

# PUBLIC PARTICIPATION GIS OF HISTORICAL LANDSCAPES: A CASE STUDY OF "KYO-MACHIYA COMMUNITY-BUILDING SURVEY" IN KYOTO CITY

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## ABSTRACT:

This study aims to consider the possibility of the research method for geographic information related to historical landscapes. The information here is collected by Kyoto citizens who participated in a survey. The purpose of the survey is to examine a distribution of approximately 50,000 machiya, traditional wooden townhouses regarded as one of Kyoto's representative historical buildings. This study focuses on Nishijin Area in Kyoto. Since the area once thrived on its textile industry, there still remain more than 10,000 machiya. In this case study, we analyze the geographic information concerning the streetscape of about 280 spots, the information collected by "Kyo-Machiya Community-building Survey" participants. Visualization of the "excellent" streetscape spots selected by them tells us that the spots correspond with areas with a lot of machiya and narrow roads. Combining such data collected through public participation with other geographic information including official cultural property data, we can provide some valuable information on hot spots as cultural landscapes. By doing so, we intend to bring people's attention to spatial information that covers areas larger than spots.

## 1. INTRODUCTION

### 1.1 What is PPGIS?

Recent years have witnessed burgeoning applications of GIS that grant legitimacy to local geographical knowledge as well as to "official" spatial data. By incorporating various forms of community participation, these newer framings of Geographical Information Systems as "Public Participation GIS" (PPGIS) or "Participatory GIS" (PGIS) have been responding to some critiques of GIS prevalent in the 1990s (Dunn, 2007). Craig et al. (2002) point out, for example, that PPGIS has the potential not only for community involvement in policy-setting and decision-making by local governments, and development by grassroots community organizations, but also participation by ordinary citizens as its users. Another example would be recent research, what Goodchild (2007) calls Volunteered Geographic Information (VGI), that encourages volunteers to develop interesting applications of Google Earth or similar web systems, with their own data. Among other things, the most important value of VGI may lie in what it can tell about local activities in various geographic locations that go unnoticed by the world media, and about life at the local level. Thus, it is more than understandable that there can be observed growing public interests in representing local knowledge and community planning by citizens using GIS for the last several years. However, while citizen participation

becomes a necessary and indispensable part when thinking about cultural property protection and landscape conservation in the region, its know-how has not been established yet.

This study aims to explore the possibilities in geographic information related to historical landscapes, especially the ones that involve citizens' participation. Among various possibilities, here we discuss how volunteered information of historical streetscape is related to distribution and condition of machiya, traditional wooden townhouse in Kyoto. By doing so, we will draw attention to how effective PPGIS by VGI can be in policy-setting and decision-making of landscape preservation.

### 1.2 Kyo-Machiya Community-building Survey

This study focuses on "Kyo-Machiya Community-building Survey", or large-scale field surveys by volunteer citizen participation. Machiya is a traditional wooden townhouse mainly built between the Meiji Period (1868-1912) and World War II. The Kyoto Center for Community Collaboration (2009) notes that the number of machiya has been decreasing year by year, especially after the 1990s, due to the ageing of the buildings and expensive maintenance costs for owners, and that this led to transformation of the City's historical landscape.

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To assess what is really going on, currently we are conducting a major survey after the first (1995-1998) and the second (2003-2004) machiya surveys and the first modern architecture survey (in the early 2000s), all led by the Kyoto City Government, NPOs, and universities in Kyoto. In the current survey (2008-2009), we are aiming at collecting valuable information on approximately 50,000 machiya and about 2,000 examples of modern architecture, including their accurate locations and attributions as far as we can assess from the outside (Yano et al., 2009). We also check each machiya's type, its condition, design elements of the façade, and whether or not it is vacant.

This survey can be distinguished from the previous surveys in not only the research targeted volume but also the way in which it is conducted. That is, while conducting the survey, citizen researchers have been selecting "excellent (judged by their own values)" machiya, postwar wooden houses—many of which are not chosen for cultural properties yet—and streetscapes. In this survey, four to five participants form a group for the research about forty to fifty machiya, and eight to twelve groups participate each time. After each field survey, a report meeting was held where the citizen researchers presented excellent examples of the streetscape they collected, including historical landscapes, by showing their photographs.

