Visualization and Spatial Analysis with QGIS and OpenGeoSuite: A Case Study of Geographic Information Collected through Citizen-participatory Surveys

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1. Introduction

This study aims at visualizing and spatially analyzing geographic information, a large amount of which was collected by volunteer citizens in "Kyo-Machiya Community-building Survey." The purpose of this survey was to examine a distribution of approximately 50,000 machiya, traditional wooden townhouses which many regard as one of the city's representative historical architecture. In this survey, the locations of machiya in itself as well as streetscape with machiya were investigated. Since the citizen participants themselves chose these streetscapes about which they felt favorable, the consequent data will contribute greatly to the landscape policy in the future. Therefore, this paper analyzes the geographic information concerning the streetscape of over 1,000 spots collected in this survey.

We can provide some valuable information on selected spots as cultural landscapes by combining such data with other geographic information including official data, and using OpenGeoSuite, an integrated package to construct Geospatial Web. Moreover, using both QGIS and OpenGeoSuite makes it possible to offer geographical information concerning historical landscape in Kyoto, not necessarily limited to the spots.

2. Kyo-machiya Community-building Survey

Our study is based on "Kyo-machiya Community-building Survey," for which the Kyoto City Government, Ritsumeikan University, "machiya-experts," and volunteer citizens worked together from October 2008 to March 2010. This most recent survey targeted much broader area along several old major roads, compared to the areas covered by the previous two surveys (1995-1996 and 2004-5) (Figure 1).

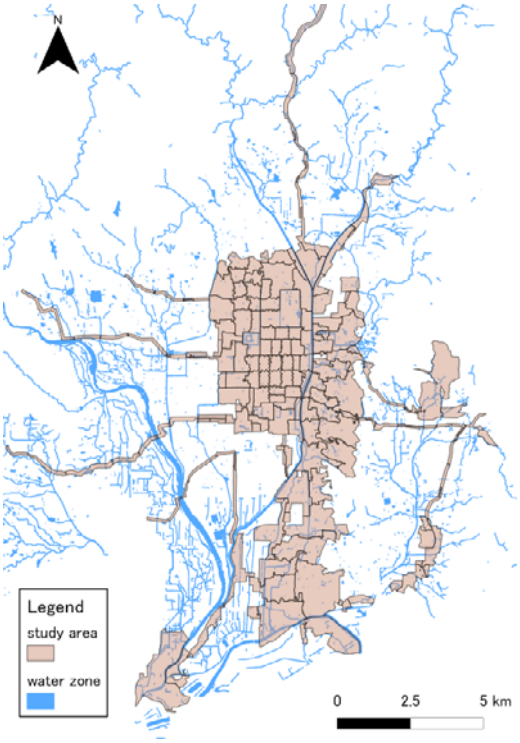

Figure 1. Study Area

Not only figuring out the distribution of existing machiya, but the last survey also aims at collecting detailed data on their façade designs and conducting a questionnaire survey to machiya residents. Since each survey group consists of a variety of members such as architectural experts, volunteer citizens, students, and city government officials, the survey produces data useful for planning landscape conservation. For example, while architectural experts and city government officials can offer practical knowledge, volunteer citizens take photos of machiya. The latter also play an important role, giving their ideas to conserve the city's landscape from the citizens' points of view. After every survey, members spend some time together to discuss and present information they have just collected, for which they show and tell what they think of good examples of streetscapes and historical landscape components.

3. Collection and Analysis of Streetscape Selected by Volunteer Citizens

The survey resulted in accumulating geographic information of streetscape over 1,000 spots with their photographs. Visualization by QGIS makes the streetscape-related information available for overlapping with various layers, including official geographic information, which in turn makes us possible to study how places whose streetscape was photographed really are from various points of view.

The following demonstrates one of good examples as such. We overlap the machiya's density distribution which we presume by using SDA4PP, one of QGIS's plug-ins, with information on where

photos were taken (Figure 2). The result shows that the survey participants took many photos in spots where machiya's density was high. Overlaying the spots with a landscape planning map reveals that the citizens value streetscape in residential areas, as well as that in historical heritage conservation areas and sightseeing spots that appeared in online photo-sharing services such as Flickr. In addition, the eVis function can visualize which direction a photo is taken from by the arrow, linking the visualized directions with actual photograph data. The result tells us which side of the street excellent machiya continuously appear.

