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Geographical Study and Identification of Desertified Patches in Chamarajanagar District

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Abstract

The study of drought conditions is very important for regional development, especially in backward areas. Chamarajanagara district is one of the economically and socially backward districts in Karnataka. The geographical environment of this district shows that many parts are affected by drought and dry conditions. The main aim of this study is to identify the dry patches in different parts of the district and to understand where drought and desertification are more severe. For this purpose, the study uses available data such as rainfall, land use, and other geographical information. The study helps to find out which areas are most affected by drought. This will be useful for planning and development. After identifying these dry areas, further studies can be conducted to suggest suitable solutions and alternative methods to reduce the impact of drought. Thus, the identification of dry patches is very important for proper planning and sustainable development in the district.

Keywords: Drought, Dry patches, Desertification, Chamarajanagara, Development

Introduction

Chamarajanagara district is one of the important districts in the southern part of Karnataka. It covers a large geographical area and has a diverse physical environment. The district includes hills, plateaus, and forest regions, which support rich biodiversity. It also has cultural diversity and several tourist places that attract visitors. Agriculture is the main occupation of the people in this district. Most of the population depends on farming for their livelihood. However, in recent years, agricultural activities have been declining. This has led to economic difficulties and increasing migration of people to other areas in search of better opportunities. One of the major reasons for this problem is the changing condition of land and climate. Many parts of the district are affected by drought and desertification. The agricultural land is losing its fertility, and water scarcity is becoming a serious issue. In this context, it is very important to study the geographical conditions of the district and identify the areas that are most affected by drought and desertification. Such a study will help in understanding the problem clearly and support proper planning and development. It will also help in suggesting suitable measures to improve agriculture and reduce migration in the district.

Objectives of the study

1. To study the geographical conditions of Chamarajanagara district.

Review of literature

Many researchers have studied drought and desertification in different parts of India and the world. These studies help to understand the causes, effects, and solutions to these problems. According to United Nations Environment Programme, desertification is a major environmental issue in dry and semi-arid regions. It mainly happens due to climate change and human activities like deforestation and overuse of land. Indian Space Research Organisation has conducted several studies using remote sensing and GIS techniques to identify drought-prone and desertified areas in India. Their reports show that many parts of Karnataka are affected by land degradation and water scarcity. Studies by National Remote Sensing Centre highlight the importance of satellite data in mapping dry areas and monitoring changes in land use over time. These studies help in identifying vulnerable

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regions more accurately. Research in Karnataka shows that districts with low rainfall and poor soil conditions are more affected by drought. Several researchers have pointed out that improper land use, population pressure, and lack of water management are major causes of desertification. Although many studies have been conducted at national and state levels, there are limited detailed studies focusing specifically on Chamarajanagara district. Therefore, this study is important to identify dry patches at the district level and to understand the local conditions more clearly.

Methodology

This study aims to identify drought-prone and dry patch areas in Chamarajanagara district by using geospatial techniques and available data sources.

The study is mainly based on secondary data. Digital Elevation Model (DEM) data were collected from USGS Earth Explorer. Rainfall and temperature data were obtained from India Meteorological Department. These datasets help in understanding the terrain and climatic conditions of the study area.

All the collected data were processed and analyzed using ArcGIS. Based on this, different thematic maps were prepared, such as DEM, drainage network, drainage density,

drainage frequency, rainfall distribution, temperature distribution, NDVI (vegetation index), geological lineament, and land use and land cover maps.

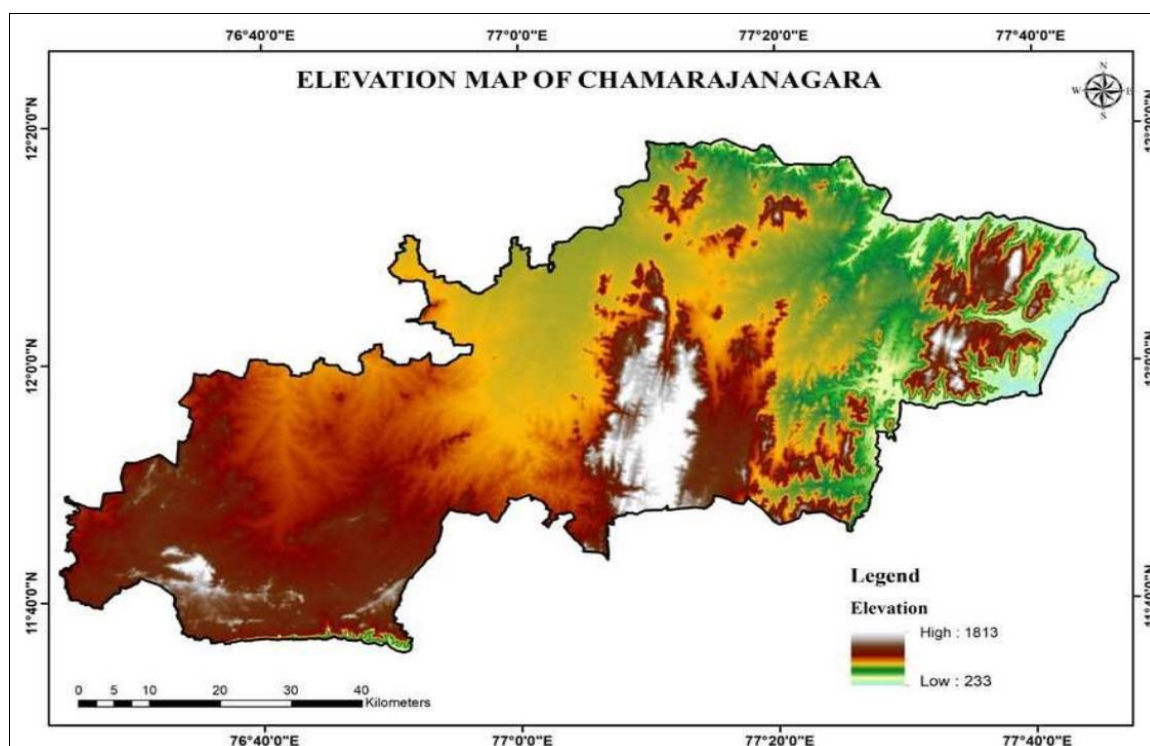
Each of these maps provides important information about factors affecting drought conditions, such as slope, water availability, vegetation cover, and land use patterns. These layers were carefully analyzed to understand the spatial variation within the district.

