

Assessment of water level and climate change on Mandakini river in Chitrakoot, Uttar Pradesh

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Abstract:

The UN conference on human environment organised in June 1972 was first event to raise issue of environment at global platform. Although fifty years have passed after that global conference, Consequences of environmental degradation continue to haunt the human population in the form of climate change and global warming.

Climate change involve long term changes in temperature and weather pattern of an area. Due to climate change, river are facing extreme water stress from place of origin of river to mouth of river. The water stress in the river has its impact on ecosystem stability, forest regeneration, agricultural growth and distribution, Tourism activity across the river and livelihood of people.

Mandakini river also known as Paisuani River originates from Khillora near Pindra village, Majhgawa, Satna, MP. The river travels for 39 km to reach Sati Anusuiya ashram site where large number of small and big Springs feed the river. Mandakini river after flowing for 50 km Joins the Yamuna river in Karwi, Uttar Pradesh. The river is lifeline of Chitrakoot as 70% population residing along river catchment area and are dependent on river for drinking and household purpose. The river flows in drought prone region of Bundelkhand region. The water Stress in drought prone region creates challenges for population with increasing temperature in summer season.

The paper aim to study the relation between climate change and its impact on forest distribution and water availability required for ecosystem stability. The paper will study present condition of water stress in river and forthcoming challenges lying ahead and will also try to explore Solution which will benefit to the population of area.

Keywords: Climate Change, Mandakini River, Chitrakoot, Bundelkhand region.

Introduction:

Climate change refers to the significant and lasting alterations in Earth's climate patterns over extended periods, particularly the shifts in temperature and weather conditions experienced across

the globe. This phenomenon is primarily driven by human activities that release large quantities of greenhouse gases such as carbon dioxide and methane, into the atmosphere. These gases trap heat and lead to a gradual warming of the planet, resulting in a wide range of environmental, social, and economic impacts.

The consequences of climate change are wide-reaching and affect various aspects of our planet. From melting glaciers and rising sea levels to more frequent and intense weather events, the evidence of these shifts is becoming increasingly apparent. The world's ecosystems, biodiversity, and the livelihoods of communities are all at stake as the planet's climate continues to evolve.

The interrelation between climate change and water stress represents a critical and intricate relationship at the heart of our planet's environmental challenges. As the Earth's climate continues to evolve, it directly influences the distribution, availability, and quality of water resources, giving rise to complex and far-reaching consequences that impact ecosystems, communities, and economies worldwide. Understanding this interplay is essential for comprehending the broader implications of climate change and for devising effective strategies to manage water resources in an increasingly uncertain and changing world.

Climate change is now a reality and visible to society in form of increasing occurrences of extreme events like cyclone, disaster, declining water level in rivers, increasing monthly temperature, etc.

