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Temporal and Spatial Variations of the Atmospheric Temperature in the Northern Province of Sri Lanka

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Abstract

Atmospheric temperature is the important phenomenon that determines and changes the weather pattern of a place. Studies regarding the climates of the Northern Province of Sri Lanka are very less compared to other disciplines. But climate influences all aspects in the Northern Province of Sri Lanka. In this context the main objective of this paper is to identify the spatial and temporal patterns of the temperature of the northern region of Sri Lanka. Data related to temperature of the study area have been collected from Department of Meteorology, from all available stations of the Northern Province of Sri Lanka from 1972 to 2014. Data from the Statistical Handbook of the Planning branch of the Northern Provincial Council also helped to contact this study. Data have been analyzed using excel work sheet and results were mapped using ARC GIS 9.1 version. Average mean temperature of the study area is 28.4 degree Celsius. But it varies from month to month, season to season and place to place. Seasonally the highest air temperature is recorded during the South West Monsoon Season and the lowest air temperature is recorded during the North East Monsoon Season. The hottest month of the study area is July and the coolest month is December. Spatially the western part of the study area receives the higher extent of temperature than the eastern part of the study area.

Keywords: Temperature, Northern Province, Spatial, Seasons and Variations.

Introduction

Atmospheric temperature is the important phenomenon in weather and climate, which determines all other parameters of the weather and their changes. Studies about the temperature of an area will help to understand and interpret the weather changes and it will help to predict the future pattern of the weather of the area[1]. So far, there has not been any detailed study carried out to demonstrate the spatial and temporal patterns of the temperature in the Northern Province of Sri Lanka[2]. Some kind of development activities cannot be preceded in the Northern Province of Sri Lanka due to the lack of information related to the atmosphere, weather and the climate of the Northern Province of Sri Lanka[3]. In this context this study emphasizes the need of identifying the spatial and temporal pattern of the Temperature in the Northern Region of Sri Lanka.

Study Area

The study area for this research is the Northern Province of Sri Lanka. It is located in the northern most part of Sri Lanka. The northern boundary of the Northern Region is the Palk Strait, while in the east it is bounded by the Bay of Bengal. The Southern and Western boundaries are the North Central province and the Arabic sea respectively[4].

Administratively the Northern region has been divided into 5 Administrative Districts, 34 DS Divisions, and 921 GN Divisions. For the purpose of Local Governance the region has been divided into one Municipal Council, 5 Urban Councils and 29 Pradeshiya Sabhas. The Northern Province has a total area of 8,848.58 sq. kms[5, 6].

Objective

The main objective of this study is to identify the spatial and temporal patterns of temperature in the Northern Province of Sri Lanka from 1972 to 2014.

Data and Methodology

According to the objective of this study various types of data ranging from primary to secondary have been used immensely in this research. Even though secondary data were helped in this study in much extent. Primary data were collected using direct observation method. Secondary data also helped to this study. Secondary data related to climate of the Northern Province of Sri Lanka, were obtained from the Meteorological Department. Basic secondary data required for the study were collected from the Meteorological Department of Sri Lanka in Colombo. Data was collected for 40 stations including Akkarayankulam, Kudaththanai, Kondavil, Punkuduthivu, Delft, Kyts, Karainagar, Vaddukkoddai, Kilinochchi, Poonagari, Vellankulam, Nanaddan, Musali, Mannar Town, Nedunkerny,

Kanakarayankulam, Omanthai, Cheddikulam, Eratperiyakulam, Mallavi, Pandiyankulam, Naddankandal, Oddusuddan, Ambalapperumal Kulam, Mamaduwa, Iranaimadhu, Thirunelveli, Kodikamam, Palai, Elephantpass, Tharmapuram, Kanukkerni, Karukkaikkulam, Murunkan, MuththaiyanKaddu, Nainathivu, Pavatkulam, Pallavarayankaddu, Vavuniya and Vavunikkulam from 1972 to 2013. Monthly Average Temperature, Monthly Maximum temperature, and Monthly minimum temperature of every selected stations, were obtained from the Meteorological Department. During the years of 2008 and 2009, there are no data for some stations of Mullaitivu, Kilinochchi and Vavuniya, due to the severe war. Statistical Hand Book of the Northern Provincial Council and Reports of the Irrigation Department data also helped to identify the seasonal and spatial pattern of air temperature of the Northern Province of Sri Lanka.

