ABSTRACT

LOCALIZED SPATIOTEMPORAL DATA ANALYSIS ON THE EFFECT OF LAND COVER CHANGES ON TEMPERATURE TRENDS OVER THE PHILIPPINES USING GOOGLE EARTH ENGINE

EDWARD P. CAJUCOM
University of the Philippines, 2021

Adviser: **Dr. Gay Jane P. Perez**
Co-adviser: **Dr. Marcelino Q. Villafuerte II**
Reader: **Dr. Cherry L. Ringor**

The effects and impacts of global warming are now evident worldwide. These impacts are expected to exacerbate and this will highly affect the economy and therefore, the lives of the people. Also, as the population growth continues to expand, the growing needs of the population especially in terms of space resources are also increasing. However, this land conversion or removal of natural vegetation producing low-reflective, impervious, non-evaporating surfaces significantly affects the local weather and climate present in an area.

As observed from the ground, the Philippines has a mean temperature increase of 0.73ºC during the 1951 – 2019 observation period. Remarkable changes in mean minimum temperature were observed as compared to mean maximum and mean temperature in several synoptic stations of the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) in the country. Also, historical analysis on the diurnal temperature variations exhibits high increase in minimum (0.013ºC increase per year) compared to maximum (0.008ºC) and mean (0.010ºC) temperature.

As seen from the space, results of the satellite-based temperature trends indicate consistent findings with those observed by PAGASA. Country-wide statistical analyses on the historical observations and correlations of Land Surface Temperature (LST), Normalized Difference Vegetation Index (NDVI), and Normalized Difference Built-up Index (NDBI) show varying patterns of trends during the entire study period (1988-2019). Daytime historical LST trends show relative likelihood and significant correlations with PAGASA observed data, especially on mean temperature observation. The urban and highly populated provinces of Metro Manila, Pampanga, Pangasinan, Nueva Ecija, and Tarlac all show high values of temperature during the study period. Also, the analysis of the pixel-based vegetation trends using NDVI provides helpful contributions on the spatial extent and current vegetation cover of the country. However, albeit good correlation observed between LST & NDVI profiles, it was noted that it is still important to investigate the degree of land use structure complexity that is present and can be determined using NDBI. The spatial variation of land surface temperature is largely dependent on the spatial distribution of impervious surface coverage and spectral response of vegetation profile. Hence, this study was able to come up with a provincial level built-up map that is consistent with the findings observed on LST and vegetation cover. Also, like the observation noted in LST, the provinces of Metro Manila, Pampanga, Pangasinan, Nueva Ecija, and Tarlac have the highest mean NDBI throughout the study period.

Drawing upon the concept of disaster risk reduction and climate change adaptation, this work successfully developed an algorithm and utilized Google Earth Engine as a main tool to process and investigate the effect of urbanization in many cities and provinces of the country. Holistic lists of science-based plans and programs that are based on the findings of this study and on the current gaps and challenges in dealing with urban heat island and climate change adaptation planning are recommended.