Finally, the weighted overlay method was applied in GIS by assigning suitable weights to each thematic layer based on its importance. All layers were combined to produce a final map showing drought-prone and dry patch areas in the district.

This method helps in clearly identifying the most vulnerable areas and provides a scientific base for planning and management.

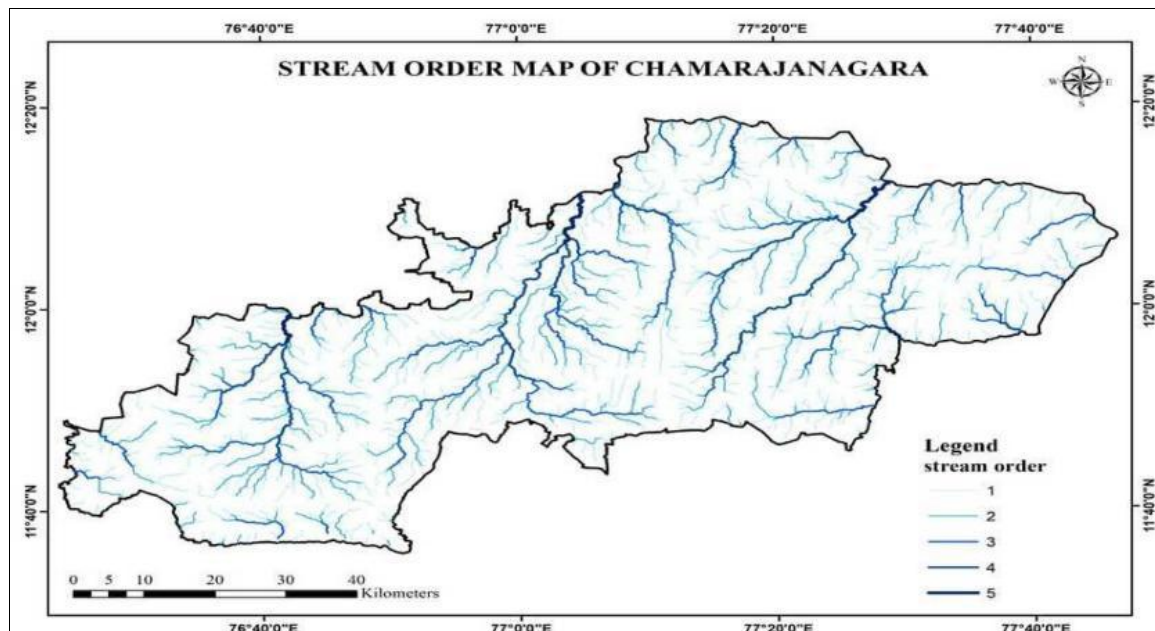
Analysis

To identify the desertified regions in Chamarajanagara district, the first step of the study was the preparation of a Digital Elevation Model (DEM). The DEM helps in understanding the elevation, slope, and terrain characteristics of the area, which are important factors influencing soil erosion, water flow, and land degradation.



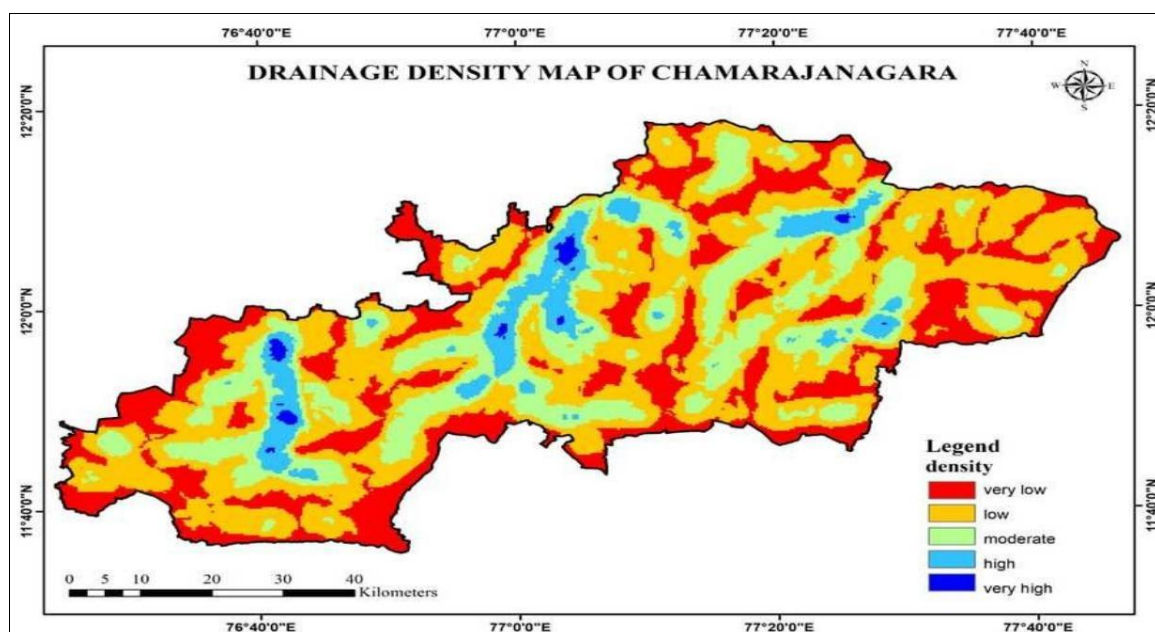
The Digital Elevation Model (DEM) of Chamarajanagara district shows that the elevation ranges from 174 m to 1815 m above sea level. Low elevation areas are mainly found in the eastern and north-eastern parts, while moderate elevation covers the central region. Higher and highest

elevations are located in the western and southern parts, especially in the Biligirirangana Hills and Gopalaswamy Hills. This variation in elevation influences the climate, water flow, and land conditions of the district.