Descriptive analysis method has been used to analyze data and interpret the results in to this study. To study the objective information related to temperature, rainfall, atmospheric pressure, humidity, and wind for the study area during the last forty-two years were obtained from the Department of Meteorological, Colombo. The collected data process and analyzed in the excel work sheet and geo spatial maps prepared by using Arc GIS software (9.2 version).

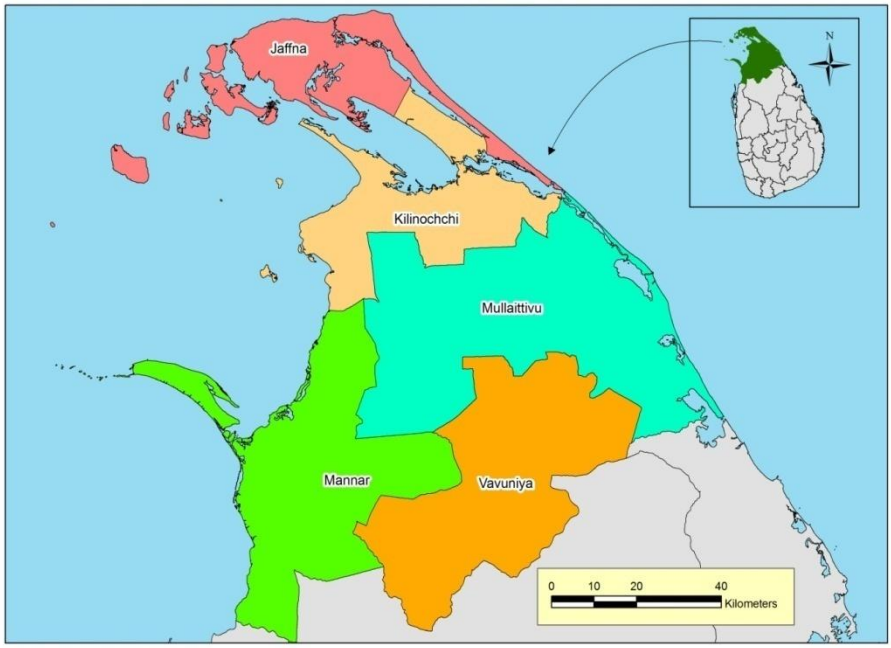

Figure-1
Study Area

Table-1
Area of the Northern Region

District	Total Area		Land Area		Inland Water	
	Sq.Km	Percent	Sq.Km	Percent	Sq.Km	Percent
Northern	**8847.98**	***100.00***	**8596.61**	***100.00***	***251.30***	***100.00***
Mullaitivu	2616.90	29.58	2516.90	29.28	100.00	39.79
Vavuniya	1966.90	22.23	1966.90	22.88	0.00	0.00
Mannar	2002.07	22.63	1991.00	23.16	11.00	4.38
Kilinochchi	1237.11	13.98	1192.81	13.88	44.30	17.63
Jaffna	1025.00	11.58	929.00	10.81	96.00	38.20

Source: Planning Branch, NPC, 2012

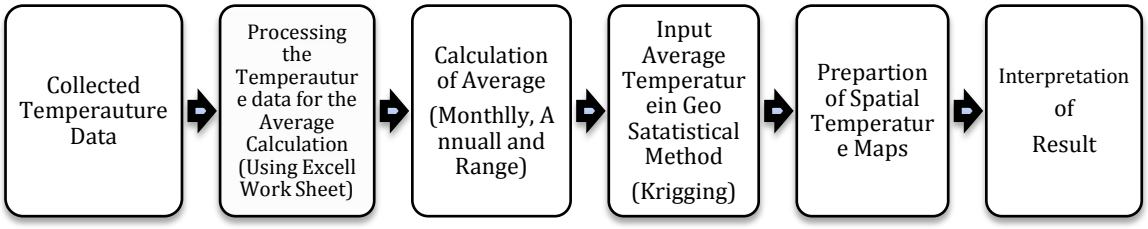

Figure-2
Method of Temperature Average Calculation and the Spatial Representation

