

The Ganga River: A Green Sanctuaries in Uttar Pradesh

Sponsored by



National Mission for Clean Ganga (NMCG),
Department of Water Resources, River
Development & Ganga Rejuvenation,
Ministry of Jal Shakti, New Delhi



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ABOUT THE EDITOR



Dr. Acharya Balkrishna, Co-founder of Patanjali Organic Research Institute, is a highly ascetic entrepreneur with a diverse personality who is a specialist in Yoga, Ayurveda, Sanskrit language, Indian sacred books, and the Vedas. Dr. Balkrishna has become a significant source of inspiration for Traditional Medicinal Practitioners and a globally recognized celebrity after dedicating his life to the resurrection of ancient healing and living practices. His maverick leadership as

Co-Founder & Managing Director of Patanjali Ayurved Limited, along with overseeing Patanjali Food and Herbal Park and Divya Pharmacy, has propelled Ayurveda into a global business phenomenon with a massive following. Additionally, he has been decorated with prestigious awards such as 'Ayurveda Expert', 'Manav Ratan', 'Bharat Gaurav', 'Indian of the Year', 'Ten Versatile and Dynamic Young Men of India', 'Bheeshma Pusaka', 'Lokmanya Tilak', and 'Transformational Business Leader' for his exceptional knowledge, passion, and service to mankind. According to a study published by Stanford University in the USA and Elsevier in Europe, Dr. Balkrishna has been recognized among the **top 2% of scientists** worldwide for his research on Ayurveda and Yoga.

With his early age passion for plants, he has become the most renowned & respected herbal specialist for health and nutrition. For the research of novel herbal medication formulations, he explored four rare plants: 'Sanjeevani', 'Somlata', 'Swarnakshiri', 'Swarnadraka', and 'Astavavarga plants'. He has taken many initiatives for Biodiversity conservation, presently working for the establishment of Patanjali Herbal Garden & herbarium, working on the compilation of a unique multivoluminous project i.e., '**World Herbal Encyclopaedia**', containing the descriptions of ~50,000 medicinal plant species with the largest collection of plant paintings and drawings. This is being done to strengthen traditional medicine systems of the world. Additionally, Dr. Balkrishna has made significant contributions to the socio-economic development of tribal communities and the upliftment of rural communities with FPOs, CLFs, and SHGs. Furthermore, his endeavors have been directed towards exploring and conserving floral diversity, phytochemical and insilico analysis, investigating soil geochemistry, understanding complex plant-microbe relationships, and monitoring water quality from Gomukh to Gangasagar.

He has published more than **400 research articles** in national and international journals received around 20 patents and authored more than **200 books** on Yoga, Ayurveda, Agriculture, Herbal Medicine, and Information Technology and edited more than **40 unpublished ancient Ayurveda manuscripts**. With the vision of ensuring universal health for the last two decades, more than **1.5 million patients** with several persistent, chronic, and non-communicable diseases have been effectively treated. He established Patanjali Ayurved College and the University of Patanjali with the humanitarian goal of assisting youngsters in achieving their goals and serving the country. Additionally, he has been involved in various government and non-government initiatives. He is also a key proponent of agricultural transformation through organic practices, working to boost agricultural productivity, increase farmer income, and ensure equitable access to a safe, affordable, and nutritious diet year-round. Apart from this, Dr. Balkrishna is actively participating in driving agricultural transformation through the 'Patanjali Farmer Samridhi Programme' by well-trained staff and around one lakh trainers. His generous personality is also reflected through his actions like helping the nation with emergency needs like post-disaster needs assessment, providing free shelter, food, and education to orphan children, and free OPD services at Patanjali Yogpeeth. With his humanitarian attitude, Dr. Balkrishna continues his phenomenal journey of making world records, uplifting mankind through medicine & lifestyle improvement, reviving sustainable agriculture, and preserving nature's gifts in the form of literature and a sustainable living approach.

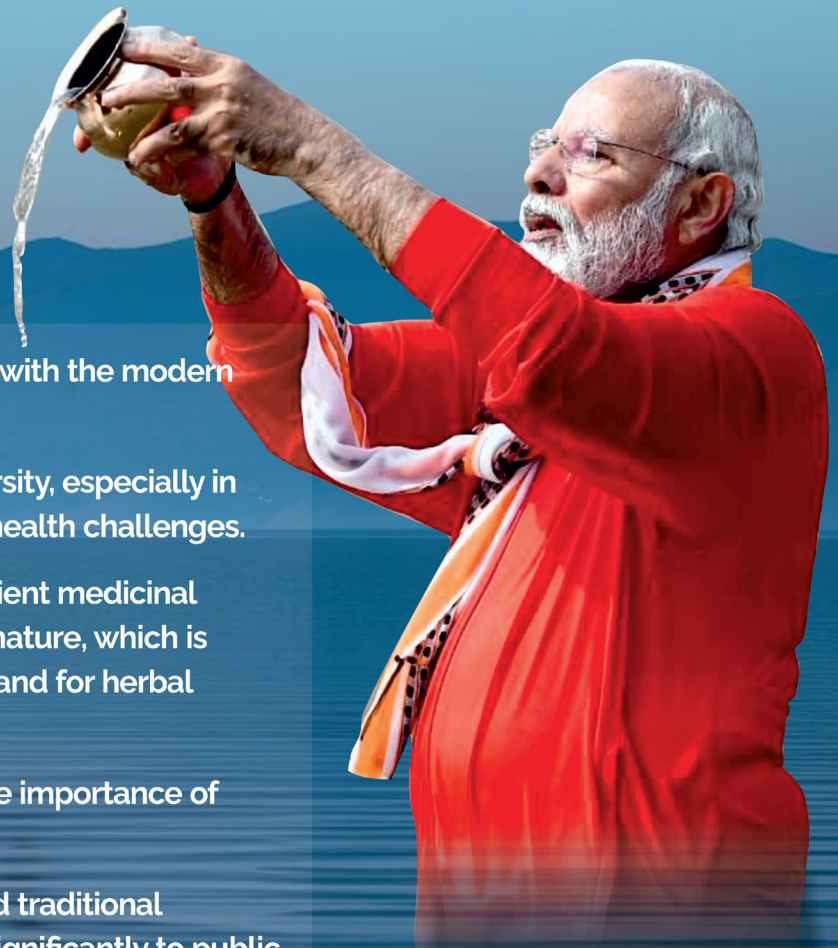
Vision of Honourable Prime Minister Shri Narendra Modi



- Medicinal plants can help in dealing with the modern day lifestyle.
- We need to harness our rich biodiversity, especially in medicinal plants, to address global health challenges.
- The world is now embracing our ancient medicinal practices. People are going back to nature, which is reflected in the growing global demand for herbal products.
- Our nation has always recognized the importance of medicinal plants.
- The potential of medicinal plants and traditional healthcare systems can contribute significantly to public health.
- Our goal is to provide affordable healthcare solutions by promoting traditional medicines including the use of medicinal plants.