Drainage Network:

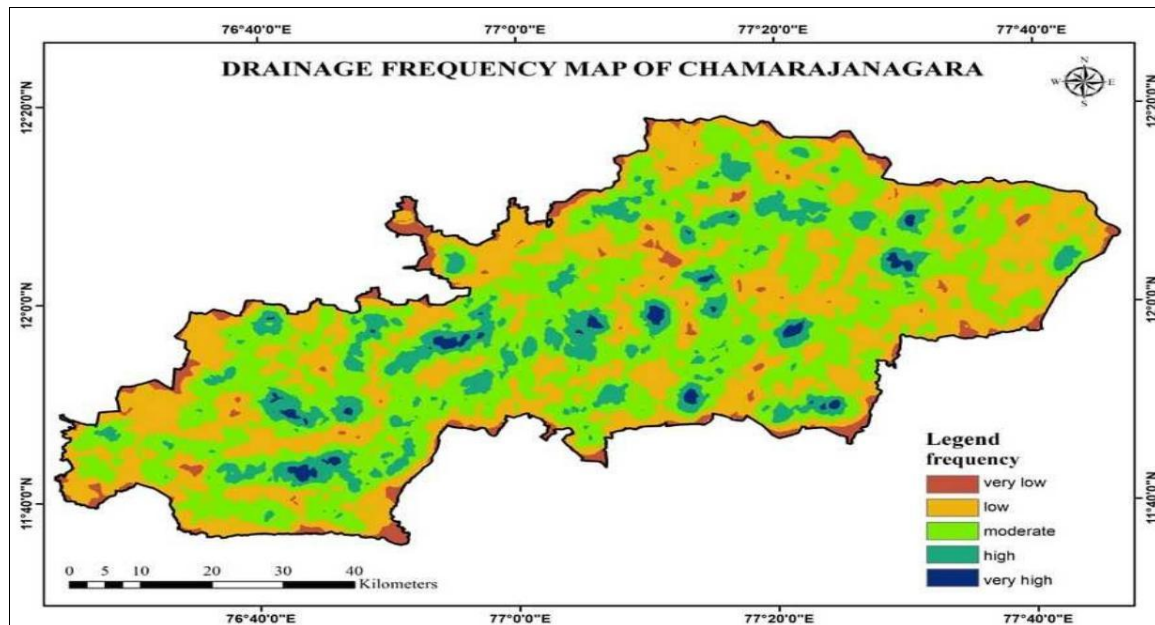
The stream order map of Chamarajanagara district is prepared using the Strahler stream ordering method and shows streams from first to fifth order. First-order streams are the most numerous and are spread throughout the

district. These small streams are mainly seasonal and depend on local rainfall, indicating limited and irregular water availability.



The map classifies drainage density into five categories: Very low, low, moderate, high, and very high. Areas with very low and low drainage density are widely distributed across the district, especially in the central, southern, and eastern parts. These regions are characterized by poorly developed drainage networks, which indicate high

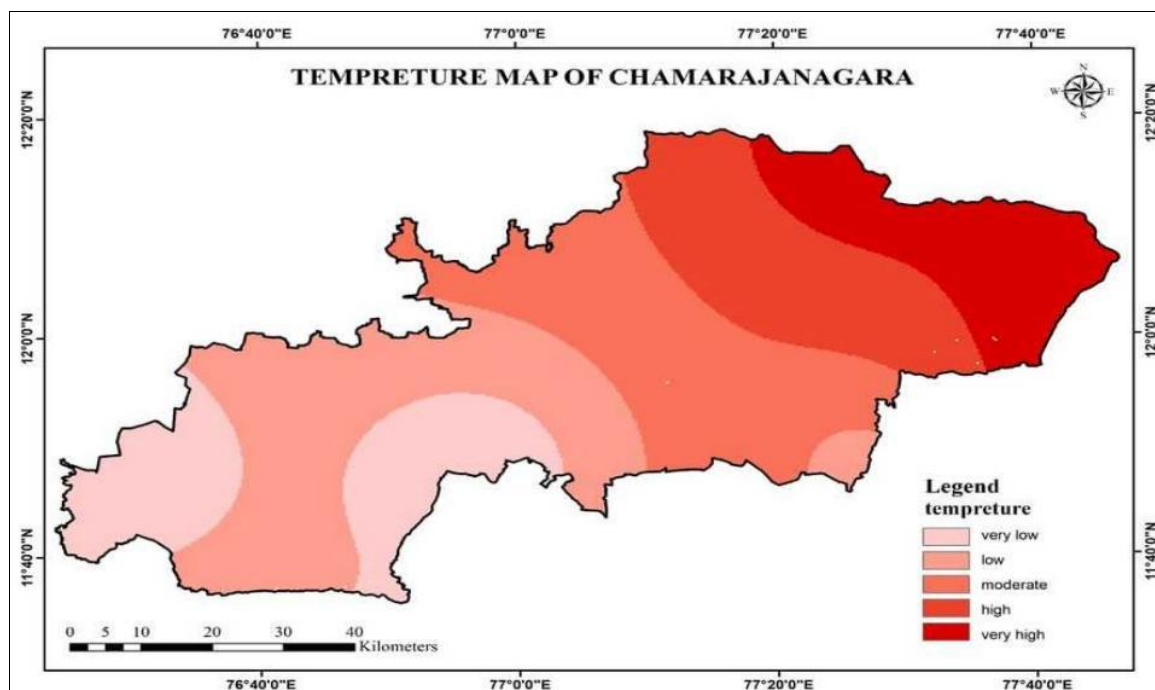
infiltration, low surface runoff, and limited surface water availability. In semi-arid climatic conditions like Chamarajanagara, such areas often experience soil moisture stress and groundwater depletion, making them highly vulnerable to desertification.