Results

Temperature is an important parameter that influences the entire weather changes of a place, though it is of greater importance to countries located in the equatorial regions. It is temperature that determines the dynamics and functions of the other weather parameters. Air temperature over Sri Lanka is measured using standard thermometers as well as maximum and minimum thermometers, which are kept in Stevenson screen, in accordance with the World Meteorological Organization's (WMO) standard and procedures. The average air temperature of the Northern Province is 28.4 degree Celsius. Nevertheless, it varies from place to place and season to season.

Seasonal Patterns of the Temperature in the Northern Province: Seasonally too, there are variations identified in the air temperature of the Northern Province. During the First Inter Monsoon Season (FIMS) study area experiences high temperature due to the angle of the sun being directly overhead to the Northern Province, especially in the latter part of March and April. During this period the average temperature is 29.2 degree Celsius. During the months of May, June, July, August and September this area experiences the highest day temperature and daily temperature compared to other seasons. During this season the maximum temperature recorded 32.7 degree Celsius in the Kariyalai Nagabaduwan station. During this period many parts of the study area such as Poonakari, Pallavarayankaddu, Nagapaduvan, Mulangavil, Vellankulam, Thunukkai, Kalvilan, Nachchikkuda, Thevanpiddy, Iluppaikkadavai, Adampan, Murunkan, Karukkaithivu, Madhu, Adkaddiveli, Musali, Manthai, kayts, Nanaddan, Karainagar, Delft, Punkudutivu, Umayalpuaram, Pannankandi, Chittikulam, Valaippadu and Kiranchi face dry weather conditions due to the prevailing high temperature. During the Second Inter Monsoon Seasons (SIMS) the study area receives an average temperature not exceeding 28.8 degree Celsius. However, during this period if any cyclonic activities occur in the Bay of Bengal, the study area may have a lower temperature below 28.2 degree Celsius. All districts of the Northern Province experience a low temperature which is less than 27.5 degree Celsius, during the NEMS especially during the months December, January and February due to influence of the moist wind blowing over the study area and the cloudiness of the sky. Minimum nocturnal temperature as recorded in the study area at late nights during the NEMS, in Vavuniya averages to 24.5 degree Celsius.

The periods from March 15 to April 15 and from September 15 to October 15 are periods of high temperature (30.08 degree Celsius) in the Northern Province. Because of the position of the sun's angle is almost at ninety degrees to Sri Lanka during these months.

In a year, the hottest month of the Northern Province is July in which the average temperature amounts to 29.6 degree Celsius. The coldest month is December, with an average temperature of 27.7 degree Celsius.

In the past hundred-year history of the Northern Province, there have been some significant variations within the last thirty years, in the annual temperature of the Northern Province based on the annual average of the temperature. For example in the Jaffna district, a comparison of three climatic periods each consisting three decades (1930-1960, 1960-1990, 1990-2011), reveals that during the third climatic period (which has only twenty years), temperature has increased by 0.24 degree Celsius[2]. Nationwide researches also indicate this increase[1]. But a complete research regarding the temperature changes in the Northern Province has not been carried out up to now.

Range of the temperature varies district wise. Annual range of temperature in the district of Mannar has certain extent of variation as far as the annual and diurnal ranges of temperature are concerned. The annual range of temperature varies between 1- 2.5 degree Celsius and the diurnal range between 3 and 6 degree Celsius.

Average, diurnal and annual range of temperature of the districts and selected places in the Northern Province are shown in table.