Narendra Modi's address at the inauguration of the first National Arogya Fair, 2017
Narendra Modi's speech at the inauguration of the National Ayurveda Summit, 2019
Narendra Modi's address at the inauguration of the AYUSH Wellness Centre, 2016
Narendra Modi's address at the inauguration of the National Institute of Ayurveda, 2020
Narendra Modi's address at the International Conference on Integrative Medicine for Chronic Diseases, 2017
Narendra Modi's address at the Indian Science Congress, 2019





Vision of Union Minister for Jal Shakti

Shri Chandrakant Raghunath Patil

“

- We will understand the importance of water, conserve it and ensure rich water resources for future generations.
- Conservation and enhancement of water resources of our country is a sacred goal. I will work with my dedication and devotion to achieve this.
- Proper access to water is a strong step towards women's empowerment.
- Jal Shakti is Nari Shakti, as women are the most affected by water scarcity due to their household responsibilities in rural India.

”

<https://pib.gov.in/PressReleaseDetail.aspx?PRID=2024324>

<https://www.newsonair.gov.in/c-r-patil-emphasizes-water-access-as-essential-for-womens-empowerment-at-catch-the-rain-2024-workshop-in-delhi/>

<https://www.indiatvnews.com/gujarat/will-transform-jal-shakti-into-rashtra-shakti-cabinet-jal-shakti-minister-c-r-patil-after-portfolio-appointment-pm-modi-2024-06-10-936272>

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Uttar Pradesh Forest Department & Biodiversity Board

Bihar Forest Department & Biodiversity Board

Jharkhand Forest Department & Biodiversity Board

West Bengal Forest Department & Biodiversity Board

Ganga Task Force (GTF)



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राष्ट्रीय स्वच्छ गंगा मिशन
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NATIONAL MISSION FOR CLEAN GANGA



सत्यमेव जयते
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आज़ादी का
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भारत सरकार
जल शक्ति मंत्रालय
जल संसाधन,
नदी विकास और गंगा संरक्षण विभाग
GOVERNMENT OF INDIA
MINISTRY OF JAL SHAKTI
DEPARTMENT OF WATER RESOURCES,
RIVER DEVELOPMENT & GANGA REJUVENATION



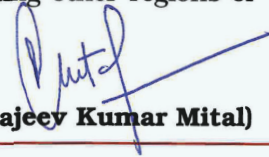
MESSAGE

The Ganga, a river deeply revered in our culture, is both a source of spiritual inspiration and home to diverse ecosystems, including riparian buffers along its banks that connect terrestrial and aquatic systems. These buffers play a crucial role in supporting amphibious life, stabilizing the riverbanks, and maintaining ecosystem services. Therefore, under the "Aviral Ganga" approach for biodiversity conservation and "Arth Ganga" for enhancing livelihoods, a project on floral diversity has been initiated through Namami Gange Mission – II, in collaboration with Patanjali Organic Research Institute (PORI), Haridwar, Uttarakhand.

The project "Scientific Exploration of Floral Diversity Near the Ganga Riverbanks for Ethnobotanical Purposes along with their Conservation and Economic Development of the Region via Skill Development Programs" aims to provide valuable scientific insights into the region's ethnobotanical wealth while promoting sustainable conservation practices. The 18-month study, conducted from Gaumukh to Gangasagar along the Ganga banks, reveals the floral profile, ethno medicinal aspects, applications, livelihood perspectives, and the role of biodiversity in ecosystem resilience, highlighting the symbiotic relationship between conservation and socio-economic development. Findings presented through publications, including project reports, monographs, exploration of ethno medicinal plants, and plant wealth along river Ganga India, will benefit stakeholders, including local communities' well-being.

It gives me immense pleasure to extend my appreciation to the entire team for successfully executing the project, which advances our understanding of the unique floral diversity along the Ganga and its role in ethnobotanical purposes, conservation, and integrating science with local knowledge. The project's focus on environmental stewardship and skill enhancement for sustainable livelihoods is commendable.

This excellent work documenting the floral diversity along the banks may pave the way for the rejuvenation of the Ganga and set a precedent for biodiversity conservation and socio-economic improvement, potentially benefiting other regions of India as well.

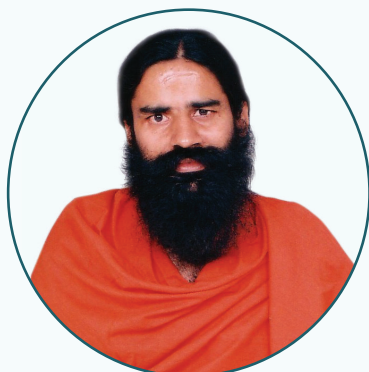

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FOREWORD



The Ganga, regarded as a goddess in Indian tradition, has enriched our country's spiritual and medical legacy in addition to its natural scenery. Many medicinal plants have been growing along the banks of this sacred river for many years. The Ganga River is vital to the existence of the local aboriginal population. The Ganga River is always important to the natives' economics, employment opportunities, religious beliefs, etc. Respected for its natural richness as well as its spiritual importance, the Ganga supports a wide variety of medicinal plants. The foundation of ancient medical systems like Ayurveda has been these plants, which are nourished by the pristine waters of the Ganga, leading us toward comprehensive health and well-being.

The Ganga River in Uttar Pradesh is longer than it is elsewhere, which benefits the local population. The Ganga and its tributaries supply the basin that is extremely vital to the native population, which makes the river extremely significant to the people of Uttar Pradesh. This basin improves agricultural output and creates employment opportunities, which strengthens the state's economy. The medicinal plants along the Ganga River symbolize the mutually beneficial relationship between humans and the natural environment, in addition to their evident applications. Through careful study and experience, our ancestors learned about the therapeutic properties of these plants and used them in everyday life and healthcare. This priceless legacy that has been passed down through the ages merits our respect and ongoing investigation. I write these remarks for this amazing compilation with immense gratitude and appreciation.

In a time when finding long-term, comprehensive health solutions is more important than ever, this compilation serves as a source of knowledge. It inspires individuals to return to their roots, appreciate the wisdom of traditional medicine, and combine it with cutting-edge medical procedures. In addition to being theoretical, the work presented in this collection has applications in terms of enhancing native activities in general, such as promoting environmental stewardship, protecting biodiversity, and enhancing health outcomes.

I express my sincere gratitude to Acharya Balkrishna and his committed group of knowledgeable scientists for their everlasting dedication. Their work emphasizes the Ganga River's ongoing significance to the local inhabitants of Uttar Pradesh, encouraging a healthy and peaceful way of life for them.

This work will draw in additional river lovers who rely on the Ganga River for their future explorations. Let's follow this path with reverence, inquiry, and dedication to protecting the environment that so kindly provides for us.