Drainage frequency represents the number of stream segments per unit area. Higher drainage frequency reflects intense dissection of land and quicker removal of surface water, leading to reduced soil moisture. Areas with high drainage frequency are therefore more susceptible to dryness and land degradation. The map is classified into five categories, namely very low, low, moderate, high, and very

high drainage frequency. Very low and low drainage frequency zones are widely distributed along the peripheral and interior parts of the district. The moderate drainage frequency zones cover a large portion of the central part of the district. The high and very high drainage frequency zones are confined to small, scattered pockets mainly in the central and south-western parts of the district.

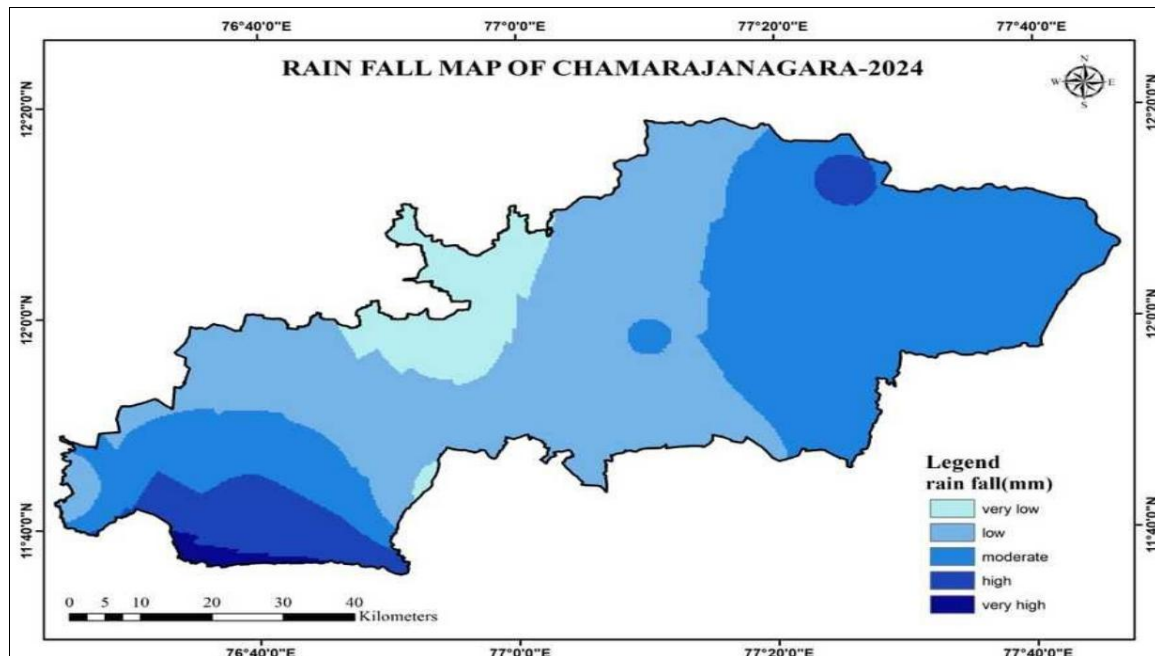
Temperature:



The temperature map of Chamarajanagara district clearly shows spatial variation in surface temperature, which is an important indicator for identifying desertified and drought-prone areas. The district is classified into five temperature zones, namely very low, low, moderate, high, and very high temperature regions.

The very high temperature zone is mainly observed in the

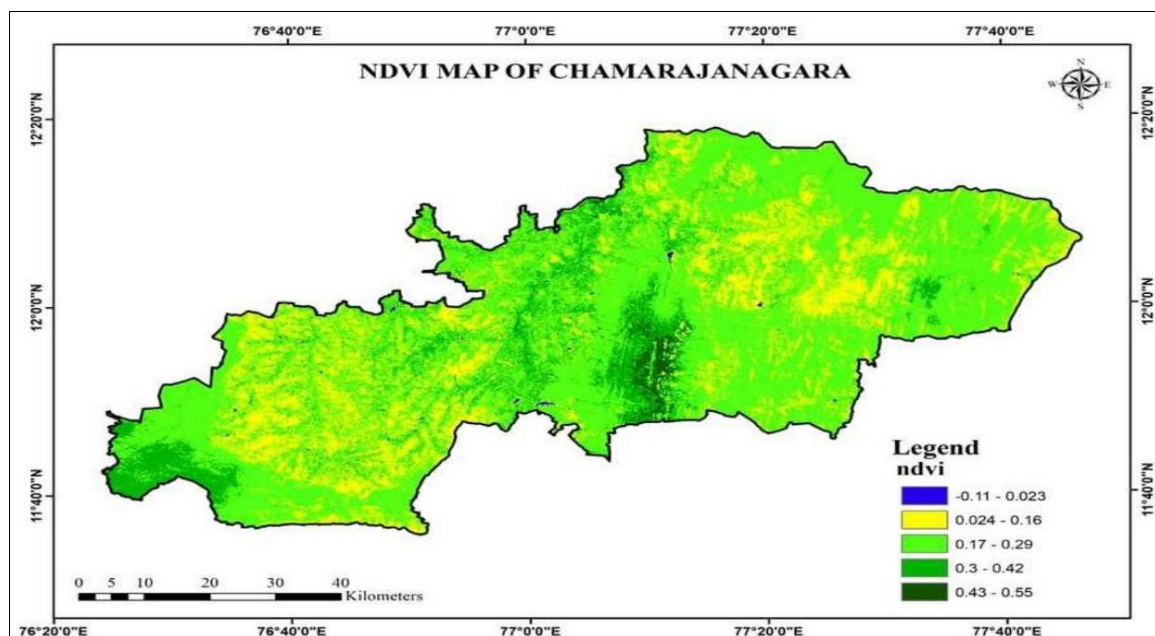
eastern and north-eastern parts of the district. The high temperature zones surround the very high temperature areas and extend towards the central parts of the district. The moderate temperature zone occupies a large portion of the central and western parts of the district. The low and very low temperature zones are mainly concentrated in the south-western and some interior parts of the district.