Focus area: Mandakini River in Chitrakoot, Uttar Pradesh

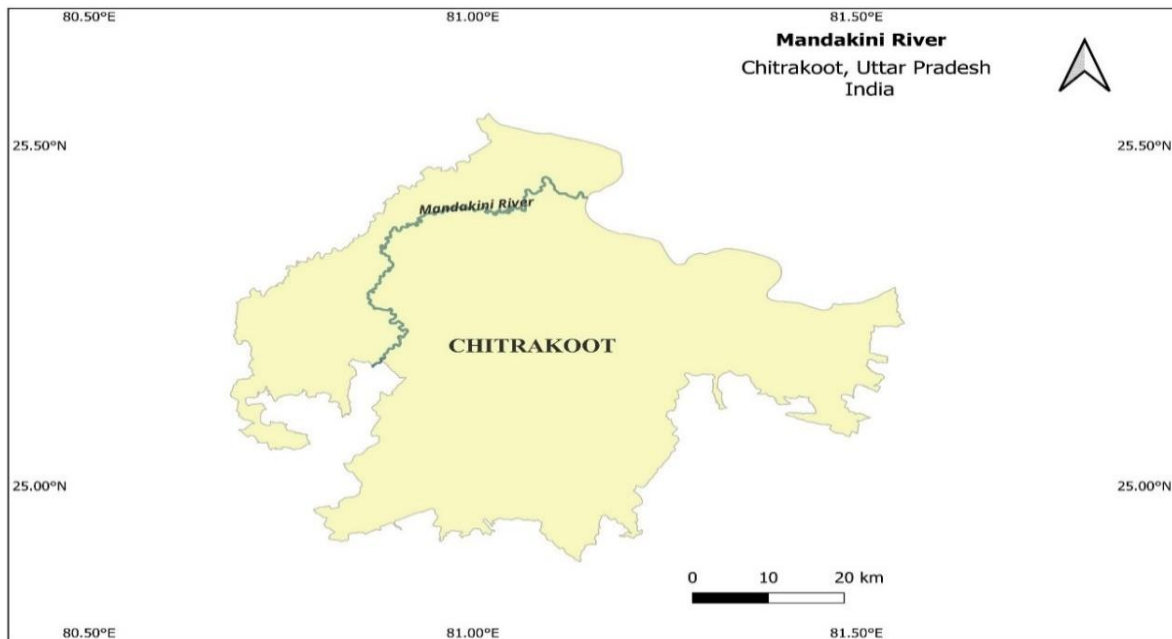
Chitrakoot is one out of seventy-five district located in administrative region of Uttar Pradesh. The district was formed in 1997 and known for spiritual attitude and scenic beauty. People who go on pilgrimages feel deeply moved when they dip in the Payaswani or Mandakini River and touch the special soil of Kamadgiri. Chitrakoot has always been a place that inspires people to think about big ideas. It's called 'the hill of many wonders' and is really important for religious reasons.

Mandakini river in Chitrakoot originates from Khillora hills in Majhgawan block in Satna district of Madhya Pradesh (25⁰ 09' 24.8'' N and 80⁰ 52' 55.3''E). The Payaswani river rises from elevation of 156m above mean sea level. River Mandakini is the tributary of Yamuna River which flows from south to north and discharges its water in Yamuna river.

The way streams develop is influenced by how steep the land is and the changes in height nearby. This can make the number of streams different in various areas. This pattern of streams is important

for taking care of rivers and the land around them. The streams come in different sizes and shapes, and together they make up the drainage system.

Mandakini river flowing in Chitrakoot.



Source: Made by Author using QGIS

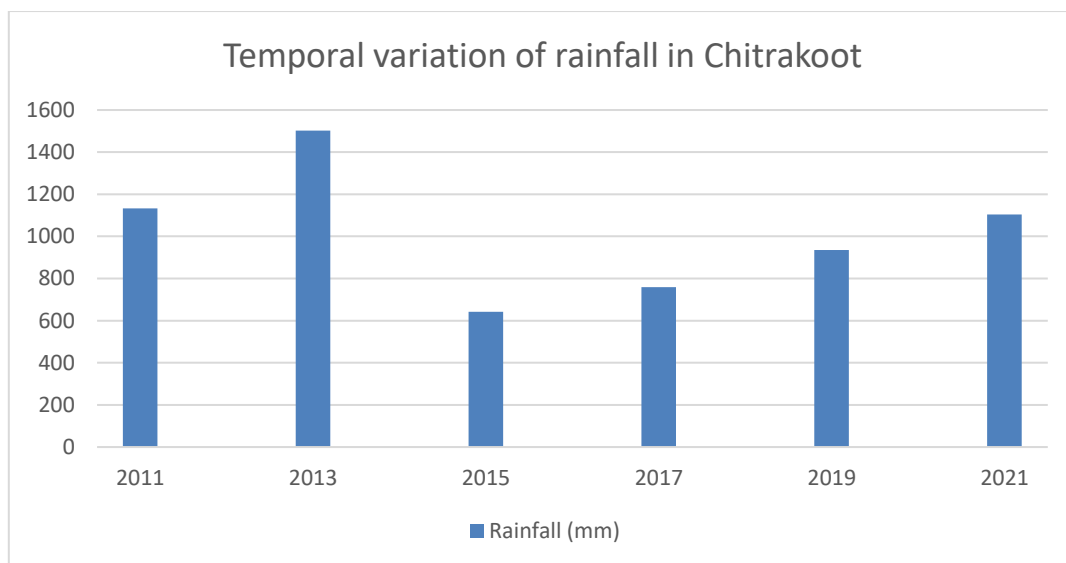
Findings of study:

The study of rainfall pattern in chitrakoot district for the second decade of 21st century shows that rainfall has not followed either increasing or decreasing trend but an uneven pattern. In the initial years of decade rainfall in the district was increasing and received highest rainfall of 1502mm in 2013 and later since 2014 the rainfall has decreased in the region. The decline in the rainfall in later half of decade was consequence of El-nino events and subsequently lesser rainfall and drought condition in the country as well.

The declining rainfall in later part of decade is one of the factor contributing to water stress in the region. The mandakini river flowing in the region is small tributary of Yamuna river which flows in the drought prone region of the country,India. The decreasing rainfall and increasing temperature simultaneously causes significant reduction in the water availability of River and it becomes hard for river to maintain its environmental flow.

Apart from study of temporal variation of rainfall, the map has been prepared to show the spatial distribution of Groundwater resources in the district. The study of groundwater resource in the Chitrakoot district shows that the north-western part of district comprising Karwi block is in critical condition and blocks including Pahari, Ramnagar and Mau are in semi critical condition. The manikpur block of district has been categorised in safe zone for ground water availability

Temporal variation of rainfall in Chitrakoot



Source: India WRIS portal

The study of ground water availability and rainfall pattern shows that region is facing the heat of climate change and water stress is experienced by the ecosystem. The water stress in the region impact every nuk and corner of the region as well as society. The decreased flow in river impact the agricultural production of the region and long term rainfall variation even leads to change in agricultural pattern in the region and fooding habits of society.

Water stress in River flow has impact on tourism inflow in Chitrakoot which is a spiritual destination for tourist as the Mandakini River also holds attraction of tourist and spiritual significance to the tourist population.

Forest distribution in Chitrakoot:

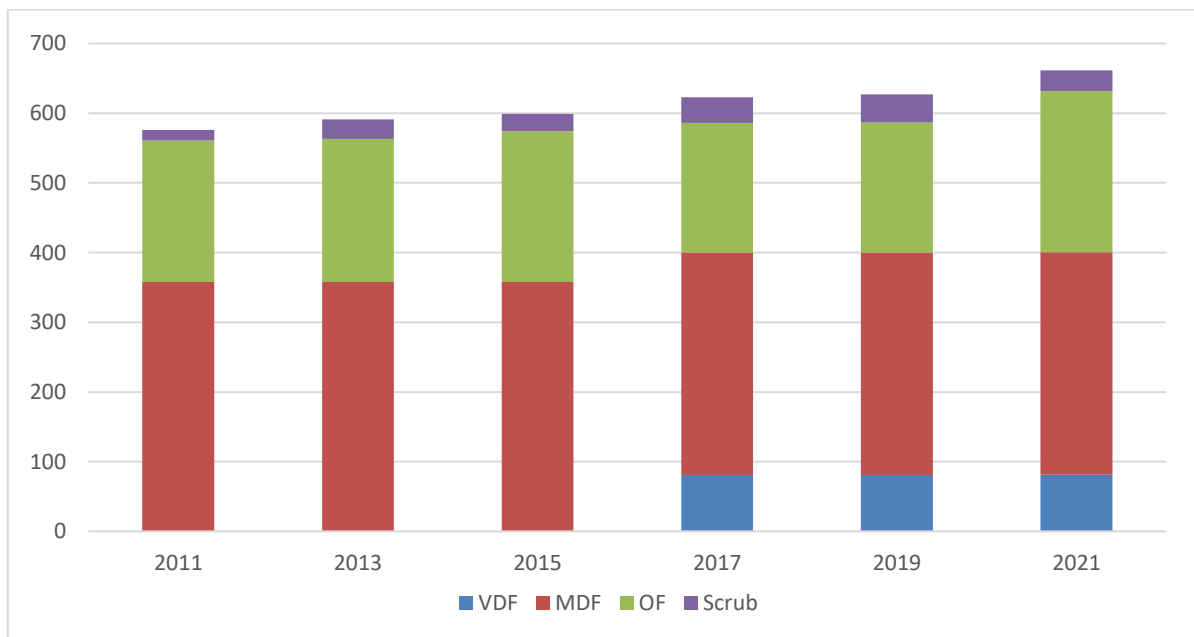
Chitrakoot in Uttar Pradesh has a notable distribution of forests that adds to its natural beauty and ecological significance. These forests are spread across various parts of the region, contributing to its environmental health and biodiversity. The forests in Chitrakoot are scattered in different areas,