With blessings and best wishes,

-Swami Ramdev

PREFACE

One of the best rivers in the northern Indian subcontinent is the Ganga. It has always been revered as the sacred river in Hinduism. The majority of its path is traversed by a broad, leisurely stream that passes through one of the world's most fertile and densely inhabited areas. It rises in the Himalayas and empties into the Bay of Bengal, hundreds of millions of people live in its basin. In Uttar Pradesh, almost two-thirds of land is covered by the Ganga basin, which is the state's major drainage zone. It comprises the Yamuna, Ghaghara, and Gomti, in addition to other notable Ganga tributaries. These plains, which are rich in fertility, are the location of some of the state's most populous cities, including as Varanasi, Prayagraj, and Kanpur. It travels through the districts of Bijnor, Garhmukteshwar, Badaun, Farrukhabad, Kannauj, Kanpur, Bithoor, Prayagraj, Mirzapur, and Ghazipur before exiting the state. The length of the Ganga River in Uttar Pradesh is around 1000 kilometers. The riverbanks are home to a wide variety of plant and animal species. The alluvial soil along the Ganga is extremely fertile and can support the growth of wheat, rice, sugarcane, and a variety of fruits and vegetables. Because it promotes sustainable agriculture, maintains the health of the soil, and reduces chemical runoff into rivers, organic farming is growing in popularity. Among the various religious practices that are strongly embedded in the culture are daily prayers, festivals, and festivities held along the banks of the Ganga. In Hinduism, the river is considered a holy entity and a means of atoning for transgressions.

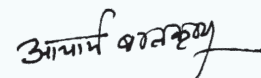
The Indian government has taken action through a number of projects, beneficiary plans, and training programs to protect the interests of the Ganga. The National Mission for Clean Ganga (NMCG) program, under the Department of Water Resources, River Development & Ganga Rejuvenation, Ministry of Jal Shakti, is the nodal ministry in charge of overall policy planning and program coordination for Ganga development. The Ganga River status is taken into consideration while designing the Ministry's plans and projects, which aim to close significant gaps in institutions and initiatives. The NMCG is in charge of several initiatives, which promote the social, economic, biological, and spiritual development of the Ganga River. Similarly, the Patanjali Organic Research Institute along with its sister institute i.e. Patanjali Research Foundation has been designated to serve as the Ganga River's revitalization and development.

Information on the Ganga River within Uttar Pradesh has been gathered and documented in this book through field surveys, earlier literature, and online research.

The Ganga River, its tributaries, employment, economy, people communities, towns, and cities nearby are all covered in detail in this book. This book also discusses the challenges the river is now experiencing. The book also discusses vegetation and the effects it has on the environment and ecology. The information on the medicinal plants gathered during the field survey is provided in this book. This book also includes information on government initiatives that have been moving forward to conserve and revitalize the Ganga River in the state.

I express my deepest gratitude to Param Puja Swami Ramdev Ji for his unwavering leadership and support throughout this endeavour, as well as for his invaluable guidance in every aspect of our work. I express my gratitude to the Ministry of Jal Shakti for their invaluable recommendations and guidance. My best wishes to the dedicated and highly skilled experts, who have gathered data and conducted extensive research on the diverse botanical heritage of the Ganga River basin. I would especially want to express my gratitude to the district and sub-district administrations, as well as the national and state biodiversity boards for their cooperation and support throughout our team's field visits.

I am confident that this book would be helpful to anyone interested in learning more about the Ganga in Uttar Pradesh.



-Acharya Balkrishna

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THE GANGA

The Ganga River is essential to life, culture, and economy in India. Originating from the Gangotri Glacier in the Himalayas, it flows across northern India, reaching the Bay of Bengal. This river system is more than just a geographical landmark; it is a cornerstone of Indian civilization. For millennia, the Ganga has supported countless communities by providing water for agriculture, drinking, and transportation. The river's consistent flow throughout the year is crucial for maintaining the agriculture, industries, and urban areas that line its banks. Water, as the foundation of life, sustains ecosystems, economies, and civilizations, with rivers like the Ganga playing a pivotal role in these processes.

The Ganga River, one of India's longest and most sacred rivers, begins its journey from the Gangotri Glacier in the Uttarkashi district of

Uttarakhand, known as the Bhagirathi. Another important tributary, the Alaknanda, starts from the Bhagirath-Kharak and Satopanth glaciers. These two significant tributaries meet at Devprayag, the official starting point of the Ganga River. From Devprayag, the Ganga flows southwards through the Himalayan foothills and passes through the holy city of Haridwar, an important pilgrimage site for Hindus. After leaving the hills at Haridwar, the Ganga enters the plains of Uttar Pradesh, beginning in the district of Bijnor and after passing through major districts Meerut, Hapur, Bulandshahar, Aligarh, Kanpur, Prayagraj, Varanasi, Ballia. From here, it enters Bihar, near Chausa in the Buxar district. The Ganga continues its eastward journey through Bihar, reaching the Katihar district before entering Jharkhand's Sahebganj district. It then turns



southwards, crossing into West Bengal from the Murshidabad district. About 40 kilometers before Farakka, the Ganga splits into two branches: the left branch flows eastwards into Bangladesh, while the right branch, known as the Hooghly River, flows southwards through West Bengal.

In its lower reaches, near Kolkata, the river is referred to as the Bhagirathi before it finally merges with the Bay of Bengal. The Ganga River spans a total length of about 2600 kilometers from its source at Gomukh to its mouth at the Bay of Bengal, nourishing millions of lives along its path and holding immense cultural and spiritual significance throughout its journey.

In terms of sheer volume, the Ganga alone accounts for about 25% of India's total water resources. This abundance has historically

supported dense populations and thriving agricultural practices in the Gangetic plains, which are among the most fertile regions in the world. Beyond India, the Ganga River basin extends into Nepal and Bangladesh, encompassing a vast area that supports more than 300 million people. Communities in these countries rely heavily on the Ganga for their water needs, further emphasizing its regional importance. However, despite its significance, the Ganga faces numerous challenges today, including pollution, unsustainable use of water resources, and environmental degradation. Efforts are ongoing to preserve and rejuvenate the river's health through initiatives like the Ganga Action Plan and Namami Gange, aimed at cleaning the river and ensuring its sustainability for future generations.



SALIENT FEATURES

Length

Total - 2600 kms

Uttarakhand - 450 kms

Uttar Pradesh - 1000 kms

Sharing length between UP & Bihar - 110 kms

Bihar - 405 kms

Jharkhand - 40 kms

West Bengal - 520 kms

Catchment Area Ganga Basin- 8,61,404 km² (26.4%) of India

Average Annual discharge- 4,93,400 million m³

Main Tributaries- Yamuna, Ramganga, Gomti, Ghaghara, Gandak, Damodar, Kosi & Kali-East

Main sub tributaries- Chambal, Sindh, Betwa, Ken, Tons, Sone & Kasia-Haldi

Major Cities located on the bank- Srinagar, Rishikesh, Haridwar, Bijnor, Narora, Kanauj, Kanpur, Prayagraj, Varanasi, Mirzapur, Patna, Bhagalpur, Bahrapur, Serampore, Hawarah, Kolkata

Festivals- Kumbh Mela, Kartik Purnima, Makar Sakranti, Ganga Navami, Ganga Dussehra, Chath Puja, Somwati Amavasya or Mauni Amavasya

SPIRITUAL VALUES

The Ganga River is more than simply a river; it has spiritual and cultural importance for India. It is sometimes compared to the country and is perceived as amiable and life-sustaining. Ultimately, the Ganga River's multifaceted nature, which reflects its significant effect on Indian mythology, religion, and daily life, symbolizes purity, divinity, and cultural legacy.

