

Spatial comparison of population density of the largest cities in the world: Distance decay effect from the city center

Shyamantha Subasinghe and Yuji Murayama
 Graduate School of Life and Environment Sciences, University of Tsukuba
 Email: <subasinghepgia@gmail.com>

(1) Motivation: Knowledge of the population distribution dynamics of the largest cities in the world is important for examining the complexity of the urban spatial structure in the international urban system. By using the concept of average population distribution (day-time and night-time), we try to classify the top 50 cities in the world through the analysis of distance decay effect from the city centers.

(2) Data and methods: We selected the top 50 cities by population using the UN stratification in *World Urbanization Prospects: The 2014 Revision Report*. We made the global population density surface of 2013 (GPDS 2013) by employing LandScan 2013 raster grid file. The cell value gives the number of people in the cell.

Then we created five-kilometer buffers from the city center in an increasing stepwise manner for each city and extracted the population density values in each zone. The city center was selected based on the location of local government center.

In order to simplify the spatial patterns of the population distributions, the linear graphs for each city were created using population density and distance from the city center.

(3) Results: We could find five basic patterns (Fig. 1). Pattern A consists of 21 cities with a greater concentration in the central area. B consists of 14 cities with a lower concentration in a limited urban space. The population density decline was gradual as the distance from the city center increased. C consists of five cities. These cities show that the population density change between the 5 km and 10 km distance zone is low. D consists of four cities. The low

population density in the 5 km distance zone is comparable to both the 10 km and 20 km distance zones, and can be easily distinguished from other patterns. E consists of six cities. The fluctuation along the gradient distance from the city center is significant in this pattern. We understand that the spatial pattern of the 50 cities is associated with global, regional and national factors. There is a great difference in distance decay shape between developing and developed countries.

(4) Future plan: We plan to analyze the spatiotemporal changes of population distribution and predict the future pattern in a comparative manner. A statistical analysis is also needed to generalize the spatiotemporal patterns of population distributions in the largest cities in the world.

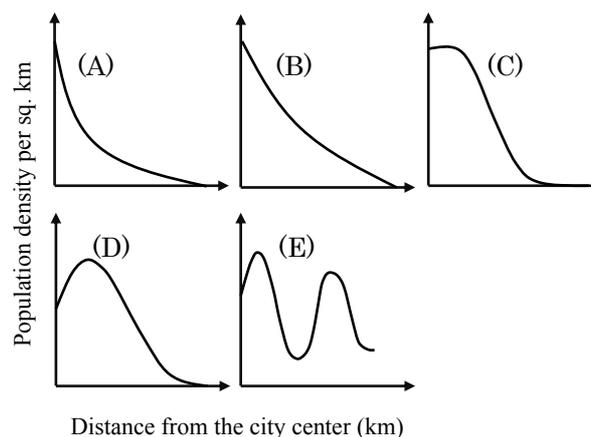


Figure 1: Basic patterns of the population

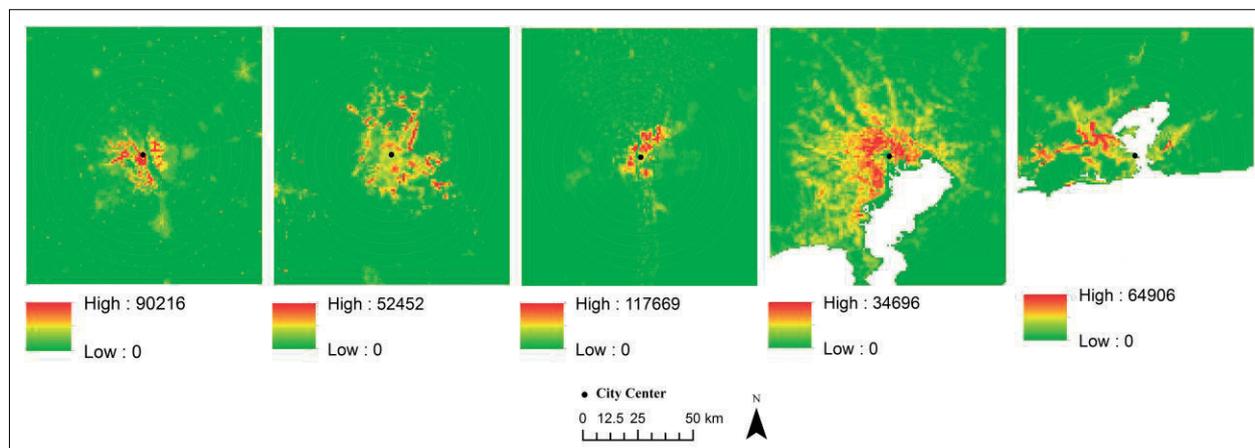


Figure 2: Examples of each pattern of the population density distribution (2013)
 Note: The values show the population density per square kilometer in 2013.