creating pockets of greenery and wildlife habitats. These wooded areas are crucial for maintaining the balance of the ecosystem, providing habitats for various plants and animals, and supporting the overall health of the environment.

These forests are not only valuable for their ecological importance but also contribute to the well-being of the local communities. They offer resources like timber, non-timber forest products, and medicinal plants. Additionally, they serve as recreational spaces for residents and visitors, allowing people to connect with nature and enjoy outdoor activities.

The specific types of trees and plants within the Chitrakoot forests can include a variety of indigenous species adapted to the local climate and soil conditions. These forests play a vital role in conserving plant diversity and preserving the natural heritage of the area.

Distribution of Forest in Chitrakoot



Source: Forest survey of India

Forest are considered basic support system of biodiversity in the region. The above distribution of forest shows an uptrend with minute increase in the forest area every year. However, the Chitrakoot district has also seen an administrative readjustment of district boundaries which resulted into increase in geographical area of district. Consequently, it also caused a little increase in forest area which appears in the form of Very dense forest since 2017.

Impact of Climate change on water stress:

The connection between climate change and water stress is like a puzzle where the pieces fit together. Climate change affects the weather, making some places hotter or drier. This can lead to water stress, which means there's not enough water for all the things people need, like drinking, farming, and industries. When the climate changes, it can mess up the usual patterns of rainfall and snow, making it hard to predict when and where water will be available. This can make the problem of not having enough water even worse.

So, climate change can make water stress more serious, and when there's water stress, it's often linked to changes in the climate. It's like a cycle where one thing leads to another, and they both make each other more challenging.

- Climate Change and Rainfall pattern
- Climate change and extreme weather event
- Climate change and environmental flow of river
- Impact on demand and supply of water
- Climate change and food security
- Climate change and Agriculture
- Climate change and Health and sanitation

Possible solutions:

Climate change is a global phenomenon and it requires a cooperative approach from all stakeholders to take guard against it. Climate change has its impact on all biotic and abiotic component of Biosphere and as biodiversity varies from equator to poles so is the variation in consequences of climate change all over the world.

Forest are viewed as the shield against the increasing global temperature. Climate change which causes variation in rainfall and temperature leading to water stress could be controlled with increasing forest wealth. Forest act as attraction point of rainfall, increase seepage of rainwater in the ground and helps in recharging the aquifers.

The water stress caused by Climate change lead to change in agricultural pattern of an area because crops are sensitive to high temperature and productivity declines if suitable temperature are not available. To be profitable in agricultural sector, one has to adapt techniques to fight against climate change induced water stress.

The habitat of biotic life is well affected by climate change and causes their migration from one geographical region to other. The migration of biotic life also lead to spread to new diseases and health disaster.

Climate change is an eustatic change to be controlled by global population for their sustainability. Adaptation is the key to sustain the climate change.

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