In Hinduism, the Ganga River—embodied as the Goddess Ganga—has great cultural and spiritual significance. Within its basin, the 'Mother Ganga' provides life for about 300 million people. Originating from Gommukh and merging with the Alaknanda River at Devprayag, it is known as the Bhagirathi River along this stretch, named after King Bhagiratha who brought Ganga from heaven through severe penance.

Ganga is revered as the river of knowledge, believed to be the sister of Goddess Saraswati,

the embodiment of knowledge. According to mythology, Ganga flows from the *Kamandal* of Lord Brahma, thus considered his daughter. She is also regarded as the sister of Goddess Parvati, hence called the daughter of the Himalayas. The Narada Purana narrates that the weight of Ganga was too immense for the earth to bear, and Lord Shiva eased its descent by capturing it in his matted hair, earning her the title 'daughter of Shiva'.

Ganga is perceived as the amalgamation of various deities—Shiva, Shakti, Brahma, and Vishnu—symbolizing purity and divinity. For Hindus, the Ganga is not just a river but a way of life, offering sustenance and spiritual purification through its purifying waters believed to possess self-cleaning properties. In essence, Ganga embodies both earthly and heavenly realms, representing a sacred link between the divine and mortal worlds in Hindu culture.





In Hindu culture, the Ganga River holds an unparalleled significance that spans across the entirety of life's milestones. It is revered as more than just a physical entity; it embodies spiritual purity and divine grace. Hindus view the water of the Ganga as sacred and liken it to *amrit*, the nectar of immortality. Many keep Ganga water in their homes for its auspicious qualities, using it in various ceremonies and rituals throughout their lives.

From birth to death, the presence of the Ganga is integral in Hindu rituals and customs. It is used during childbirth, naming ceremonies (*namakaran*), the introduction of solid food (*annagrahan*), sacred thread ceremonies (*yagyopaweet*), marriages, and funerals. During funerals, Gangajal (water from the Ganga) is often poured into the mouth of the deceased, symbolizing purification and the journey towards spiritual liberation.

For many Hindus, the Ganga is the center of their daily existence. They take a bath in its waters to start their days, saying prayers and hymns to the river in adoration. There are several rich cultures, festivals, fairs, and ceremonies throughout the whole Ganga River. The stairs that lead down to the river, known as ghats, are especially sacred and are used as meeting spots for meditation, ceremonies, and spiritual activities. These ghats are said to aid in spiritual enlightenment and cleansing and are regarded as emblems of purity.

Ultimately, the Ganga River gives life a deep spiritual dimension in addition to sustaining it. It provides Hindus with a link to their spirituality, cultural history, and the divine; it is a constant in their existence.

VARIOUS NAMES

The Ganga River, known by various names and revered across different dimensions, holds a

unique place in Hindu mythology and culture. Its names reflect its diverse origins and roles:

- **Haripadodbhava Ganga:** Originating from the feet of Lord Vishnu.
- **Swargaloka's Ganga:** The Ganga of heaven.
- **Akash Ganga:** Milky Way.
- **Shiva Jattas Ganga:** Ganga flowing from the matted hair of Shiva.
- **Bhulok's Ganga:** The Ganga of the earth.
- **Van, Parvat, and Sarovar's Ganga:** The Ganga is associated with forests, mountains, and lakes.
- **Gautamanugamini Ganga:** The Ganga associated with Rishi Gautam.
- **Bhagirathanugamini Ganga:** The Ganga associated with King Bhagiratha.

- **Gautami:** The sage Gautam gave the river the name Gautami.
- **Tripathga:** Signifying its course through heaven, earth, and the netherworld.
- **Shrotsamasmi Jahanvi:** In Bhagavad Gita, Lord Krishna declares it "Shrotsamasmi Jahanvi", emphasizing Ganga's significance among all rivers.

HISTORICAL SIGNIFICANCE

The Ganga River holds a profound historical and cultural significance in the Indian subcontinent, having witnessed the evolution of various civilizations and spiritual traditions over millennia.

Cultural Evolution: The banks of the Ganga have been a cradle for the evolution of Hindu culture, Buddhist culture, and the cultures of various





dynasties like the Shakas and Huns. It has been a focal point for trade, philosophy, and spiritual practices, nurturing diverse communities and civilizations.

Gangashtak: Adi Guru Shankaracharya's treatise, Gangashtak, underscores the spiritual importance of the Ganga. It highlights how the river is revered not only for its physical presence but also for its profound spiritual symbolism in Hinduism.

Synonymous with Himalayas: The Ganga River is closely associated with the majestic Himalayan Mountains, often described as their necklace. This association evokes a sense of spiritual sanctity and purity, as Hindu culture considers both the Himalayas and the Ganga sacred.

Spiritual Symbolism: According to Hindu scriptures and hymns, Ganga is revered as a divine river flowing through heaven and earth. It is believed to have purifying and benedictory

qualities, capable of washing away sins and bestowing spiritual upliftment.

Description by Rishi Valmiki: Rishi Valmiki's depiction of Ganga captures its majestic journey—from descending from heaven, gracing Lord Shiva's matted locks, flowing through the earth, and ultimately merging into the ocean. This portrayal emphasizes Ganga's role in purifying the soul and cleansing sins.

In essence, the Ganga River transcends its physical existence to embody a spiritual and cultural icon in India. It has not only shaped the geographical landscape but also influenced the spiritual and philosophical fabric of the region, making it a source of inspiration and reverence for millions over millennia.

CULTURAL SIGNIFICANCE

The Ganga River holds immense religious significance for Hindus and Sikhs, serving as the



focal point for numerous festivals and rituals throughout the year.

Kumbh Mela: Held every twelve years in four major locations—Haridwar, Prayagraj (formerly Allahabad), Ujjain, and Nashik—the Kumbh Mela is the largest religious gathering on Earth. Devotees gather to take a holy dip in the Ganga, seeking spiritual purification and blessings.

Ardh Kumbh: A smaller version of the Kumbh Mela, known as Ardh Kumbh, is held every six years in Haridwar and Prayagraj.

Ganga Dussehra: Celebrated on the Dashami Tithi (tenth day) of the Jyeshtha month in the Hindu calendar, Ganga Dussehra marks the descent of the Ganga from heaven to earth. Devotees perform rituals and take dips in the river to cleanse themselves of sins.

Magh Mela: Held annually on the banks of the Ganga, particularly in Prayagraj, the Magh Mela

lasts for 45 days starting from Makar Sankranti. Pilgrims gather to take holy dips and participate in religious activities.

Ganga Mahotsav: This five-day festival begins on Kartik Purnima and ends on Diwali. It is celebrated with cultural events, devotional music, and rituals along the banks of the Ganga.

Sawan Month and Kanwar Yatra: The month of Sawan (July-August) is considered highly auspicious for Shiva devotees. During this time, millions of Kanwariyas (devotees of Lord Shiva) carry holy water from the Ganga and walk long distances to pour it over Shivalingas in their hometowns.

