Application of RS & GIS in Risk area assessment for mosquito borne diseases- A case study in a part of   Gwalior City (M.P.)

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Abstract

With the increase of mosquito borne diseases in the recent past , there is an ever increasing demand on source available for the control program, so wise and prudent management of the resource is becoming increasingly important. Application of Remote Sensing & GIS may help the decision makers to take decision about control program for mosquito borne diseases like malaria, dengue, and elephantiasis at right place and in right direction. It became easier by identifying risk area identification. It also provides the architecture and analysis tool to perform spatio-temporal modeling of climate, environment, disease transmission, and other factors relevant to understanding the impacts and risks associated with vector borne disease (VBD). Main aim of the study is to identify risk area in study area. The study area selected is a small part of Gwalior city (M.P.) and lies between 26°13′N 78°11′E to 26.22°N 78.18°E coordinates. It has an average elevation of 197 meters (646 feet). In this study different sites are recognized as mosquito breeding sites and the location of the sites were taken by using GPS instrument. The Built up area is extracted from satellite image using classification techniques after that by using GIS analysis the risk area affected by those mosquito breeding sites is identified.

Introduction

The threats to human health from vector borne diseases especially mosquito borne diseases like malaria, dengue, elephantiasis etc. continue to be a global problem**.** It is estimated that disease like malaria causes about 247 million cases among 3.3 billion people at risk in the World during 2006. Many factors like changes in land-use pattern, settlement patterns, ongoing urban development activities, indiscriminate use of insecticides, drug resistance of malarial parasites, rise in temperature, population movements and degree of deforestation are resulting in increase of malaria and the disease control is becoming difficult. Several factors, such as seasonality, proximity to breeding grounds, vector density, biting rates, and proportion of infectious mosquitoes, contribute to the spread of mosquito-borne diseases. GIS owing to its inherent ability to manage both spatial and non spatial information, provides an excellent framework for disease management. It can integrate data from any source whether it is RS or aerial photographs, survey data or published records. It can then overlays a series of maps, integrate and analyze the data. The approach in developing remote sensing applications in epidemiology depends on the spectral, spatial, and temporal characteristics of remote sensing measurements. A combination of high spatial resolution data for land use and land cover classification and frequent coarse resolution environmental satellite data for monitoring environmental variability would be ideal for studying surface climate conditions for modeling vector populations. A GIS based decision support system (DSS) with a remote sensing component , could significantly improve the management of vector borne disease events by providing : i) an improved prediction capability based on climate and environment models; ii) improved remediation measures through efficient allocation of resources; iii) improved methods of prevention by providing a capability to perform scenario evaluation.

Study Area:

A small part of the Gwalior city is selected for the study and is lies between 26°13′N 78°11′E to 26.22°N 78.18°E. It has an average elevation of 197 meters (646 feet). The area covers in topographic sheet no. of Gwalior is 54j/4. Gwalior is a historical Indian city - is located on the periphery of Madhya Pradesh State, 321 Kms (199.5 Miles) from Delhi and 121 Kms (76 Miles) from Agra.
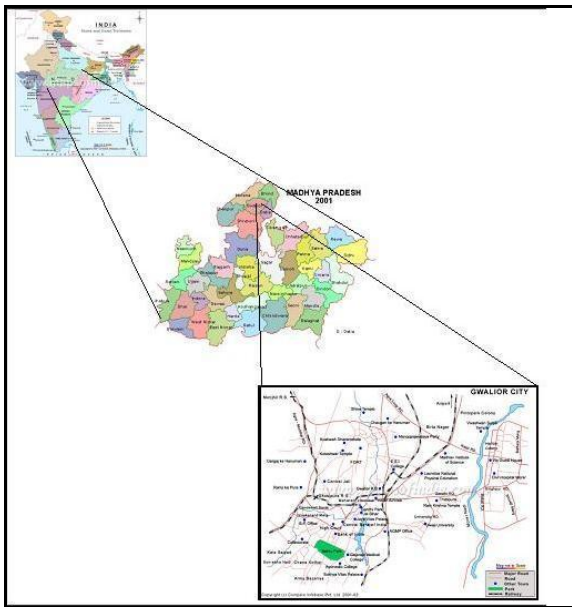

Figure 1: Location Map of Gwalior

Material and Methods:

IRS-Satellite images, topographic sheet of the area, GPS instrument, multiparameter analyzer, hardware and software's are used in study. In the present study, the landscape features of the study area were identified using remote sensing data for future identification of high risk areas with the help of distribution data for vector mosquito.   Different sites are recognized as mosquito breeding sites and the location of the sites were taken by using GPS instrument. The study sites are randomly selected in study area. The sites are those water bodies where larval density is present. The sites are expressed as G1 to G22. GIS models are prepared to show mosquito population dynamics. Satellite image classification is done for built-up area extraction. After that buffer of the study sites is created on the basis of flying limit of mosquito from the breeding habitat, finally overlay analysis of built-up area and study area buffer is done for risk area identification.
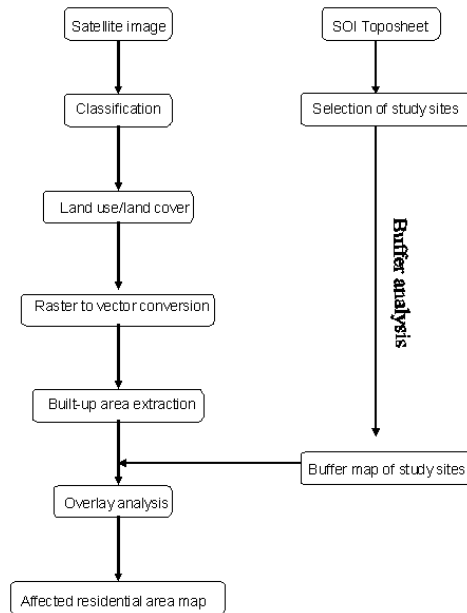