Rainfall is the primary source of water availability in the study area. Low and irregular rainfall directly leads to water scarcity, reduced groundwater recharge, and agricultural stress. Spatial variation in rainfall plays a critical role in distinguishing relatively moist zones from severely dry pockets.

The very low rainfall zones are mainly observed in the central and northern parts of the district. These areas receive

insufficient rainfall to support sustainable agriculture and groundwater recharge. The low rainfall regions surround the very low rainfall zones and cover a considerable part of the district. The moderate rainfall zones are distributed mainly in the southern and eastern parts of the district. The high and very high rainfall zones are confined mainly to the western and south-western parts of Chamarajanagara district, especially near the Biligirirangana Hills.



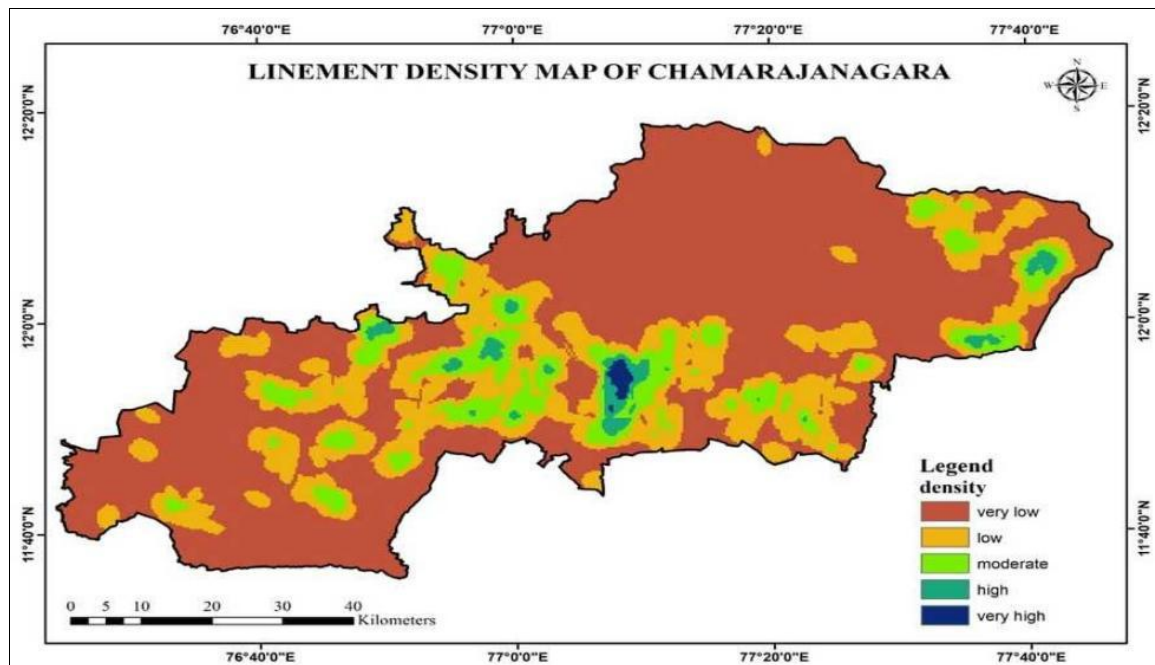
The Normalized Difference Vegetation Index (NDVI) is a standard satellite-derived metric used to quantify the "greenness" of a landscape. It operates on the principle that healthy vegetation absorbs most visible red light for photosynthesis and reflects a high proportion of Near-Infrared (NIR) light.

The Forested Uplands (High NDVI): Areas like Bandipur, Biligiri Ranganatha Temple (BRT) Hills, and Male

Mahadeshwara Hills (MM Hills) show high positive values (0.5+). These are ecological strongholds and are generally safe from desertification unless affected by severe deforestation.