Sikh Festivals: Sikh communities also celebrate festivals along the Ganga, such as Dev Parva or Prakash Parva, which marks the birth anniversary of Guru Nanak Dev, the founder of Sikhism.



Hindu Funeral Rituals: It is believed that immersing the ashes of the deceased in the river ensures their soul attains moksha (liberation). Dedicated funeral pyres are located on riverbanks called ghats, where cremations take place amidst sacred chants and rituals.

Among all these, the other common ritual in the Ganga River is "Aarti," or prayer, is the major event that takes place at every Ghat along the river every morning and evening. It is a notable occasion that is mostly known in the Ghats of Rishikesh, Haridwar, and Varanasi. All kinds of 'Havans' or 'Yogas', including the *Ganga Puja*, *Laghurudra*, *Maharudra*, *Atirudra*, *Durgapuja*, *Laxchandi*, *Navchandi*, *Gayatri*, *Bhoomi*, *Shilanyas*, *Murti Partishtha*, *Vastu*, *Grah Shanti*, *Nakshtra*, *Lalsrap*, *Shradh Karma*, *Narayanbali*, and *Shivlingam Abishek*, as well as the *Namkaran*, *Vivah*, and *Antimsamsakra*

perform along the river. In addition to this, Ganga Ghats are used for various rituals such as *Pitra Dosha*, *Kalsarp Yoga*, *Shani Dosha*, *Manglik Dosha*, *Alpayu Yoga*, *Mrityu Yoga*, and other rituals.

Millions of people have a profound spiritual connection to the Ganga River, which is highlighted by these festivals and customs. They are not just times for religious observance but also chances for intercultural dialogue and communal peace among various cultures. Millions of Hindus rely on the Ganga River as a spiritual vitality because it provides a means of purification, spiritual rejuvenation, and moksha. Hindu tradition regards its waters as sanctifying and cleansing, thereby elevating it to the status of a symbol of heavenly grace and everlasting spirituality.



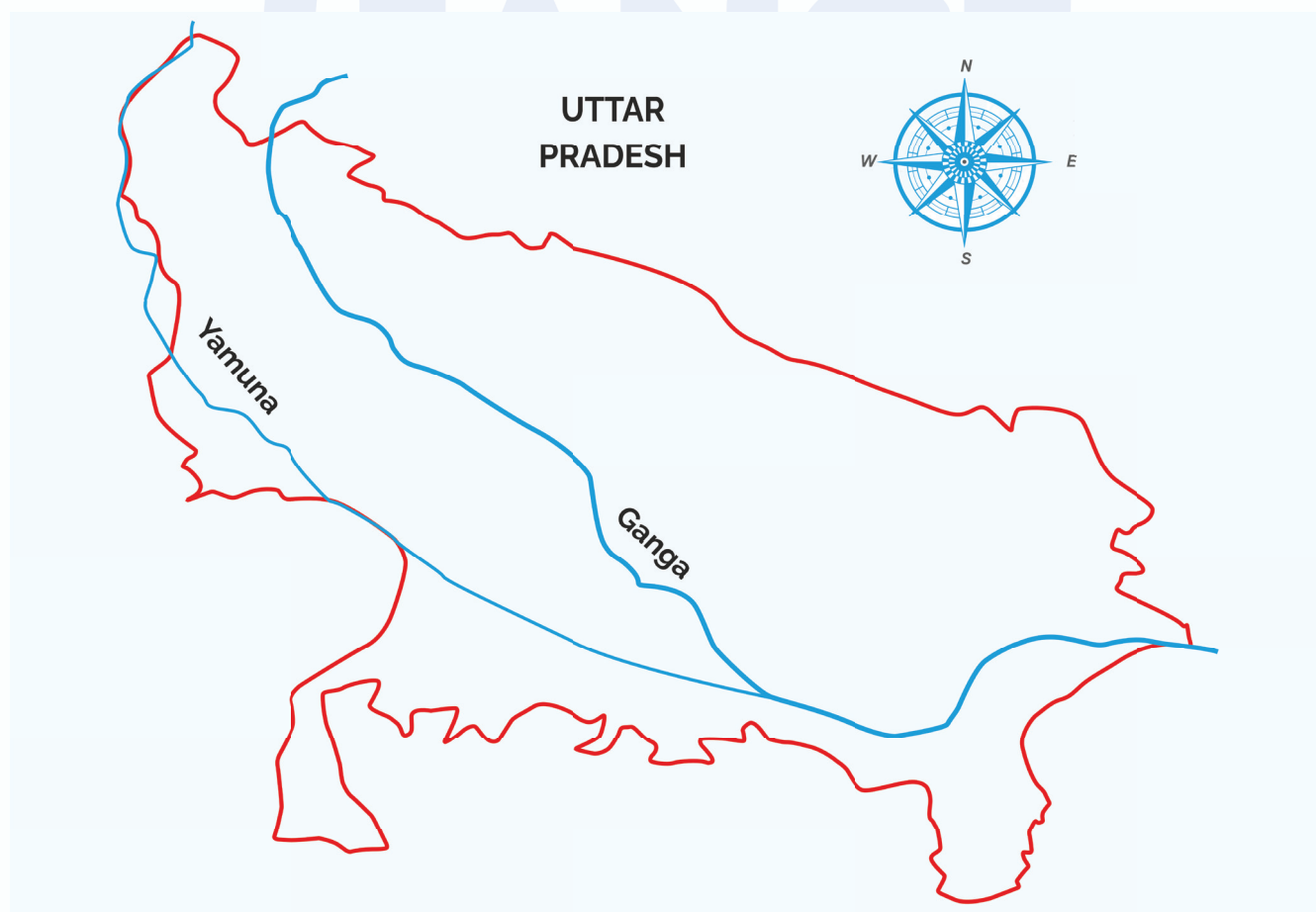


THE GANGA RIVER IN UTTAR PRADESH

Almost two-thirds of Uttar Pradesh's land is covered by the Ganga basin, which is the state's major drainage zone. It includes the Yamuna, Ghaghara, and Gomti, among other significant tributaries of the Ganga. Known for its fertile alluvial plains, this area is home to some of the state's most populated towns, including as Varanasi, Prayagraj, and Kanpur. It enters the state from Bijnor district and from here; it goes out of the state via Garhmukteshwar, Badaun, Farrukhabad, Kannauj, Kanpur, Bithoor, Prayagraj, Mirzapur, and Ghazipur. The Ganga River in Uttar Pradesh is about 1000 km in length, with a population density of 828 people.km⁻²; its catchment area is home to 687 industries; its water consumption is about 693 megaliters per day (MLD); and its wastewater discharge

is around to be about 269 MLD. Ganga flows through cities despite having a great positive influence on them.

Diverse plant and animal life may be found along the riverbanks. Due to the extreme fertility of the alluvial soil along the Ganga, wheat, rice, sugarcane, and a wide range of fruits and vegetables may be grown there. Organic farming is becoming more and more popular because it supports sustainable agriculture, preserves the health of the soil, and minimizes chemical runoff into rivers. Daily prayers, celebrations, and ceremonies around the banks of the Ganga are all part of the many religious activities that are deeply ingrained in the culture. The river is revered in Hinduism and is seen as both a celestial being and the purifier of sins.





