



# Evaluating Telangana's Forest Resources in the Context of Sustainable Development Goals

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## Abstract

Forests deliver irreplaceable ecosystem services that underpin ecological stability, including carbon sequestration, habitat preservation for myriad species, and regulation of regional hydrology and microclimates. Within the United Nations 2030 Agenda, these resources are inextricably linked to Sustainable Development Goal 13 (Climate Action) through their role as terrestrial carbon sinks and to Sustainable Development Goal 15 (Life on Land) by supporting biodiversity conservation and halting land degradation. Telangana, situated in the semi-arid Deccan Plateau with significant tracts of tropical dry deciduous and thorn forests concentrated along the Godavari basin, faces acute challenges from rapid urban expansion, agricultural intensification, and infrastructure development. These anthropogenic pressures have produced stark spatial imbalances in forest distribution across the state's 33 districts. This study draws upon district-level forest cover statistics compiled from the India State of Forest Report series and official Telangana Forest Department records. Quantitative techniques—percentage cover calculations, categorical classification (high >40 %, moderate 20–40 %, low <20 %), spatial mapping, and graphical representations—were employed to quantify disparities. Results indicate extreme concentration of forest resources in northern and eastern districts (e.g., Mulugu at 77.4 %, Komaram Bheem Asifabad at 66.8 %, Bhadradi Kothagudem at 65.7 %), while central and urbanized districts exhibit critically low cover (Hyderabad 0.2 %, Medchal–Malkajgiri 1.5 %). The statewide mean forest cover stands at approximately 19.35 % (standard deviation 21.16 %), revealing pronounced heterogeneity that threatens carbon storage capacity, watershed integrity, and tribal livelihoods dependent on non-timber forest products. Such imbalances jeopardise progress toward SDG targets unless addressed through spatially targeted interventions. The analysis underscores the urgency of integrating geospatial monitoring, large-scale afforestation, and urban forestry to enhance ecological resilience and secure long-term environmental sustainability in Telangana.

**Keywords:** Environmental Sustainability; Forest Cover Distribution; Telangana State; Sustainable Development Goals; Spatial Disparities; Biodiversity Conservation

## Introduction

Forests represent dynamic socio-ecological systems that regulate global biogeochemical cycles, mitigate extreme weather events, and sustain genetic repositories essential for future adaptation. Their degradation accelerates climate feedback loops and erodes the natural capital upon which human well-being depends. In the framework of the Sustainable Development Goals, SDG 13 emphasises forests' capacity to sequester atmospheric carbon and buffer temperature rises, while SDG 15 calls for the protection, restoration and sustainable use of terrestrial ecosystems. India, despite hosting one of the world's largest forest programmes, continues to grapple with uneven regional retention of these resources amid competing land-use demands.

Telangana, formed in 2014, encompasses 1,12,077 km<sup>2</sup> of varied topography ranging from the Eastern Ghats escarpments in the north and east to the semi-arid plains of the south and west. The state's forest estate is predominantly tropical dry deciduous, with pockets of moist deciduous and scrub vegetation. Historical records show that the northern Godavari basin districts have historically supported dense canopy cover owing to favourable rainfall patterns and lower population densities. Conversely, the Hyderabad metropolitan region and surrounding districts have experienced accelerated land conversion for urban and agricultural purposes. These transformations have amplified spatial inequities, concentrating biodiversity-rich habitats and ecosystem services in a handful of districts while leaving others ecologically impoverished. Previous macro-level assessments have documented Telangana's overall forest cover at roughly 18–21 % of geographical area, yet district-scale granularity remains

underexplored in relation to SDG alignment. The present investigation therefore seeks to (i) map district-wise forest cover distribution, (ii) quantify regional disparities through statistical and graphical lenses, (iii) evaluate implications for climate regulation and biodiversity targets under SDGs 13 and 15, and (iv) propose evidence-based strategies for equitable and sustainable forest governance.

## Methods

The study relies exclusively on secondary data compiled from the India State of Forest Report (Forest Survey of India, 2021) and supplementary statistics published by the Telangana Forest Department. Forest cover is defined as the area under tree canopy density of  $\geq 10\%$  and includes very dense, moderately dense, and open forest classes. For each of the 33 districts, forest cover percentage was computed using the formula:

$$\text{Forest Cover (\%)} = (\text{Forest Area} / \text{Total Geographical Area}) \times 100$$

Districts were categorised as high ( $>40\%$ ), moderate ( $20\text{--}40\%$ ), or low ( $<20\%$ ) to facilitate comparative analysis. Descriptive statistics (mean, median, standard deviation) and frequency distributions were calculated to assess central tendency and variability. Spatial patterns were visualised through bar charts (district-wise ranking), categorical pie charts, and cumulative distribution curves to highlight inequality in resource allocation. All computations were performed in spreadsheet software with manual cross-verification for accuracy. No primary fieldwork or remote-sensing reinterpretation was undertaken; the analysis strictly adheres to the most recent official figures available at the time of data compilation.