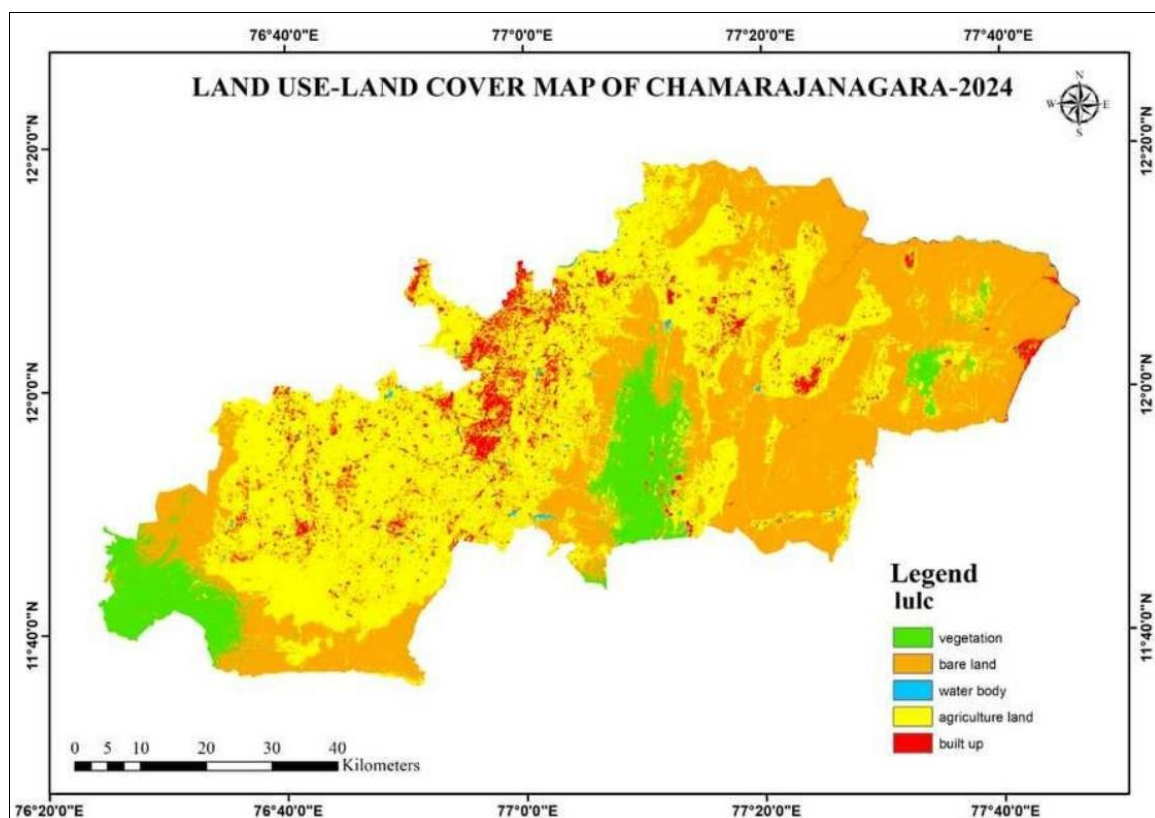
The Semi-Arid Lowlands (Low NDVI): The plains of Gundlupet and parts of Kollegala and Hanooru are vulnerable. If the map shows significant patches in the 0.05 to 0.15 range, these are "desertification hotspots."

Geological Lineaments:



The map is classified into five categories, namely very low, low, moderate, high, and very high lineament density. A large part of the district is covered by very low to low lineament density zones, especially in the western, south-western, and northern parts. The moderate lineament density

zones are distributed mainly in the central parts of the district. The high and very high lineament density zones are confined to small, scattered pockets, mainly in the central-eastern and eastern parts of the district.



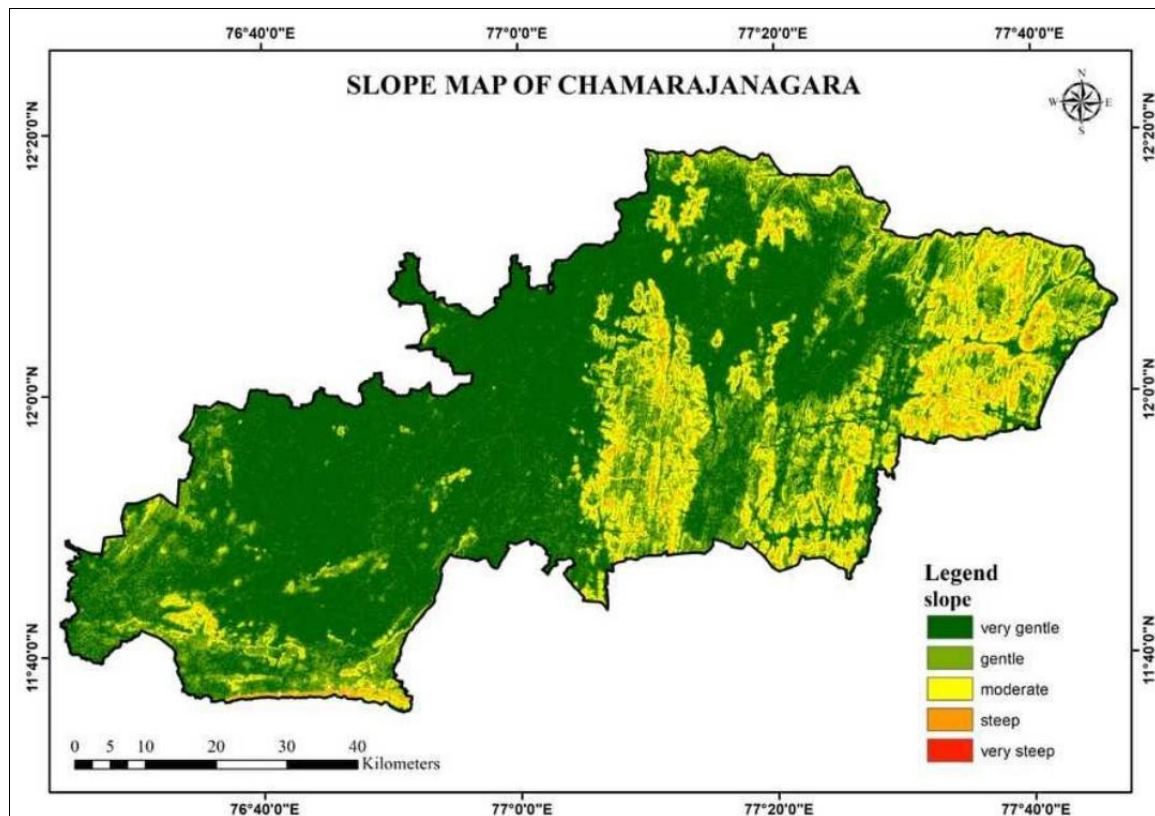
The Land Use and Land Cover (LULC) map of Chamarajanagara district illustrates the spatial distribution of major land cover classes such as vegetation, agricultural land, bare land, water bodies, and built-up areas. LULC is a crucial indicator for identifying desertified areas, as changes in land cover directly influence soil moisture, vegetation

health, and land degradation processes.

