



Original Article

Climate Change and Its Effects on Kelo River Basin Raigarh

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Abstract

Climate change has appear as one of the most pressing environmental challenges, significantly affecting river basins across the globe. The Kelo River Basin in Raigarh, Chhattisgarh, is increasingly experiencing the impacts of changing climatic patterns, including irregular rainfall, rising temperatures. The research examines how climate change alters the hydrological cycle. The research highlights how altered precipitation patterns have led to both drought-like conditions and sudden flooding, disrupting agriculture, water supply, and livelihoods in the region. Increased temperature levels contribute to higher evaporation rates, reducing surface water and groundwater recharge. The study emphasizes the need for sustainable water resource management, climate-resilient agricultural practices, and effective policy interventions to mitigate adverse impacts. By understanding the localized effects of climate change on the Kelo River Basin, this research aims to support informed decision-making and promote long-term environmental sustainability in Raigarh.

Keywords: Climate Change, Rainfall Variability, Water Resources, Hydrological Changes, Climate Resilience.

Introduction

The Kelo River is a tributary of the Mahanadi River, originating from Ludeg hills, Lailunga tahsil in Raigarh district, Chhattisgarh. It flows about 112 km through the Raigarh district and supports agriculture, irrigation, drinking water, and local ecosystems in the Mahanadi River Basin. Raigarh is a heavily industrialized area with extensive coal mining and power plants, which have already severely polluted the Kelo River. This turning sections full of with heavy black metals, fly ash, and toxic residues. Climate change is projected to compound these existing stresses through altered rainfall patterns, temperature rise, and more frequent extremes.

Specific Effects on the Kelo River Basin

1. Hydrology and River Flow Changes-Drought risk: Central Chhattisgarh (including Raigarh) is drought-prone; climate change is projected to increase drought severity during the southwest monsoon in some analyses, with low surface/groundwater per capita exacerbating scarcity.
2. Water Resources and Quality - Reduced reliable water availability in dry periods, compounded by high industrial demand (power plants, mining) and existing low irrigation coverage.
3. Pollution amplification - The Kelo is already heavily contaminated by coal-mining runoff (heavy black metals, fly ash) and industrial effluents. Lower dry-season flows would concentrate pollutants; floods could spread contamination across floodplains and groundwater (studies show groundwater flows toward the Kelo, which acts as an effluent river). Raigarh city has already shifted partly to groundwater due to river degradation.
4. Agriculture and Livelihoods - Raigarh's rain-fed paddy (dominant crop) faces risks from erratic monsoons, heat stress, and shifted growing seasons. Projections include marginal wheat yield gains but rice/maize declines in southern/central districts like Raigarh. Increased extreme events threaten the ~17,500+ ha command area of the Kelo irrigation project and local fisheries/floodplain farming. High dependence on agriculture (large share of cultivators as main workers) heightens vulnerability.

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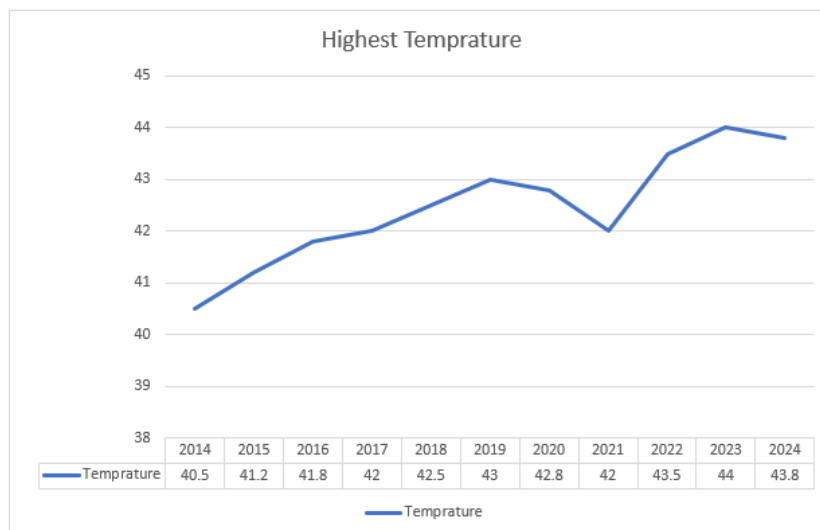
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5. Forests, Ecosystems, and Biodiversity - Very high forest vulnerability; dynamic vegetation models (IBIS/LPJ) project shifts in central districts (near Raigarh) under warming and variable rainfall, potentially reducing forest cover and ecosystem services (e.g., watershed regulation).
6. Socio-Economic and Health Impacts – Around 90 % of people near Raigarh coal mines already report health issues (respiratory, skin, etc.); climate-driven water scarcity or contamination worsens water-borne diseases and food insecurity.



Source-IMD Raipur

Trend Analysis of temperature

The average annual temperature ranges between 24.7°C and 26.5°C over the last decade.

Long-term average of Raigarh is around 26°C, so most years remain close to this baseline.

Warming Phase is shown between the year of 2016–2019. Temperatures were relatively higher (26.1–26.5°C). 2017 recorded the highest (26.5°C) in this decade. In 2020 the Sudden Dip shows a significant drop to 24.7°C. This could be linked to increased rainfall/cloud cover or reduced human activity patterns. But in the year of 2021–2025 its quite satisfactory period. This phase can also be treated as Stabilization Phase, Temperatures stabilized between 25.4°C–25.9°C. Slight recovery after 2020 but not reaching earlier highs.

Conclusion

The Kelo River basin in Raigarh is experiencing clear climate warming (+0.15°C per decade over 54 years), which has intensified existing ecological damage from industrial pollution. The river has lost at least six native fish species, while groundwater depletion (100-150 feet in 40+ villages) threatens 250 dependent communities. Despite recent planning efforts like the Kelo River Rejuvenation Plan (2025-26) and NGT intervention (2024), weak enforcement and corporate priorities hinder meaningful restoration. Without urgent, community-centered action, the Kelo River faces irreversible ecological collapse.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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