In order to explain the survey and its significances in further details, the following sections discuss Nishijin area as a case study. A historical center of Kyoto, Nishijin has a lot of machiya, and some zones in this area are designated as aesthetic landscape districts of historical heritage. All together, we conducted twenty-one field surveys in the area between October 19, 2008 and January 25, 2009.

## 2. CASE STUDY

This study focuses on Nishijin area (Figure 1) that lies in the northwest of Kyoto City. Figure 2 shows Nishijin as an areal unit that has continued since the Meiji Period, within which eighteen elementary school districts function as community bases today.

There are a lot of cultural properties and landmarks including the Kitano-Tenmangu Shrine and Shokoku-ji Temple in the area. Besides the main streets of Horikawa Street and Karasuma Street that cross at the center of Nishijin area, there

are numerous narrower roads. Famous for its silk textile industry, the area has been overcrowded since the Muromachi Period (1338-1573) with many machiya that craftsmen and merchants used for their business and living. Yet, this machiya life style, i.e., working and living at the same place, has been severely damaged by recent decline of the industry, and the number of machiya has been rapidly decreasing. The area's total population as of July, 2009 was about 83,000 people and ranked as the second most densely populated (11,612 persons/km<sup>2</sup> at Kamigyo-ku) in Kyoto City.

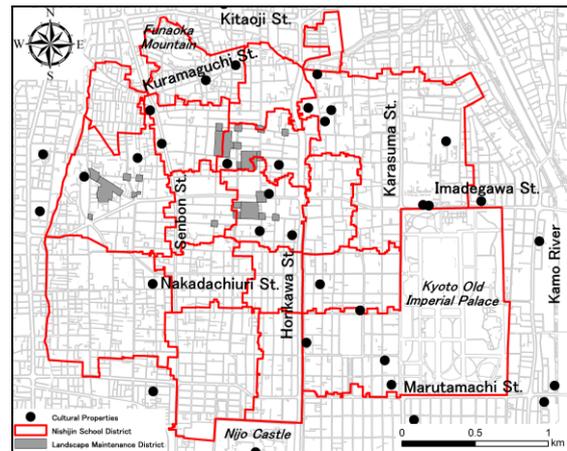


Figure 1. Study area

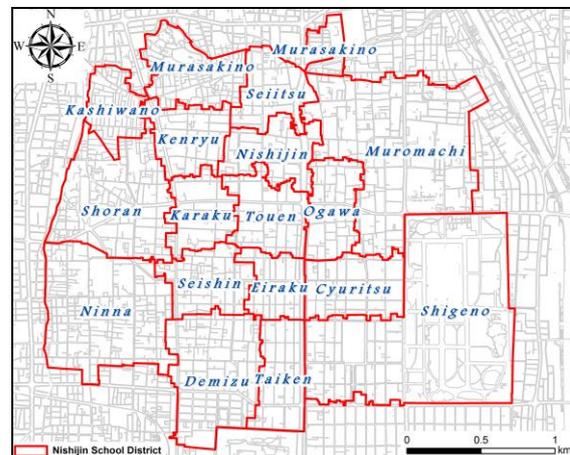


Figure 2. School district of study area

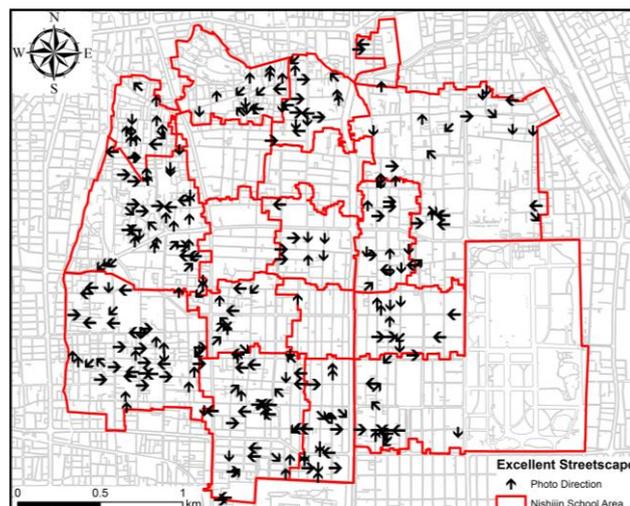


Figure 3. Excellent streetscape spots collected by citizen researchers

### 3. COMPONENTS OF STREETSCAPE

Figure 3 shows the locations of 266 excellent streetscape spots collected by the citizen researchers while they were conducting the survey of Nishijin area. As mentioned above, eight to twelve groups participate each time, and each group selects the maximum two excellent streetscape spots.