The map shows that agricultural land occupies a large portion of the district, particularly in the central and western regions. Bare land is widely distributed across the eastern, northeastern, and southern parts of the district. Vegetation cover is mainly concentrated in the southwestern and central

forested tracts of the district. Water bodies are limited in spatial extent and are unevenly distributed across the district. Built-up areas are sparsely distributed but show concentration around major towns and transport corridors.

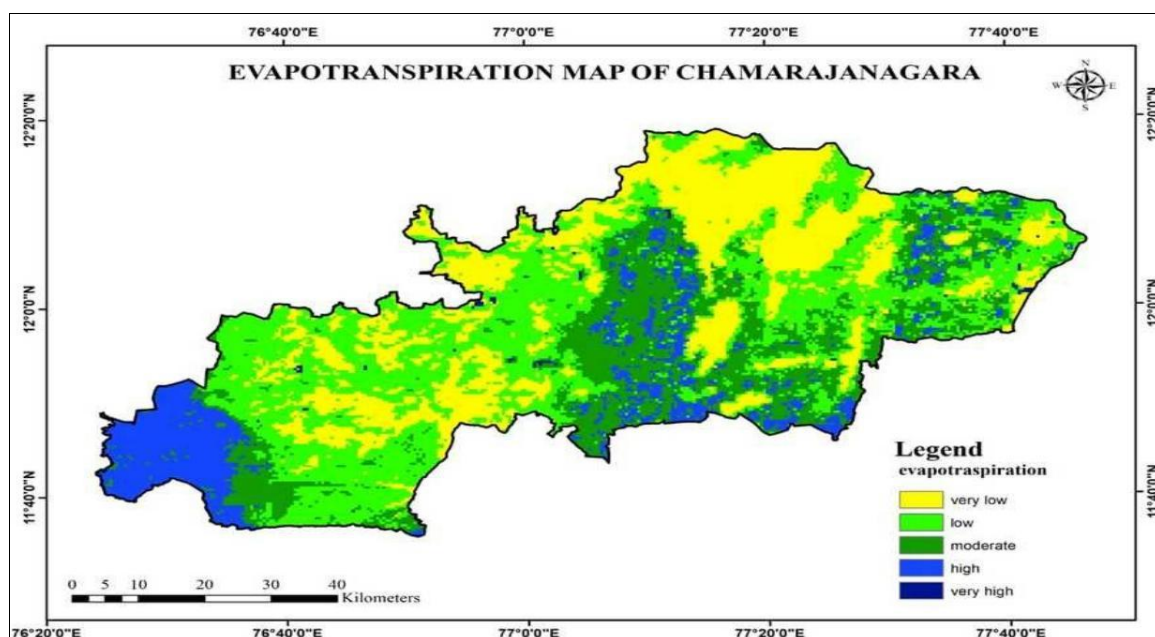
Expansion of built-up land often leads to loss of agricultural and vegetated areas, increased surface runoff, and localized land degradation.



The slope map of Chamarajanagara district shows the variation in slope conditions ranging from very gentle to very steep. A large part of the district is dominated by very gentle and gentle slopes, especially in the central and

western regions. These areas represent plain and plateau surfaces, which are suitable for agriculture but are vulnerable to water stagnation, poor runoff, and moisture stress under low rainfall conditions.

Evapotranspiration



The map is categorized into five classes, namely very low, low, moderate, high, and very high evapotranspiration. The very high evapotranspiration zones are mainly observed in

parts of the central and eastern regions of the district. The high evapotranspiration zones are distributed in the south-western and central-southern parts of the district. The

moderate evapotranspiration zones occupy a considerable portion of the district, particularly in the central belt. The low and very low evapotranspiration zones are mainly found in limited pockets of the western and north-western parts of the district.

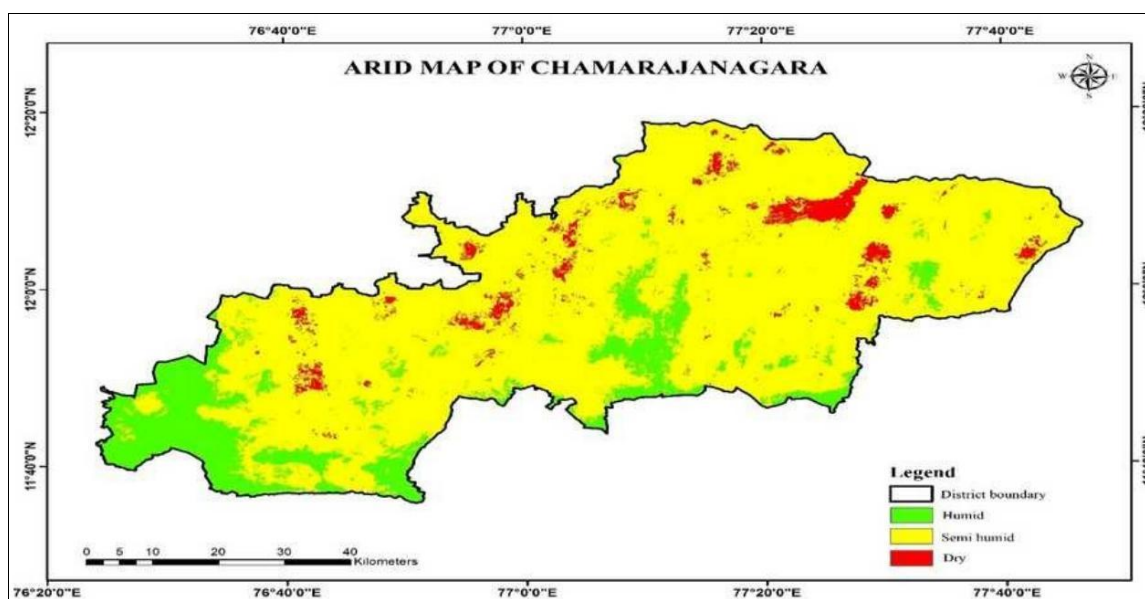
Weighted Overlay Analysis

SL.NO	Key Indicators	Ranking	Weightage
1	Digital Elevation Model (DEM)		5
2	Evapotranspiration		20
3	Drainage Density Map		7
4	Drainage Frequency Map		7
5	Temperature Distribution Map		20
6	Rainfall Distribution Map		20
7	Normalized Difference Vegetation Index (NDVI)		7
8	Geological Lineament Map		3
9	Land Use and Land Cover (LULC) Map		5
10	Slope		6
	Total		100

