



The Effects of the Decreasing Farm Ponds on Human Thermal Comfort in Taoyuan, Taiwan

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Over the past few decades, Taoyuan, located in northern Taiwan, has been experiencing a significant decrease in number and area of its unique landscape—the farm ponds. The numbers of the farm ponds were more than 5,000 in this area about a hundred years ago, but only less than one-third of them is left due to increased urbanization. The impacts of land use and land cover (LULC) change on microenvironment and the cooling effects of water bodies over different scales have been widely studied in recent years. However, there is relatively little research focusing on the effects of small water bodies like farm ponds on regional environment and human thermal comfort at diurnal or seasonal scales. The aim of this study is to quantitatively investigate the influences of the decreasing farm ponds on the thermal environment and physiological equivalent temperature (PET), an important human comfort index, in Taoyuan from 1960 to 2014. In this study, satellite images are used to identify the spatial distribution of LULC over different periods. WRF, a mesoscale meteorological model, is conducted to quantify the regional climate change caused by the decrease of farm ponds, and spatial distribution of PET over different periods is calculated by RayMan model. The findings from this study are expected to provide a better quantitative understanding of the role of the farm ponds in this area, and could be taken into considerations for urban planning and management for the administrations, and the adaptation to environmental change in the future.

Keywords: Land use and land cover change, farm ponds, human thermal comfort, physiological equivalent temperature