Can *The Siberian Curse* be applied to Central Asia? Recalculation and examination of Temperature per Capita (TPC)

Ueda Akira

This study recalculates the temperature per capita (TPC) for Kazakhstan and Kyrgyzstan to examine whether *The Siberian Curse*, a famous thesis relating to the economic geography of Russia, can also be applied to Central Asia. In 2003, Fiona Hill and Clifford Gaddy argued that Siberia's population was too large from a market economy perspective and that this uneconomic population distribution was the result of a series of policies introduced by the Soviet communist planners. Their argument was based on two sets of statistical data: the rank-size of urban populations and the unique coldness of Siberia's large cities, quantified by TPC. Regarding rank-size analysis, Kazuhiro Kumo and Elena Shadrina revisited this data in 2021 and revealed fundamental problems with Hill and Gaddy's analysis. This paper, though, focuses on TPC as a useful indicator not only in Russia but in any other region. Although Hill and Gaddy used TPC only to suggest the difference in population distribution between Russia and Canada, this indicator has potential for area research on other regions because it can be calculated using only two sets of fundamental statistical data: population and temperature.

From a methodological point of view, this paper tries to suggest the potential of raster data for academic area research using TPC as an example. In the late 20th and 21st centuries, remote sensing of the earth's surface has rapidly advanced and survey results are generally published in raster data format that divides the ground into a grid of tiles. High resolution raster data can be cut to arbitrary administrative boundaries by using GIS software, allowing comparison with official statistics for any administrative units.

In recalculating TPC, this paper takes two technical measures. One is that temperatures are aggregated using a global raster dataset, and the other is that there are two levels of administrative units subject to re-aggregation. In principle, the TPC value changes depending on which administrative unit is targeted. Russia has more than 80 "oblast" level administrative divisions, which are effective units of analysis for TPC, but the number of "oblasts" in Kazakhstan and Kyrgyzstan is extremely small compared to Russia. This paper recalculates TPC at two levels: "oblast" and district. For both countries, many of the meaningful results came from district-level analyses but oblast-level analyses were essential for comparison with the Russian case.

The TPC of Kazakhstan rose from 1970 to 2009 and there was no evidence of *The Siberian Curse*. This is explicable given the contrasting demographic dynamics between northern and southern Kazakhstan, especially the outflow of the Russian population from the northern part of the country after independence. Notably, the TPC in urban areas became lower than the national average following independence. This seems strange given that cities are generally built in locations with comfortable environments, and thus shows that the transfer of the capital to Astana from Almaty affected the national TPC of Kazakhstan.

The lowest TPC in Kyrgyzstan was recorded in the late Soviet era, suggesting that a situation similar to *The Siberian Curse* may have occurred in this country. Population growth in the eastern mountainous area halted after the independence, while the population in Bishkek in the Chui valley and the districts in the southwestern Ferghana valley expanded, although, surprisingly, the average elevation of the population rose over the same period. This seemingly contradictory situation may result from the inefficiency of the Soviet style of development and its readjustment after the collapse of the USSR. In other words, this shows that the relationship between altitude and winter cold is not a simple correlation in the human geography of Kyrgyzstan.

While various types of regional information, including the results of remote sensing, have increased at an accelerating rate in recent years, how to utilize this vast amount of information is an important issue in the humanities and social sciences. This case study using climate and elevation data reexamined *The Siberian Curse* hypothesis concerning Central Asian countries and highlighted the usefulness of borderless raster data to relativize any layer of administrative borders.