The arid map of Chamarajanagara district was generated using a weighted overlay analysis in ArcGIS by integrating multiple geo-environmental indicators that influence aridity and desertification. Each indicator was assigned a specific weight based on its relative importance in controlling moisture availability, surface conditions, and land degradation processes. Higher weights were given to dominant climatic factors such as temperature (20%), rainfall (20%), and evapotranspiration (20%), as these directly control water balance and dryness conditions. Moderate weights were assigned to slope (6%), drainage density (7%), drainage frequency (7%), and NDVI (7%), which influence runoff, vegetation cover, and surface moisture retention. Lower weights were given to DEM (5%), LULC (5%), and geological lineaments (3%), as these act as supporting factors in desertification processes.

Result and Discussion

After conducting a detailed analysis by preparing various thematic maps and applying overlay techniques, a final map was generated to clearly identify the drought-prone and dry patch areas in the study area.



The aridity map prepared for Chamarajanagara district shows clear variation in moisture conditions across the district. Most of the area falls under semi-humid and humid categories, which are mainly found in the central and western parts. These regions have relatively better environmental conditions compared to other areas.

However, some parts of the district are affected by dry conditions. The eastern region shows a higher concentration of dry patches. Among all the taluks, Hanur taluk has the maximum number of dry patches. This is followed by Gundlupete taluk and Chamarajanagara taluk, where dry conditions are also clearly observed.

Overall, the results indicate that drought conditions are more severe in the eastern part of the district, while the central and western parts are relatively less affected.

According to Dr. Umakanth R., deforestation has been one of the major factors contributing to land degradation and desertification in Chamarajanagara district. His study, which used geospatial tools to analyse land-use changes, revealed that about 48 percent of the district's geographical area is covered by forests, while around 33 percent is under

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Historically, the district had approximately 3,370 sq. km of forest area in 1930, accounting for nearly 60 percent of its total geographical area. However, after independence, the expansion of agricultural activities led to continuous deforestation. Between 1930 and 1970, about 8 percent of the forest cover was lost, and the reduction continued until 2010. Overall, nearly 19 percent of the forest area disappeared during the period from 1930 to 2010.

The study identified several causes of deforestation, including encroachment of forest land for agriculture, livestock grazing and overgrazing, rehabilitation settlements

for Tibetan refugees, and frequent forest fires. The loss of forest cover has reduced vegetation density, increased soil erosion, lowered soil moisture retention, and disturbed the ecological balance of the region. These environmental changes have accelerated land degradation and have played a significant role in the desertification process in many parts of Chamarajanagara district.

Conclusion:

The present study clearly shows that drought and desertification are serious problems in Chamarajanagara district. Although some parts of the district have semi-humid and humid conditions, many areas, especially in the eastern region, are highly affected by dry conditions. Several villages such as Bandahalli village, Goreyur village, Arapakere village, Bhadrenahalli village, Martahalli village, Sri Mahadeshwara Hills, Chikkyluru village, Kelasuru village, Beguru village, Ummatthuru village, and Devarahalli village are facing severe drought and land degradation. These conditions have created many problems for the people, especially in agriculture and water availability. As a result, livelihoods are affected and migration is increasing. Therefore, it is very important to take proper steps to reduce the impact of drought. Effective measures such as water conservation, proper land use planning, and sustainable agricultural practices should be implemented. Thus, the identification of dry patches in the district helps in better planning and provides a base for future development and management of drought-prone areas.

- **United Nations Environment Programme (2016):** Global Environment Outlook Report. This report explains the causes and effects of desertification and land degradation in different parts of the world.
- **Indian Space Research Organisation (2018):** Desertification and Land Degradation Atlas of India. This report gives detailed information about drought-prone and degraded lands in India using satellite data.
- **National Remote Sensing Centre (2019):** Remote Sensing Applications for Land Use Analysis. This study shows how GIS and satellite data can be used to identify dry and drought-affected areas.
- **India Meteorological Department (2020):** Climate Data Reports. These reports provide rainfall and temperature data useful for drought analysis.
- **USGS:** Earth Explorer Data Portal. This source provides DEM and other satellite data used for geographical analysis.
- **Food and Agriculture Organization (2017):** Drought and Agriculture Report. This report explains how drought affects agriculture and rural livelihoods.
- **Government of Karnataka (2015):** District Census Handbook – Chamarajanagar. This book gives basic information about population, land use, and economy of the district.

References

1. United Nations Environment Programme. Global Environment Outlook Report. Nairobi: United Nations Environment Programme; 2016.
2. Indian Space Research Organisation. Desertification and Land Degradation Atlas of India. Ahmedabad: Space Applications Centre, Indian Space Research

Organisation; 2018.

3. National Remote Sensing Centre. Remote Sensing Applications for Land Use Analysis. Hyderabad: National Remote Sensing Centre; 2019.
4. India Meteorological Department. Climate Data Reports. New Delhi: India Meteorological Department; 2020.
5. Food and Agriculture Organization. Drought and Agriculture Report. Rome: Food and Agriculture Organization of the United Nations; 2017.
6. Government of Karnataka. District Census Handbook – Chamarajanagar. Bengaluru: Directorate of Census Operations, Karnataka; 2015.