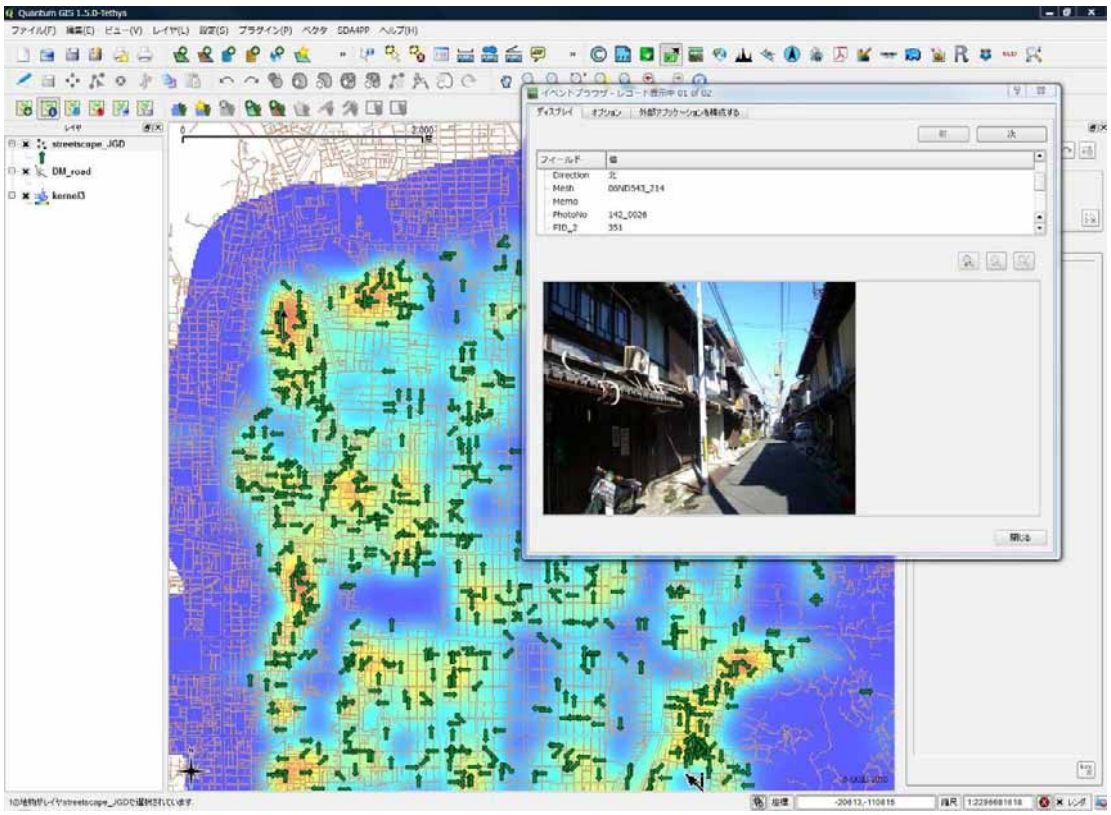

Figure 2. A Case of Streetscape Analysis

4. For the Delivery by Geospatial Web and its Use for Landscape Policy

The GIS data constructed in the stand-alone environment will be available locally through the Geospatial Web. For this purpose, we choose Google Maps as the base map for its capability to distinguish narrow roads and building shapes, with the help of OpenGeoSuite 2.1.0. Since WMS service on Geoserver makes it possible to overlap and deliver various maps, including city planning maps in the past and the current landscape policy zoning map, it can be employed to visualize spatio-temporal condition of citizen-selected spots. Figure 3 shows overlaying the citizen-identified streetscape spots (red point) with city planning maps of the early twentieth century and current Google

maps. Collected by citizen participants, each piece of information may be subejective, but accumulation of such pieces within an area unit or layering of that data with administrative maps and machiya database might changes its nature, making it more valuable information resource for landscape planning.