TRIBUTARIES

In Uttar Pradesh, the Ganga has tributaries on both banks. The Yamuna and Son are tributaries on its right bank, while some left-bank tributaries are Kosi, Gandak, Ghaghara, and Gomti. It is India's biggest river system. Here are the major tributaries are as follows:

Yamuna River: The Yamuna is the Ganga's most important tributary. This river, which is 1,444 km long, joins the Ganga at Prayagraj's Triveni Sangam, a very sacred location, especially during the Kumbh Mela festivals. The Yamuna is bigger than the Ganges at its confluence, delivering approximately 58.5% of the total flow with an average flow of 2,948 m³/s (104,100 cu ft/s).

Ghaghara River: This river, which is 1,156 km long merges into Ganga near Chapra, Bihar. It flows southward from the Himalayas of Tibet via Nepal. With an average yearly flow of around 2,991 m³/s (105,600 cu ft/s). The Ghaghara (Karnali) is the Ganges' greatest tributary in terms of discharge.

Gomti River: The Gomti River (625 km long), which originates in the Himalayas and flows entirely within Uttar Pradesh and joins the Ganga near the town of Saidpur in Ghazipur district. It passes through Lucknow, the state capital, where it serves as a critical water source. Approximately 234 m³/s (8,300 cu ft/s) is the average annual flow contributed by the Gomti.

Ramganga River: The Ramganga River, originating from the lower Himalayas, flows through the western part of Uttar Pradesh and joins the Ganga near Kannauj, adds an average yearly flow of 495 m³/s (17,500 cu ft/s) to the river along the route. It is essential for irrigation and local water supply.

Sone River: Although primarily flowing through Bihar, the Sone River is a significant southern tributary of the Ganga. It joins the Ganga near Patna after flowing along the border of Uttar Pradesh and Bihar.

Kali River (West): Also known as the Sharda River, it originates in the Himalayas and flows through the western part of Uttar Pradesh before merging with the Ganga.

Varuna River: A smaller tributary, the Varuna River flows through Varanasi and joins the Ganga near the city. The river holds cultural and historical significance in the region.

Tamsa (Tons) River: The Tamsa River originates in the Kaimur Range of Madhya Pradesh, flows through Uttar Pradesh, and merges with the Ganga near Varanasi.

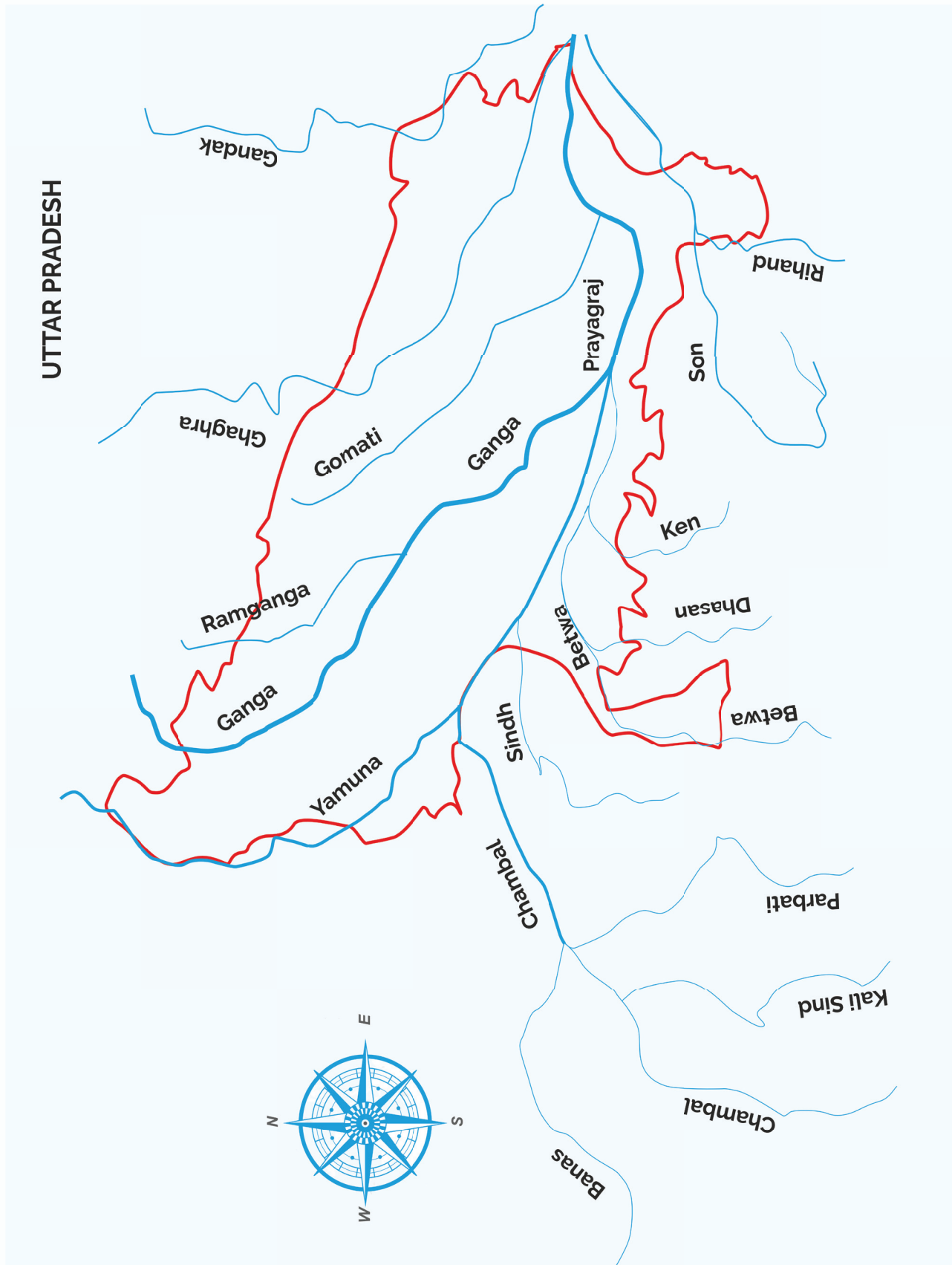
VARIOUS COMMUNITIES AROUND THE GANGA RIVER

In Uttar Pradesh, several communities rely on the Ganga River for their livelihoods, culture, and daily needs. These communities include:

Farmers: Agriculture is a primary occupation in the region, with farmers depending on the Ganga for irrigation. The fertile plains of the Ganga support the cultivation of crops like wheat, rice, sugarcane, and various vegetables. Along the Ganga River in Uttar Pradesh, farmers belong to diverse communities, castes, and socio-economic backgrounds. Various state and central government schemes aim to support farmers with subsidies, loans, crop insurance, and infrastructure development.

Fisherfolk: Fishing communities depend on the Ganga for their daily catch, which is a significant source of food and income. The fisherfolk play a vital role in the local economy and culture. Fisherfolk communities have traditionally lived along the banks of the Ganga, relying on the river for their livelihoods. They include various caste and community groups, often with distinct fishing practices and cultural traditions.