## Results

Forest cover exhibits marked spatial heterogeneity across Telangana. The five districts with high cover ( $>40\%$ ) are Mulugu (77.4%), Komaram Bheem Asifabad (66.8%), Bhadradi Kothagudem (65.7%), Jayashankar Bhupalpally (58.0%), and Adilabad (42.1%). These northern and eastern units collectively harbour the bulk of the state's dense forest ecosystems. In contrast, six districts fall in the moderate category ( $20\text{--}40\%$ ): Nagarkurnool (38.0%), Mancheril (36.0%), Nirmal (34.0%), Mahabubabad (28.0%), Khammam (27.0%), and Vikarabad (22.0%). The remaining 22 districts record low cover ( $<20\%$ ), with the lowest values registered in Hyderabad (0.2%), Medchal-Malkajiri (1.5%), Jogulamba Gadwal (2.3%), and Karimnagar (2.3%).

Statewide, the arithmetic mean forest cover is 19.35% (median 8.80%, standard deviation 21.16%), confirming high dispersion. Urban and central districts cluster near the lower tail of the distribution, while Godavari-basin districts dominate the upper tail.

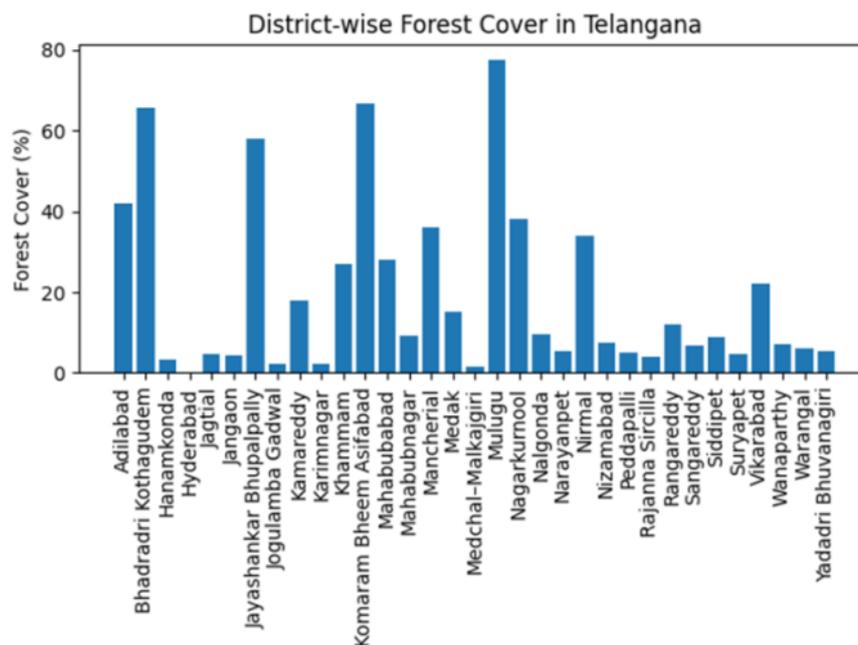


Fig. 1. District-wise Forest Cover Distribution

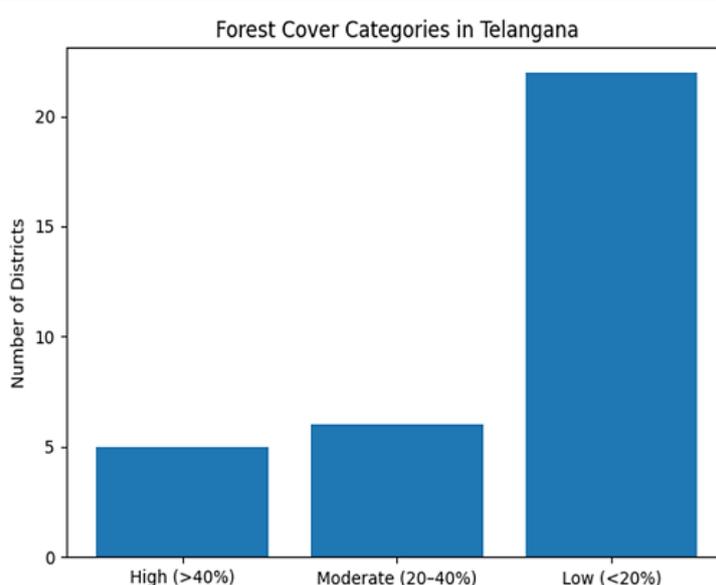
## Discussion

The pronounced concentration of forest resources in five northern and eastern districts underscores a classic core-periphery pattern common in tropical developing regions. These areas function as critical carbon sinks and biodiversity reservoirs, supporting endemic flora and fauna while providing hydrological services to downstream agricultural landscapes. Conversely, the near-absent forest cover in Hyderabad and adjoining urban districts reflects intensive land-use conversion that diminishes local climate regulation capacity and increases vulnerability

to urban heat islands. The high standard deviation (21.16 %) quantifies this inequity and signals that statewide averages mask critical ecological deficits in the majority of districts.