Table-2
Average Temperatures of the Districts in the Northern Province of Sri Lanka (1972 to 2012)

District	Average Annual Temperature in degree Celsius	Annual Range of Temperature in Degree Celsius	Diurnal Range of Temperature in Degree Celsius
Jaffna	27.8	1.5-2.3	3.5-6.4
Kilinochchi	27.7	1.7- 3.1	3.8-6.2
Mannar	28.2	2.9-4.2	3.9-6.7
Mullaitivu	27.9	1.4-3.7	3.8-6.3
Vavuniya	27.6	1.2-3.6	3.8-6.3

Sources: Department of Meteorology, Colombo, 2014

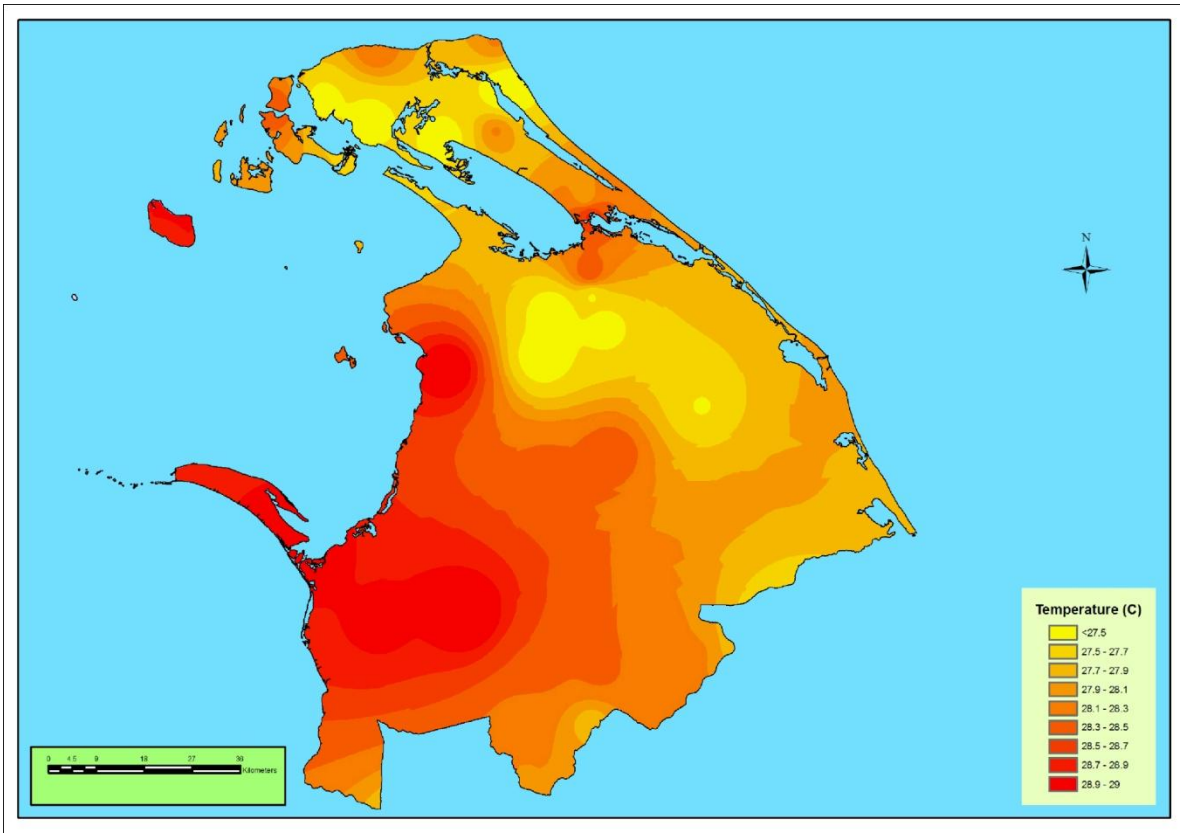

Figure-3
Annual Average Temperature of the Northern Region of Sri Lanka

Spatial Patterns of Temperature in the Northern Region of Sri Lanka: Spatially there are some variations in the temperature of the study area. Compared to other, areas such as Delft, Veravil, Nagapaduvan, Pallavarayankadu, Moondampiddi, Thunukkai, Oddankulam, Mundumurippu, Iluppaikkadavai, Kalliyadi, Aththimoddai, Vidaththalthivu, Periyamadhu, Balampiddi, Andankulam, Mdhu, Iranai iluppaikulam, Periyapandivirichchan, Pandivirichchan, Adampan, Uyilankulam, Mathoddam, Nanaddan, Vankalai, Erukkalampiddi, Thoddaveli, Pesalai, Arippu, Silavaththurai, Kondaichchi, Maruthondikkuda, Marichchukkatti, Musali, Murunkan, Parayanalankulam, Sinnathampanai, Cheddikulam, Iththimurippu, Pappmoddi, Kompansainthakulam, Kurunthavankulam, Vidaththaltheevu, Salampan, Adaikkalamoddai, Thalladi, Kalvilan, Therankandal, Kayts and Anlaitheevu, have a higher annual temperature The reasons for this increase in the amount of annual temperature in these areas include the influence of the Indian subcontinent and the location on the opposite side of the North East Monsoon direction. Some areas such as Uruththiirapuram, Akkarayan, Skandapuaram, Vaddakkachchi, Iranaimadhu, Maniyankulam Kokkuvil, Thirunelveli, areas have a lower amount of annual temperature compared to other areas in the Northern Region due to local factors such as inland water bodies, proximity to

lagoon water and natural vegetation covers Hence, during the high temperature period (SWMS) some areas of Mannar District receive at times a small amount of rainfall during these months consequent to convectional activity. These areas being located near the Indian Ocean receive a rainfall of less than 25 mm. Compared to other districts, Jaffna and Kilinochchi have a rather low temperature due to their geographical locations.