The participants put information of each spot, including its position, direction of the photo they take, and photograph number, on the paper map. Thinking that the collected data should be integrated with GIS databases of machiya and others, we constructed an integrated database by using ArcGIS 9.2, the same software we had used for the machiya database (Yano et al., 2008; 2009).

These procedures revealed the following overall tendencies. First of all, excellent streetscape spots are found concentrated on the streets that run from east to west, for example, Kuramaguchi Street in the North; Teranouchi Street in the Northwest area; and Ninnaji Street in the Southwest. Another concentration can be seen on some streets that run from south to north, such as Ogawa Street and Aburanokōji Street, in the east side of Horikawa Street. Second, we also analyze the relationship between distribution density of machiya and streetscape spots. Figure 4 shows the distribution density by the method of Kernel density estimation. A lot of streetscape spots—over two-thirds of the total—are found in the zone with high distribution density of machiya. Yet, less spots are found in the zone with the highest value of the Kernel density distribution, while a lot of spots are in the surrounding areas (about 4,000 to 5,000 spots per one square kilometer).

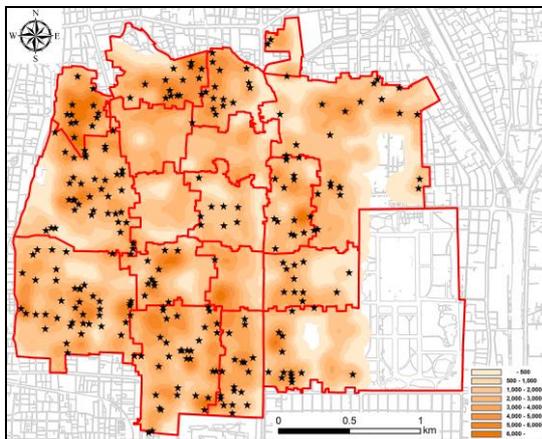


Figure 4. Distribution of machiya



Figure 5. Machiya high density zone (Kashiwano district)

Third, we sought zones with concatenated machiya in good condition, and calculated them through Neighbourhood Statistics (Figure 6). Distance of the machiya from the representative point to the next was set to fifteen meters in radius and measured (Isoda et al., 2005). It turned out that such examples concentrate on the northwest area (Kashiwano district) and the southwest area (Ninna and Demizu districts), corresponding to high density of the collected streetscape spots. It is almost understandable that no spots were chosen in the zones with machiya not concatenated, which remains white in Figure 6. To put it differently, in order to be chosen for excellent stops, machiya need to be concatenated and in good condition. This is also proven by the fact that pictures are taken from the direction that feature machiya in such condition (for example, see Figure 7).

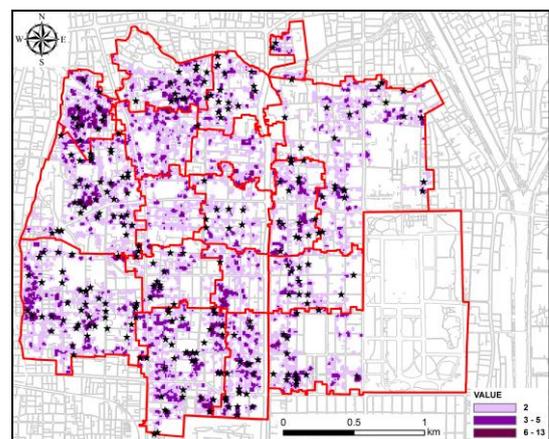


Figure 6. Distribution of concatenated machiya in good condition



Figure 7. Concatenated machiya in good condition (Demizu district)