Boatmen: They operate various types of boats, including traditional wooden boats (like rowboats and country boats) and motorized





boats. They offer transportation services for passengers, goods, and livestock across the river, an essential part of the local economy and connectivity. The Kewat, Mallah, and Nishad communities are involved in fishing and boating. They have the traditional knowledge and techniques for fishing and navigating the river.

Artisans and Craftsmen: Many traditional artisans and craftsmen live along the Ganga, creating products such as pottery, textiles, and handcrafted goods that are often linked to the cultural heritage of the area. Artisans often inherit their skills and techniques from their families and communities, preserving traditional craftsmanship and cultural practices. They generate income through the sale of their products in local markets, tourist areas, and sometimes through export markets.

Pilgrims and Religious Communities: The Ganga is considered sacred in Hinduism, and several towns along its banks, such as Varanasi, Prayagraj, and Kanpur, are significant religious centers. These places attract pilgrims and support communities involved in religious activities, rituals, and ceremonies.

Urban Residents: Cities and towns along the Ganga, have large urban populations that rely on the river for water supply, sanitation, and other daily needs.

Tribal Communities: Certain tribal groups live in the regions surrounding the Ganga, relying on the river for fishing, agriculture, and traditional practices.

Industrial Workers: In industrial cities like Kanpur, the Ganga provides water for various industries, and the river is integral to the livelihoods of workers in these sectors.

ETHNIC ASPECTS OF RIVER GANGA

The Ganga River in Uttar Pradesh is not only a crucial natural resource but also a significant cultural and ethnic landmark that

has shaped the lives of various communities along its banks. The ethnic aspects of the Ganga encompass a diverse array of cultural, religious, and social practices that reflect the deep connection between the river and the people who live nearby. Here's an overview of the ethnic aspects related to the Ganga River in Uttar Pradesh:

➔ Cultural and Religious Significance

- **Hinduism:** The Ganga is considered one of the holiest rivers in Hinduism. Numerous ghats (steps leading to the river) in cities like Varanasi, Prayagraj, and Kanpur are sites of daily rituals, prayers, and significant religious ceremonies such as the Kumbh Mela, Ganga Aarti, and the immersion of ashes.
- **Festivals and Rituals:** Major Hindu festivals such as Diwali, Chhath Puja, Makar Sankranti, and Kartik Purnima involve rituals performed on the banks of the Ganga. These festivals draw millions of devotees from various ethnic backgrounds. The Kumbh Mela, held in Prayagraj, is the largest religious gathering globally, where millions of pilgrims bathe at the confluence of the Ganga, Yamuna, and Saraswati rivers.
- **Pilgrimage:** The river is a major pilgrimage site, attracting devotees who seek purification and blessings. Cities like Varanasi and Prayagraj are renowned for their spiritual significance and attract pilgrims from across India and the world.

➔ Economic Livelihoods

- **Agriculture:** The Ganga's alluvial plains are extremely fertile, supporting intensive agriculture. The communities along the Ganga engage in agriculture,

relying on the river's water for irrigation and livelihoods.

- **Fishing:** The communities such as Mallahs, Kewats, and Nishads rely on fishing as a primary source of livelihood. They catch fish for local consumption and sale in markets.
- **Tourism:** The Ganga's cultural and natural heritage attracts tourists, contributing to the local economy through hospitality services, handicrafts, and cultural exchanges. Tourism related to religious festivals, rituals, and ceremonies provides significant income to local residents. Tourists are drawn to the cultural heritage, historical sites, and scenic beauty of the Ganga. This has led to the growth of businesses such as hotels, restaurants, guides, and souvenir shops.

The Ganga River in Uttar Pradesh is not just a geographical feature but a dynamic cultural entity integral to the lives, beliefs, and traditions of the people. Its importance transcends environmental and economic considerations, embodying a profound spiritual and ethnic heritage that continues to shape local identities and practices.

EMPLOYMENTS ALONG THE GANGA RIVER

Employment opportunities along the Ganga River in Uttar Pradesh are varied and span multiple sectors due to the river's significant impact on the region's economy, culture, and ecology. Here is a thorough examination of the many jobs available in Uttar Pradesh around the Ganga River:

- **Agriculture:** The fertile plains of the Ganga support intensive agriculture. Employment opportunities include cultivating crops such as wheat, rice, sugarcane, and vegetables.





Many people find work as laborers on farms, involved in planting, harvesting, and processing crops.

- **Fishing and Aquaculture:** Traditional fishing is a major source of livelihood. Fishermen catch various species of fish for local consumption and markets. The aquaculture or fish farming provides additional employment opportunities, including the management and operation of fish farms.
- **Transportation:** Boatmen (Mallahs, Kewats) operate ferries and boats, providing essential transportation services across the river. Riverine trade involves transporting goods via boats, creating jobs for boat operators and logistics handlers.
- **Tourism and Hospitality:** Millions of pilgrims visit places like Prayagraj and Varanasi every year. Jobs at restaurants, lodging establishments, hotels, and tour guides are among the employment options. Businesses that serve visitors, local guides, and craftspeople all contribute significantly to employment.
- **Religious Services:** Numerous people perform ceremonies, oversee temples, and assist pilgrims in their religious endeavors. The majority of those who plan and oversee religious festivals and activities generate both temporary and permanent employment.
- **Handicrafts and Artisanal Work:** Varanasi is famous for its Varanasi sarees. Weaving and textile production employ many artisans. Pottery making and selling clay products offer livelihoods to artisans. Creating metal goods and jewelry supports artisans and small-scale manufacturers.
- **Industrial Employment:** Industrial cities like Kanpur provide jobs in leather processing,



textiles, chemicals, and other manufacturing sectors. Small and medium enterprises in various sectors, including food processing and garment manufacturing, offer employment opportunities.

- **Environmental and Conservation Work:** Government initiatives like the Namami Gange program create jobs in river clean-up and environmental conservation efforts. Sustainable fishing and agriculture encourage environmentally beneficial ways and generate jobs in the monitoring, training, and use of sustainable practices.
- **Government and Administrative Jobs:** Jobs in government agencies that regulate and manage the river's resources, including water management, pollution control, and environmental protection. Employment in public services such as education, healthcare, and infrastructure development along the river.
- **Education and Research:** Schools and colleges along the Ganga provide teaching and administrative jobs. Opportunities in research institutions focused on studying the river's ecology, hydrology, and socio-economic impact.

SOCIO-ECONOMIC ISSUES ALONG THE GANGA RIVER

The communities living along the Ganga River in Uttar Pradesh face a variety of socio-economic issues that impact their livelihoods, health, and overall well-being. These issues are intertwined with environmental challenges and socio-political dynamics. Here's an overview of the key socio-economic issues:

- **Environmental issues:** Industrial discharge, untreated sewage, agricultural runoff, and religious offerings contribute to severe

pollution in the Ganga, affecting water quality and public health. The water scarcity due to over-extraction of water for agriculture and urban needs leads to reduced water flow, impacting agriculture, fisheries, and drinking water supplies.

