Estimation of urban surface temperatures using remote sensing in eThekwini municipality

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Urban Heat Islands (UHI's) are an increasingly common phenomenon within urban areas around the world. These heat islands may lead to a variety of negative effects, such as health impacts on urban inhabitants and disruption of the functioning of surrounding natural environments amongst others. The best method of determining the presence and magnitude of UHI's is through remote sensor thermal imaging. However, due to differing resolution characteristics, certain remote sensors would be better equipped at determining Land Surface Temperatures (LST's) and from it inferring UHI's. The aim of this study was to determine the presence and magnitude of UHI's across eThekwini municipality using Landsat 8 and MODIS remote sensors for each season over the period of a year. An additional aim included checking the accuracy of these sensors in determining LST's. MODIS LST products were obtained directly from the EROS data centre (EDC) and converted into degrees Celsius. Landsat 8 images were also obtained from the EDC and LST's were obtained through an algorithm developed by Stathopoulou and Cartalis, (2007). Accuracy results showed that MODIS had an RMSE of 7.04 °C while Landsat 8 had an RMSE of 2.92 °C. MODIS also had an R2 value of 0.65 while Landsat 8 a R2 value of 0.93. Based on these results, Landsat 8 was considered a more suitable remote sensor to determine LST in the case study area. Differences in temperature between highly urbanised and nonurban areas were around 2 - 6 °C warm, confirming the presence of UHI's within eThekwini municipality. In other areas, the cooling effects of vegetation could be clearly observed suggesting possible mitigation methods.