Finally, it is worth noticing the relationship between Kyoto-characteristic narrow streets and the streetscape. Since the time of the ancient capital of Heian-kyo (794-1180), there have still remained a lot of city blocks divided by grid-pattern roads in Kyoto. The smallest units of alleys, roughly less than 4 meters wide are called *rōji* or *zushi* in Kyoto (Shimamura and Suzuka, 1971). Machiya residents have long used these alleys, as both private and community space in their daily life. The selected streetscape spots include about 1,300 alley sites in the study area and are very highly evaluated by the citizen researchers (see, for example, Figures 8 and 9). This makes a noticeable contrast with the zones already specified for scenic

preservation districts, since few alleys were selected in these zones. This derived from the fact that many researchers at their presentations highly regarded daily life landscapes and tenement-type machiya as excellent examples of Nishijin streetscape.



Figure 8. Streetscape of *zushi* (Shigeno district)



Figure 9. Streetscape of *rōji* (Taiken district)

#### 4. CONCLUSIONS AND FUTURE WORKS

The study reveals that the streetscape spots that citizen researchers collected in the field survey are strongly related to machiya and excellent historical streetscape in Kyoto. The survey led us to see the following three distinguishable characteristics in the stops: (1) They are related to machiya's distribution density and concatenation; (2) Citizen researchers selected streetscape where machiya's conditions were relatively good, or the façade's maintenance and/or repair is properly done; and (3) Streets and alleys chosen for streetscape spots are not only narrower than surrounding streets, but also alluding to daily life in Nishijin. While we have to conduct more detailed analysis, most spots seem chosen in such machiya districts, rather than in scenic preservation districts. Giving consideration to these points, it seems safe to say that these collected streetscape spots suggest new values, that is, daily life spots as attractive landscape.

Furthermore, advancing information disclosure leads us to more appropriate evaluation of the streetscape spots, collected by a lot of voluntary citizen researchers, and it may also give a chance to extract more landscape elements. Therefore, while constructing the GIS database, we are also experimenting on free and open-source software for geospatial (FOSS4G) to combine photos and maps, seeking the best way to publicize.

Figure 10 shows one of our attempts with Google Earth, to combine streetscape spots and photos. We are also planning to add evaluation and comment functions to a similar system in the future. Likewise, Figure 11 is an interactive map of Google Map (2D Map) and Google Street View with Google Maps Flash API.

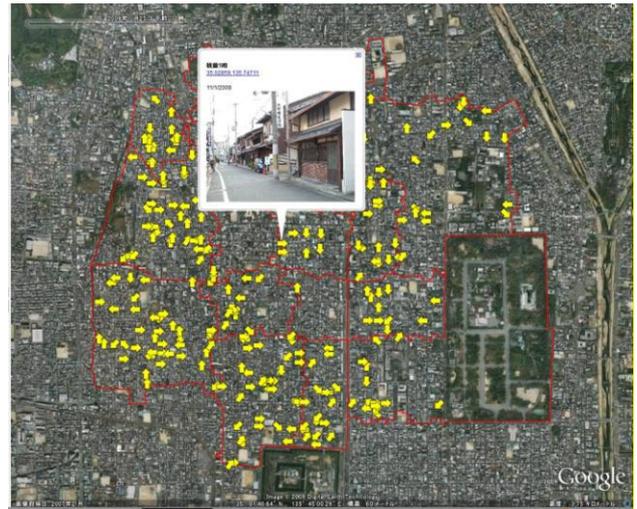


Figure 10. Visualization by Google Earth



Figure 11. 2D interactive map and street view of Google Maps Flash API

A Web display system of the streetscape can be constructed at a relatively low cost by combining the map data offered by Google, massive panoramic shot data, the positional data of the streetscape, and a local photograph. As a result, regardless of the place, people can discuss landscape policies and other things, since a real space can be made visible while they can freely change perspectives on a virtual space.

In short, this study demonstrates one example of so-called "Qualitative GIS" (Cope and Elwood, 2009) that uses qualitative data and analyzes spatial database through PPGIS. VGI-based PPGIS can be expected to give us more information by combining them with various GIS data, which can surely

contribute new meanings and values to cultural properties and the historical landscape in the historical city of Kyoto.

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