This high temperature in the Northern Province does not have any impacts on a comfortable climate due to its geographical location.

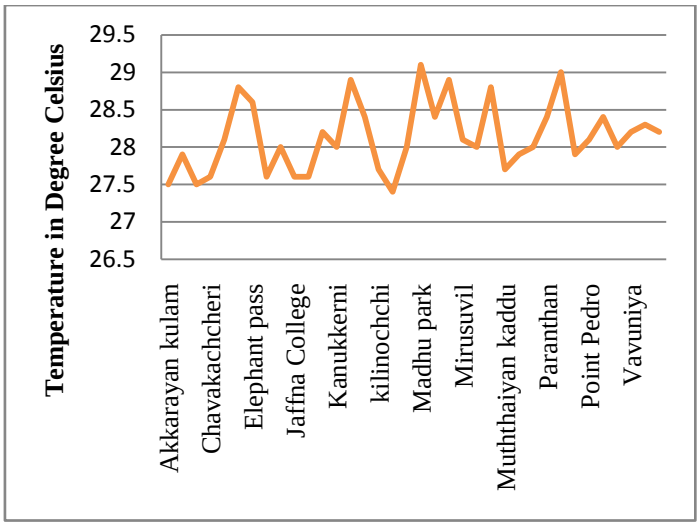

Figure-4
Annual Average Temperature of Selected Places in Northern Province of Sri Lanka

Conclusion

Climate studies are the very important for the future planning and development activities of the Northern Province of Sri Lanka. During the last four decades there were no any studies pertaining to the climate of the Northern Province of Sri Lanka due to the civil conflict. Average temperature of the study area is varying every month and year. Seasonally, during the SWMS the study area received the most amounts of the temperature and during the NEMS, study area received less amount of the temperature. Spatially, Manthai west area is receiving more amount of temperature than other areas and eastern part of the study area is receiving the less amount of temperature. Geographical factors determine the spatial variations of the temperature and the rainfall of the study area. Seasonal variations of the temperature are determined by the temporal weather characteristics and the global climate change in the study area.

References

1. Manawadu L. and Nelum Fernando. (2008). Climate Change in Sri Lanka. *Review Journal of the University of Colombo,* 1(2).

2. Piratheeparajah N. (2010). Increasing Temperature in the Jaffna District of Sri Lanka. Proceeding of the 3rd National Geographic Conference. University of Ruhunu, Matara, 23

3. World Meteorological Organization. (2015). Reports of World Meteorological Organization.

4. Northern Provincial Council. (2014). Reports Data and Statements. Department of Irrigation of Northern Province, Jaffna.

6. Sri Lanka Meteorological Service. (2014). Reports Data and Statements. Department of Meteorology, Colombo.

7. North Eastern Provincial Council. (2014). Statistical Hand Books. Northern Provincial Council. Northern Province, Jaffna.