STUDY OF VARIATION OF AEROSOL OPTICAL DEPTH OVER ALWAR DISTRICT USING MODIS DATA

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Abstract:
The present study shows the analysis of variation of Aerosol Optical Density over Alwar District using GIS techniques. Air quality can be monitored by studying the aerosol content in the atmosphere determined by satellite measurements of aerosols called as Aerosol Optical Thickness (AOD). AOD is a measure by which how much light aerosols prevent from travelling through the atmosphere. Different studies show that Indian sub-continent has been one of the major hotspot of aerosols. Air quality is continued to be decreasing with the rising levels of air pollution mostly in the industrial areas. In District Alwar there have been the rise in industrial development in the past decade and the monitoring and management of air quality is essential in the study area.

The Moderate Resolution Imaging Spectroradiometer (MODIS) monthly data for the year 2014 (January-December) is used for this study. The study of spatial distribution pattern of aerosols and its analysis is carried out in ArcGIS 10.3.1.

Keywords: - Aerosol Optical Density (AOD), Moderate Resolution Imaging Spectroradiometer (MODIS), Alwar District and ArcGIS.

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Introduction

Human being is rapidly changing the aerosol environment by doing the change in land cover, burning of fossil fuel in large extent and the introduction of harmful gasses in the atmosphere. Industries have the major impact on the air quality of an area. With the rising levels of air pollution, it is very important to develop methodologies to manage air quality and to reduce the air pollution impact. Air quality can be determined by studying the aerosol load in the atmosphere in an area. Aerosol Optical Density is used to measure the aerosol load in the atmosphere. Aerosols affect the climate of earth both directly (by absorption and scattering) and indirectly (by altering the cloud properties). Aerosol optical density of less than 0.1 indicates the clear sky where visibility is maximum and the value of 1 indicates the maximum presence of aerosols in the atmosphere and thus reduces the visibility in environment.

The main objective of this study is to assess the temporal variation of Aerosol Optical Depth over Alwar District in Rajasthan. In the past decade there has been the rapid increase in industrialization in Alwar District. The Alwar District has various industrial estates such as Alwar, Bhiwadi, Shahjahanpur, Neemrana, Behror, Kherli, Rajgarh, Khairthal, Thanagazi, Khusghera, Tapukra, Ghilot, Keharani, Rampur Mundana, etc. where companies such as G. S. Pharmbutor, Ashok Leyland, Pepsi, Parryware, Kajaria Ceramics and Honda Motors have manufacturing plants. The Rajasthan State Industrial Development and Investment Corporation Ltd. (RIICO) has played an important role in the overall industrial development in Rajasthan.

Study Area

The Alwar District is situated in the north-east of Rajasthan between 27°4’ and 28°4’ north Latitudes and 76°7’ and 77°13’ east Longitude. Its greatest length from south to north is about 137 K.M. and greatest breadth from east to west about 110 K.M. It is bounded on the north and north-east by Gurgaon (of Haryana) and Bharatpur district and on the north-west by Mahendragarh district of Haryana, on the south-west by Jaipur and on the south by Sawai- Madhopur and Jaipur districts. The Study area map (Fig: 1) is shown below:

![Study Area Map](image-url)
Data Used:
MODIS is the key instrument aboard the Terra and Aqua satellites. Terra MODIS and Aqua MODIS are viewing the entire Earth's surface every 1 to 2 days, acquiring data in 36 spectral bands at three spatial resolutions i.e. 250 meters, 500 meters and 1000 meters. MODIS aerosol monthly data having swath dimensions 2330 km (across track) by 10 km (along track at nadir) is acquired for all the months of year 2014 (January-December).

Methodology: - Modis Aerosol Data is acquired for the Year 2014 (From January-December) and the study area have been extracted by using clip tool in ArcGIS. Each resultant dataset has been converted to points by using raster to point tool in ArcGIS. Those points further used as an input for interpolation to derive continuous surface for AOD. This continuous surface leads to determine the variations in AOD for each month of year 2014. Finally, the AOD maps were created and the spatial distribution pattern of AOD is analysed.

Results and Discussions: - The Aerosol Optical Density maps are created for each month of year 2014 and are shown below. The maps gives the spatial distribution pattern of AOD over Alwar District with the value ranges between 0.1 to 1 with the corresponding color ranges from blue to red. The value 0.1 (blue color) shows the minimum AOD concentration and the value 1 (red color) shows the maximum AOD concentration in the study area. Further the graph is plotted which shows the maxima and minima AOD temporal variations for each month of year 2014.
Figure 15 shows that the highest AOD concentration is observed in the months of April and August and from August to December there is decreasing trend in maximum AOD concentration while the lowest AOD concentration is observed in the months from January to April and further there is an increasing trend from May to December in minimum AOD concentration for the year 2014.
Conclusion
The study shows the temporal variation of AOD over Alwar District for each month of the year 2014 (January-December). The aerosol concentration level is studied for entire year and maxima and minima value for AOD is observed with the analysis of monthly variations from January to December. In Alwar District, there has been increase in the industrialization and urbanization, effective strategies should be developed to manage the air quality of the study area.

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References

6. T. Kiran Kumar, Harish Gadhavi, A. Jayaraman, M.N. Sai Suman, S. Vijaya Bhaskara Rao. Temporal and Spatial Variability of Aerosol Optical Depth over South India as Inferred from MODIS.