

A Study of Land Surface Temperature Variation in Selected Urban Cities in Sri Lanka

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Abstract - Land Surface Temperature (LST) is one of the prominent methods to conduct climate studies and commonly used to analyze the impact of land surface changes all over the world. Due to many anthropogenic activities, natural environment transformed into urbanized areas rapidly. As a result, certain climatic components including land surface temperature has been modified dramatically. Therefore, this study was conducted to estimate Land Surface Temperature (LST) in highest population growth cities in Sri Lanka. The main objective of this research was to examine the relationship of rapid urban population growth with Land Surface Temperature using Geographical Information System (GIS) and Remote Sensing (RS) techniques. The study was conducted in five cities in Sri Lanka and those cities were selected by the population growth rate. Population data were collected from two census and statistic survey conducted in 2001 and 2011. The study has estimated Land Surface Temperature using Landsat TM, Landsat 8 data and spatial and temporal variations were also taken in to the consideration. Finally the study has revealed that the maximum LST values of the selected cities varied from 29 °C to 37 °C. When considering about spatial pattern of LST in 2005 and 2016 the highest mean LST were shown in Hambantota in 2005 and 2016. In 2005 mean LST has varied from 25 °C to 27 °C and in 2016 it was from 25 °C to 29 °C. LST has been increased with the population growth rate and land surface changes. However, some external factors such as meteorological, physical and environmental factors have influenced on the changes in LST in certain urban cities.

Index terms – LST, Population Growth, Land use, GIS

I. INTRODUCTION

Land Surface Temperature (LST) is one of the key parameters in the physics of land surface processes from local through global scales (Liang Li Z. et al, 2013). According to the NASA Earth Observatory, USA, Land Surface Temperature is how hot the “surface” of the Earth would feel to the touch in a particular location and from the satellite point of view, the object it sees when it looks through the atmosphere to the ground.

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Urban spatial areas have expanded rapidly during the last five decades and also rates of urban population growth are higher than the other areas (Xu H., 2007). The land-use and land cover changes occur rapidly and these have direct effect on the land surface temperature variation. Therefore, land surface temperature and population growth has a positive co-relationship with the earth surface. Many anthropogenic activities have directly affected the environmental transformation, and has created numerous major environmental problems. As a result of rapid growth of population, land surface modify dramatically and become impervious and reduce vegetation cover in any given urban area, Due to that the surface temperature of the earth gets modified accordingly.

To be more clear, land surface temperature is not the same as the air temperature that is included in the daily weather report, it is the warmth representation of earth’s landscape and strongly related to land surface emissivity (<http://www.cssteap.org>, 01.09.2016). Satellite base Land Surface Temperature is one of the best methods to identify the changes in environmental conditions for many research fields. Such widely used fields included, but not limited to evapotranspiration, climate change, vegetation changes, hydrological cycle and other environmental studies.

Furthermore, studying of land surface temperature variations with urbanization is very important for sustainable, environmental friendly future planning. It will also directly address the issue of how to reduce negative human impact on the environment. In Sri Lanka, many areas have been undergoing rapid urbanization, unhealthy land-use practices and land cover changes. Current urbanized areas can be identified as the densely populated areas in Sri Lanka. Therefore, more human impact and environment changes occurs frequently. Hence, identifying the spatial and temporal variation of land surface temperatures in cities which has the highest population growth is significantly important.

II. LITERATURE REVIEW

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