Institute of Japan, May 2009
2) Website of the Urban Planning Department, NILIM: http://www.nilim.go.jp/lab/bcg/busyoukai/pr-kakubu-center.html#toshi