Spatial Relationship between Water Area and Human Inhabitation in the Lake Biwa-Yodo River basin

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Introduction

Previous studies on population distribution covered administrative and socio-economic regional units such as a prefecture, a municipality, and a metropolitan area. They also focused on the distribution patterns in relation to the distance from CBD, transportation network, and the location of economic functions. On the other hand, the purpose of this study is to analyze the spatio-temporal characteristics of population distributions in the Lake Biwa-Yodo River basin from Meiji era to today. Through this analysis, this study is intended to discuss the spatial relationship between water area and human inhabitation. Although a watershed as a study unit has been drawn attention in various research fields since the 1970s, quantitative and spatio-temporal data analyses on watershed scale haven't been conducted enough. In recent years, however, the development and spread of GIS technology with the improvement of digital maps and statistical data allow spatial analyses based on adaptable regional divisions such as catchment division and distance zone division.

Data and research method

In this study, the Lake Biwa-Yodo River basin was firstly divided into the Yodo River basin and Lake Biwa basin. Furthermore, the Yodo River basin was divided into four analysis units by the following two methods with using GIS.

1) A line data of the main river was divided into four equal parts. Then, the water inflow ranges to each four part were decided.

2) The four buffer zones by distance from the main river were formed, which are named 5km zone, 5-10km zone, 10-20km zone, and the further zone, respectively.

On the other hand, Lake Biwa basin was also divided into eight analysis units by the following method. First, the shoreline of Lake Biwa was divided into eight equal parts. Second, the water inflow ranges to each eight part were decided. For these settings of analysis units, this study used line data of rivers and polygon data of watershed units provided by the Digital National Land Information website. Population data, 'Requisition Order List' in 1890 and 'National Census' in 2000, were mapped by the method shown in Fujita et al. (2005). Then, populations and their densities in 1890 and 2000 and population change from 1890 to 2000 were calculated for the every analysis units mentioned above.

Results

1) In 1890, population density of the Yodo River basin didn't show so much difference from that of Lake Biwa basin. In 2000, however, population density of the Yodo River basin was four times as much as that of Lake Biwa basin.

2) While only the most downstream division of the Yodo River basin had high population density in 1891, the population of second downstream division also had high density in 2000 and increased at a fastest rate.

3) While population densities in both 1890 and 2000 were the highest in 5km zone, the rate of population change was the highest in 10-20km zone and second-highest in 5-10km zone.

4) In Lake Biwa basin, population density was already high in the southern and eastern parts of the basin in 1890. This gap in population between the northwest and the southeast has become increasingly widened to the present.

Acknowledgements

Reference

Fujita, K., Murayama, Y., Morimoto, T., Yamashita, A., and Watanabe, H. 2005. A Spatial Analysis of Population Change in Tokyo Metropolitan Area from Meiji Era to Today -By Using a Requisition Order List 1891 and DEM Data-. Papers and Proceedings of the GISA 14: 61-66.