Research Proposal

Title: Remote Sensing and GIS for Spatiotemporal analysis and the Ecological Modeling of Japanese Encephalitis (JE) Epidemics in India, using Geo-Climatic variables

Duration: 3 years

Objectives:

The present attempt is made for fulfilling the following three objectives for the research study using remote sensing and geographical information Systems (GIS)

1. To study the Spatiotemporal Changes of Japanese Encephalitis (JE) epidemics in India (1956 - 2010)

2. To study the water resource development projects and land use / land cover changes in India (1956 -2010)

3. The ecological modeling of Japanese Encephalitis (JE) epidemics using the Geo-Climatic variables

Introduction:

The first report of Japanese Encephalitis (JE) in India during the year 1956\(^3\) and the first epidemics in many districts of India was occurred during 1976\(^4,5\) and the subsequent outbreaks are asymmetrical in nature and are highly associated with geographical and climatic determinants, the spatial and temporal changes of JE epidemics in the country from 1956 to 2010\(^1,9, 12,13, 17-28,30\) are spatially determined by
the geo-climatic variables.\textsuperscript{10,11,14-16,18,29,31-33} These variables are important determinants JE transmission and which are directly responsible for the spatial and temporal aspects of JE epidemics in the country from 1956 to 2010.\textsuperscript{1-9,12,13,17-28,30} Remote sensing and GIS are replacing the conventional methods of investigation of lack of information on the causes of JE epidemics in the country and are assisting to capable of identifying these changes, the image classification of satellite imagery is able to define and predict the areas with low and high transmission of JE at a particular time periods. Thus, the potential use of remote sensing and GIS are highly appreciated and are used for mapping, monitoring and evaluating the geo-climatic risk factors associated with JE epidemics.\textsuperscript{10,11,23,29,31-33} The findings of this research study are useful for further investigation and research follow-up for JE epidemic control and management.

**Remote Sensing and Geographic information system (GIS):**

The readily available images are easy accessible, reliable, low cost, accurate and precise, real time and repetitive coverage, which are not available in used form immediately for programmers.\textsuperscript{10,11,18,23,29,31-33} The most appropriate facility for achieving this is perhaps a geographic information system (GIS), which is able to read, process, analyze, and present spatially-related data for effective interpretation and use for a variety of environmental and resource management purposes.\textsuperscript{10,11,18,23,29,31-33} Therefore, the present attempt is made for the appreciation and utilization of GIS software for the spatial and temporal analysis for ecological modeling of JE transmission,\textsuperscript{10,11,23,29,31-33} in which the remote sensing and GIS engineers / specialists produce the layers of information in such a way so as to be able to produce easy decision-making for JE transmission control.

**Review of literatures:**

There have been many research studies carried out on the application of remote sensing and GIS for mapping, climatic modeling, and the geostatistical modeling for Vector borne disease transmissions for the past 25 years.\textsuperscript{10,11,14-16,18,29,31-33} A detailed review of literatures of the past research works is studied for doing the present attempt
for mapping, spatial and temporal analysis and the ecological modeling of JE epidemics in India from 1956 to 2010. 1-9, 12,13, 17-28,30

Database and Data analysis:

The layers of thematic information on geo-climatic variables (mean annual temperature, mean annual rainfall, relative humidity, Saturation deficiency, and land use / land cover information) 10,11,14-16,,18,28,29,31-33 and the epidemiological data on Japanese Encephalitis (JE) epidemics, 10,11,18,23,29,31-33 vegetation cover information are to be collected for the research studies. The geo-climatic variables data and the epidemiological data are to be integrated in to the GIS platform for mapping and spatiotemporal analysis of JE epidemics and finding the spatial reasoning for the JE outbreaks from 1956 to 2010.

Research Methods:

Mapping of Japanese Encephalitis (JE) epidemics from 1956 to 2010 and the geostatistical analysis are to be carried out for ecological modeling for finding the spatial autocorrelations of the geo-climatic variables and the Japanese Encephalitis (JE) epidemics in India for the past 57 years, 1-9, 12,13, 17-28,30 and also the appreciation of remote sensing and GIS technology in the spatiotemporal changes and the ecological modeling of Japanese Encephalitis epidemics, using geo-climatic variables.

Expected Results and outcomes:

The geospatial analysis of spatial agreements between the geo-climatic variables and the JE epidemics, and the spatial autocorrelations among the geo-climatic variables and JE epidemics are to be examined and added value of ranking are to be assigned for list of determinants based on the contribution of the variables, thus, a suitable ecological modeling to be developed for spatial reasoning and predicting JE epidemic in India.

References:


18. M.Palaniyandi, The Impact of National River Water Projects on Regional Climatic Changes and Vector Borne Disease Outbreaks in India", Paper presented at the
National Conference on Climate Change and its Impact on Water Resources in India, Dec. 15-17, 2004, School of Earth and Atmospheric Sciences, Madurai Kamaraj University, Madurai – 21, Tamil Nadu, India


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