**Table 1.** District-wise Forest Cover (%) in Telangana

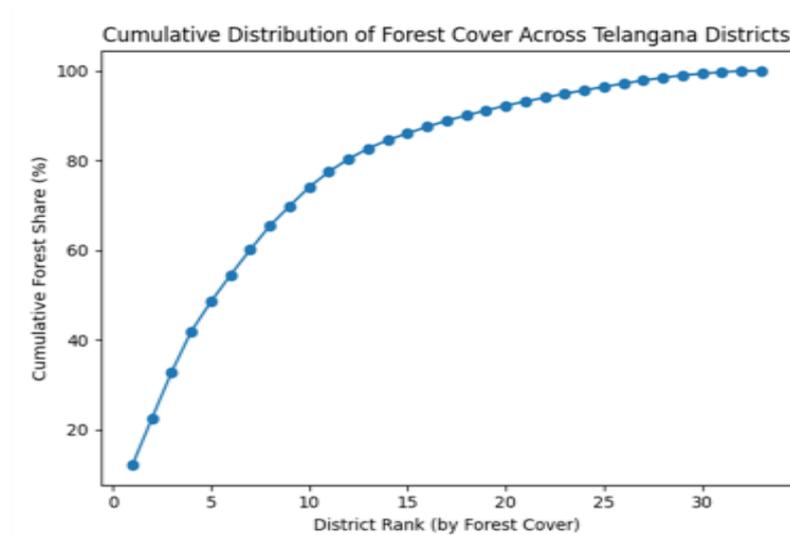
District	Forest Cover (%)
Adilabad	42.1
Bhadradi Kothagudem	65.7
Hanamkonda	3.4
Hyderabad	0.2
Jagtial	4.8
Jangaon	4.4
Jayashankar Bhupalpally	58.0
Jogulamba Gadwal	2.3
Kamareddy	18.0
Karimnagar	2.3
Khammam	27.0
Komaram Bheem Asifabad	66.8
Mahabubabad	28.0
Mahabubnagar	9.2
Mancherial	36.0
Medak	15.0
Medchal-Malkajgiri	1.5
Mulugu	77.4
Nagarkurnool	38.0
Nalgonda	9.6
Narayanpet	5.4
Nirmal	34.0
Nizamabad	7.5
Peddapalli	5.1
Rajanna Sircilla	3.9
Rangareddy	12.0
Sangareddy	6.8
Siddipet	8.8
Suryapet	4.7
Vikarabad	22.0
Wanaparthy	7.1
Warangal	6.0
Yadadri Bhuvanagiri	5.5



**Fig. 2.** Forest Cover Category Distribution (pie chart showing 5 high, 6 moderate, and 22 low districts)

From an SDG perspective, the observed disparities directly impede uniform progress toward climate mitigation (SDG 13) and terrestrial ecosystem protection (SDG 15). Districts with minimal cover contribute negligibly to national carbon sequestration targets and offer limited scope for biodiversity conservation. Moreover, tribal communities in high-cover districts depend heavily on forests for subsistence, whereas low-cover districts

experience heightened pressure on remaining natural resources, potentially triggering unsustainable extraction elsewhere. Graphical analyses (Figures 1–3) vividly illustrate that approximately 80 % of districts hold less than the statewide mean, reinforcing the need for spatially explicit interventions rather than blanket policies.



**Fig. 3.** Cumulative Distribution of Forest Cover across Telangana Districts (Lorenz-like curve highlighting concentration of cover in few districts).

Policy implications emerging from these findings include: (i) prioritising intensive afforestation under the Telangana Ku Haritha Haram programme in low-cover districts to restore ecological corridors; (ii) strengthening protection of high-cover districts through community-based conservation models that integrate tribal rights; (iii) mandating urban forestry and green infrastructure in metropolitan zones to offset local deficits; and (iv) institutionalising GIS-based real-time monitoring linked to SDG reporting frameworks. Such measures, grounded in empirical district-level evidence, can harmonise economic growth with environmental sustainability and accelerate Telangana's contribution to national and global sustainability targets.

In conclusion, the uneven distribution of forest resources represents both a challenge and an opportunity. Targeted, science-driven management that addresses spatial disparities will be essential to safeguard ecosystem services and fulfil SDG commitments in the coming decades.

### References

Forest Survey of India (2021) India State of Forest Report. Dehradun: Ministry of Environment, Forest and Climate Change, Government of India.

Government of Telangana (2022) Socio-Economic Outlook. Hyderabad: Department of Economics and Statistics, Government of Telangana.

Telangana Forest Department (2020) Forest Statistics and Annual Reports. Hyderabad: Telangana Forest Department.

### Author Contributions

The author conceived the concept, wrote and approved the manuscript.

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