

Visualization and Analysis of Global Habitability by Remote Sensing

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Abstract: Since globalization is spreading and the language barriers are gradually disappearing with the development of automatic translation systems today, there may be a time we choose where to live freely regardless of country or region. The free choice of residence will trigger global competitions among cities so that they make themselves more attractive, where a fair indicator of habitability is necessary. The purpose of this research is to establish an indicator of habitability and to analyze it.

In this research, three parameters were configured to measure habitability; “environment”, “economy” and “natural disaster”. Environmental qualities were estimated by the yearly maximum number of normalized difference vegetation index (NDVI). At the point where the maximum NDVI is smaller than a certain number, the aerosol optical depth (AOD) was combined for more precise estimations in urban areas. Energy consumptions were estimated by nighttime light exposure from the Defense Meteorological Satellite Program’s Operational Linescan System (DMSP-OLS). Natural disaster risks were evaluated by the combination of datasets from Global Risk Data Platform in UNISDR’s Global Assessment Report on Disaster Risk Reduction.

These parameters were visualized by RGB mapping on a global scale assigning natural disaster risks to red, environmental qualities to green, and energy consumptions to blue. To investigate the relationship between habitability and population, this global habitability map was compared with the global population distribution map derived from Landsat 7 ETM+ imagery based on a population density estimation models. This comparison can lead to a prediction about the future population distribution.

Keywords: Geographical information; Mapping; NDVI; DMSP-OLS