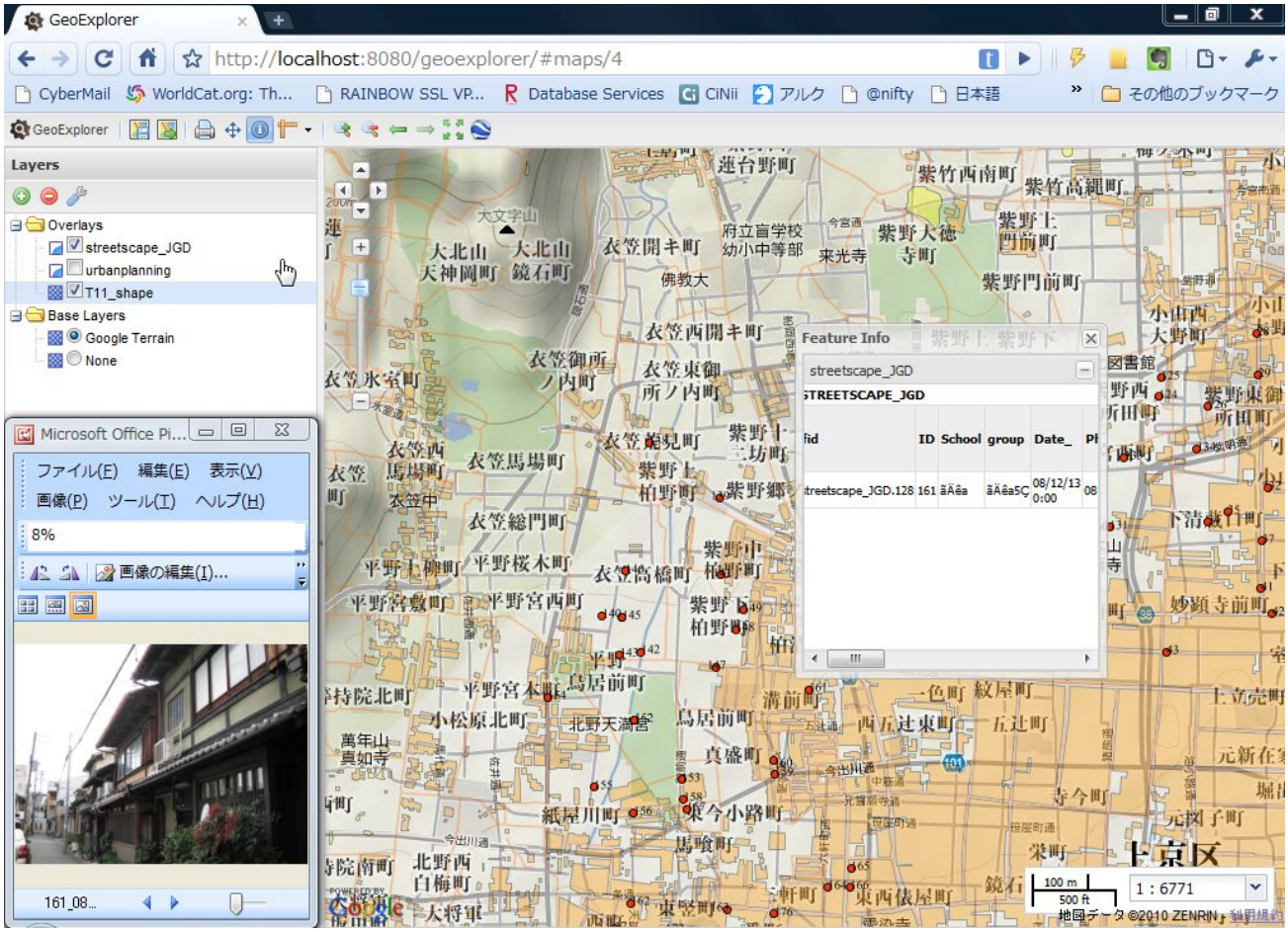

Figure 3. Interface of Streetscape Mapping System with OpenGeoSuite

In short, this paper discussed the process in which we integrated geographical data provided by both official maps and the citizens survey data, and its visualization and analysis. Hopefully, this leads those who are concerned with the landscape policy to come up with a variety of new ideas which include the one from grass-roots perspectives, not necessarily as valued as it should be. As OpenGeoSuite can make this geographic information available to the general public, that shall work to invite more citizens to participate in discussion on the landscape policy.