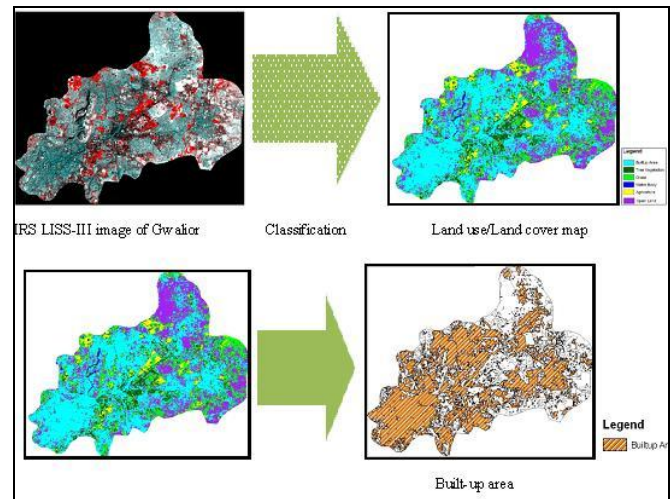**Figure 2: Methodology for mapping of affected area**

Figure 3: Built up area Extraction

Figure 4: Buffering and overlay analysis

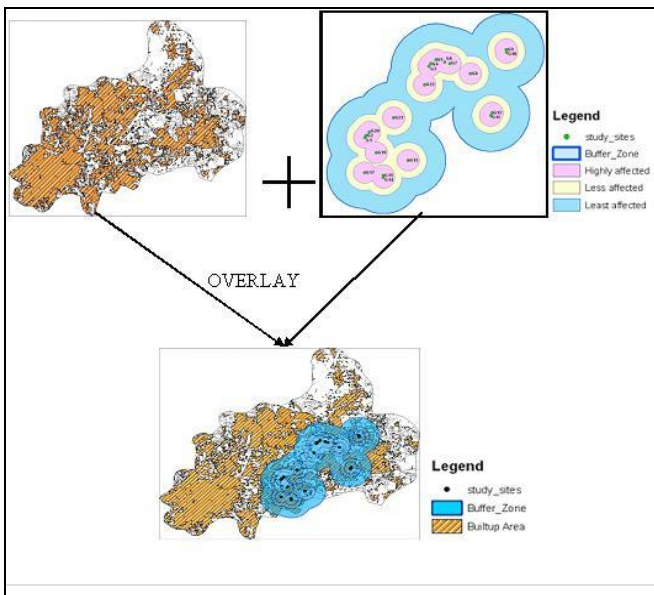**Figure 5: Risk area identification**

Conclusion:

GIS and Remote sensing are increasingly used for the study of spatial and temporal patterns of vector borne diseases. The study carried out in central region of Gwalior reveals that RS and GIS techniques are proved to be a significant in larval habitat identification and risk area mapping. The risk area identification map indicates affected built up area which varies for different sites. Red color in map show highly affected as these areas are nearest to mosquito breeding habitat as well as the green color show less affected and least affected area on the basis of distance from mosquito breeding habitat. Raksha vihar and some portion of city center are affected by sites G1 and G2. Study site G3 show the presence of *Anopheles* mosquitoes and responsible for malarial infection in slum people of mela ground. As in Mela ground and surrounding area the population density is low, so site G4,G5,G6, and G7 do not affect or influence a significant residential area. The mosquitoes of site G9 and G10 are responsible for vector borne disease in Morar and residential area around square no.7. Site number G14,G15, and G17 affect Mehalgaon highly while the site G19 and G20 are responsible for disease in City Center.
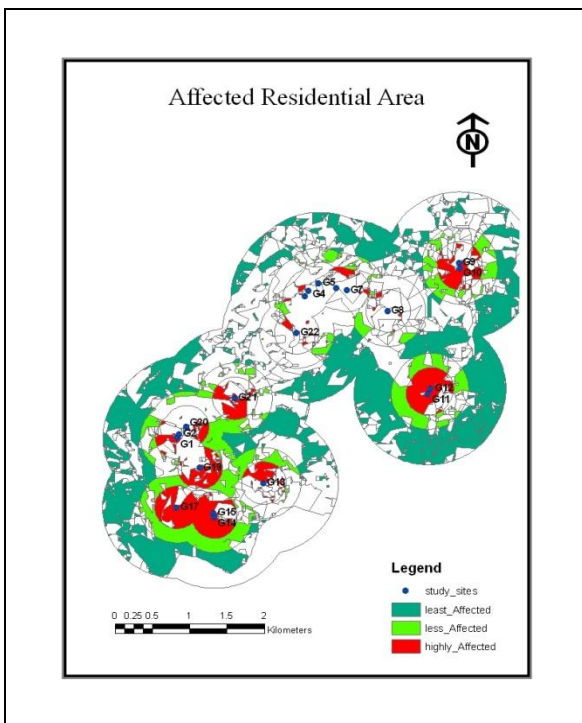
Acknowledgement

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