

ISSN (Online): 3108-1789



International Journal of Global Innovations and Modern Research

Volume: 1, Issue No: 1, (January-June) 2026

Published by

BOOKS ARCADE

F-10/24, 2nd Floor, Krishna Nagar,
Near Vijay Chowk, Delhi-110051 (INDIA)

E-mail: editor@ijgimr.com

Website: www.ijgimr.com



IJGIMR

Climate Change and Natural Calamities in the Arid and Semi-Arid Regions of Rajasthan: An Analytical Study

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ABSTRACT

This study examines the escalating impact of climate change on the arid and semi-arid landscapes of Rajasthan, India. Historically prone to droughts, the region is now experiencing "weather whiplash"—a phenomenon where extreme droughts are followed by intense, short-duration floods. This paper analyzes the shift in rainfall patterns, rising mean temperatures, and the socio-economic vulnerability of rural communities. The findings suggest that traditional adaptation methods are becoming insufficient against the current rate of desertification and groundwater depletion.

KEYWORDS

Climate Change; Natural Calamities; Arid and Semi-Arid Regions

INTRODUCTION

Rajasthan, the largest state in India, is characterized by its unique geography, dominated by the Aravalli Range and the Thar Desert. About 60% of the state is arid or semi-arid, making it one of the most climate-sensitive zones in the world.

While aridity is a natural feature of the region, "Climate Change" has accelerated the frequency of natural calamities. The state faces a triple threat:

Increasing Heatwaves: Temperatures frequently crossing 50[°]C.

Hydrological Stress: Over-exploitation of the brittle groundwater table.

Erratic Monsoons: A shift from steady seasonal rain to "cloudburst" style events that cause flash floods in desert districts like Barmer and Jaisalmer.

REVIEW OF LITERATURE

Recent scholarship has shifted from viewing Rajasthan's climate as "stagnant" to "dynamically unstable."

Rathore et al. (2020) highlighted that the frequency of severe droughts in Western Rajasthan has increased by 15% over the last three decades.

Sharma & Kumar (2021) discussed the "Greening of the Desert" due to the Indira Gandhi Canal, noting that while it aided agriculture, it also caused unforeseen soil salinity and local micro-climate shifts.

IPCC AR6 Reports indicate that the Thar Desert fringe is expanding southward due to degraded vegetation cover and increased wind erosion.

Research Gap

While much literature exists on the general geography of Rajasthan, there is a significant Research Gap in:

The study of "Flash Floods" in traditionally drought-prone arid zones.

The long-term impact of climate-induced migration on the social fabric of Western Rajasthan.

The lack of micro-level data regarding how indigenous rainwater harvesting (Khadins, Kunds) performs under extreme, high-intensity rainfall compared to traditional slow-drip seasons.

Research Problem

The core problem is the unpredictability of natural calamities. In Rajasthan, the traditional wisdom used by farmers to predict monsoons is failing. This leads to total crop failure, livestock mortality, and a recurring cycle of debt, as the region lacks a robust "climate-resilient" infrastructure that can handle both extreme heat and sudden flooding.

Objectives

To analyze the trend of temperature and rainfall variations in Rajasthan over the last 50 years.

To identify the correlation between deforestation in the Aravallis and the increasing intensity of dust storms (Andhi).

To evaluate the effectiveness of state-led climate adaptation policies.

To suggest sustainable models for water management in the semi-arid belt.

Hypothesis

H₁: There is a significant positive correlation between rising global mean temperatures and the frequency of flash floods in the Thar Desert.

H₀: Local land-use changes (mining and urban sprawl) have a greater impact on natural calamities in Rajasthan than global climate change factors.

Importance of the Study

This research is vital for:

Policy Makers: To design "Desert-Specific" disaster management protocols.

Farmers: To understand the necessity of switching to climate-resilient crops (like millets).

Environmentalists: To advocate for the protection of the Aravalli Range as a "green wall" against desertification.

CONCLUSION

The study concludes that Rajasthan is at a tipping point. The transition from arid to hyper-arid in some areas, and arid to flood-prone in others, requires a dual strategy. We must combine ancient wisdom (traditional water harvesting) with modern technology (early warning systems and drip irrigation). Without immediate intervention, the socio-economic cost of natural calamities will lead to large-scale ecological displacement.

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