- **Health Issues:** Polluted water is a major cause of waterborne diseases such as cholera, dysentery, and hepatitis, posing a significant health risk to communities. Lack of proper sanitation facilities contributes to the contamination of the river and exacerbates health problems, particularly in rural areas.
- **Economic Vulnerability:** Many communities rely heavily on agriculture, which is vulnerable to changes in river flow, pollution, and climate change, leading to economic instability. Pollution and overfishing reduce fish populations, threatening the livelihoods of fishing communities.
- **Socio-Economic Marginalization:** High levels of poverty are prevalent among river-dependent communities, limiting access to education, healthcare, and other essential services. Marginalized groups, including Scheduled Castes and Scheduled Tribes, often face social discrimination and have fewer opportunities for economic advancement.
- **Cultural and Religious Challenges:** Traditional religious practices, including cremation and offerings, contribute to pollution, creating a tension between cultural practices and environmental sustainability. Large-scale pilgrimages strain local resources and infrastructure, leading to environmental degradation and public health concerns.
- **Climate Change:** Climate change increases the frequency and intensity of floods



and droughts, disrupting livelihoods and causing displacement. Erosion of riverbanks due to changing water patterns threatens agricultural land, homes, and infrastructure.

The socio-economic issues along the Ganga River in Uttar Pradesh are complex and multifaceted, requiring integrated approaches that address environmental, health, economic, and social dimensions. Sustainable management of the river and targeted interventions to support vulnerable communities are crucial for improving livelihoods and ensuring the long-term well-being of the region.

MAJOR TOWNS AND CITIES ALONG THE GANGA RIVER

The Ganga River flows through several major towns and cities in Uttar Pradesh, each with its own historical, cultural, and economic significance. Here are some of the major towns and cities along the Ganga River in Uttar Pradesh:

- **Bijnor:** It is located in the northwestern part of Uttar Pradesh where a barrage is constructed to divert Ganga water into the
- **Narora:** It is known for the Narora Atomic Power Station. The town has importance due to its location along the Ganga and its contribution to the energy sector. A barrage is located at Narora, where the Lower Ganga Canal is constructed.
- **Kannauj:** An ancient city with a rich history dating back to the time of the Mahabharata. It is famous for its perfume (attar) industry and historical sites. 14 km before Kannauj the Ramganga River merges with the Ganga River.
- **Kanpur:** It is one of the major industrial hubs of Uttar Pradesh and known for its leather and textile industries, Kanpur also has significant educational institutions like the Indian Institute of Technology (IIT) Kanpur.
- **Prayagraj:** One of the holiest cities in Hinduism, known for the Triveni Sangam, the confluence of the Ganga, Yamuna, and the

Madhya Ganga Canal mainly during the monsoon season. Bijnor has historical and cultural relevance, with agriculture being a significant part of the local economy.



mythical Saraswati rivers. The description of the importance of Prayagraj is mentioned in our religious wisdom such as the Ramayana and the Mahabharata. It hosts the Kumbh Mela, one of the largest religious gatherings in the world. The city is also an administrative and educational center.

- **Varanasi (Kashi):** It is one of the oldest continuously inhabited cities in the world and a major religious hub it believed to be the city that owes its birth to Lord Shiva. It is famous for its ghats, temples, and as a center of learning and culture. Varanasi is a key destination for pilgrims and tourists alike.
- **Mirzapur:** It is known for its carpet and brassware industries. The famous Vindhyachal Temple and other scenic spots along the river are the significance of the Mirzapur.
- **Ghazipur:** Historically it is well known for producing opium and agriculture. The city is significant for its importance in trade and commerce along the Ganga and for its numerous historical structures.
- **Ballia:** It is a historically important city, often referred to as the "Land of

Revolutionaries". Agriculture is the mainstay of the economy, and the city is known for its cultural heritage.

The other important towns in Uttar Pradesh along the Ganga River include Garhmukteshwar, Fatehpur, Chunar, etc. In addition to their economic significance, these Ganga River-front towns and cities in Uttar Pradesh are noteworthy for their cultural and religious significance. They are an essential component of the state's socioeconomic structure, with each place making a distinct contribution to the history and advancement of the area.

MAJOR TOWNS AND CITIES ALONG THE GANGA'S TRIBUTARIES

The Ganga River in Uttar Pradesh is fed by several significant tributaries, each with its own network of towns and cities that play vital roles in the state's socio-economic landscape. These towns and cities along the Ganga's tributaries in Uttar Pradesh are essential to the state's economic, cultural, and religious life. They offer a glimpse into the diverse activities and traditions that thrive along these rivers, contributing to the overall richness of the region. Here are some major towns and cities along the Ganga's tributaries in Uttar Pradesh:





- **Yamuna River:** Mathura, Agra, Firozabad, Etawah, Kalpi, Prayagraj
- **Ghaghara River:** Ayodhya, Gonda
- **Gomti River:** Lucknow, Sultanpur, Jaunpur, Lakhimpur Kheri, Misrikh, Zafarabad
- **Rapti River:** Gorakhpur, Balrampur
- **Saryu River:** Ayodhya, Gola, Badhalganj, Barhaj
- **Betwa River:** Jhansi
- **Ken River:** Banda
- **Chambal River:** Etawah
- **Ramganga River:** Bareilly, Moradabad, Kannauj
- **Agricultural Runoff:** The use of fertilizers and pesticides in agriculture leads to runoff that carries these chemicals into the river, affecting water quality and harming aquatic ecosystems.
- **Water Extraction:** Excessive extraction of water for irrigation and drinking purposes reduces the flow of the river, affecting its ability to dilute pollutants and support aquatic life.
- **Encroachment and Sand Mining:** Encroachment along the riverbanks and illegal sand mining activities disrupt the natural flow of the river, leading to erosion and habitat destruction.
- **Climate Change:** Changes in weather patterns due to climate change have led to irregular rainfall and reduced water levels in the river, exacerbating the impact of pollution and affecting the river's health.
- **Lack of Proper Waste Management:** Inefficient waste management systems in urban and rural areas contribute to the accumulation of waste in the river.
- **Deforestation:** The cutting down of trees along the riverbanks leads to soil erosion, which in turn causes sedimentation in the river, affecting its flow and quality.
- **Lack of Awareness and Education:** Insufficient public awareness and education about the importance of keeping the river clean and the impact of pollution contribute to the ongoing challenges.

CHALLENGES FACING THE GANGA RIVER

The Ganga River in Uttar Pradesh faces several challenges that threaten its ecological health, cultural significance, and the livelihoods of communities dependent on it. Here are some of the key challenges:

- **Pollution:** Industrial waste, agricultural runoff, and untreated sewage are major sources of pollution. Many factories discharge effluents directly into the river, contaminating the water with harmful chemicals.
- **Solid Waste:** Large amounts of solid waste, including plastic and other non-biodegradable materials, are dumped into the river. This not only pollutes the water but also affects aquatic life.
- **Religious Practices:** Rituals such as immersing idols and throwing religious offerings into the river contribute to pollution. Additionally, human cremations along the riverbanks result in the disposal of partially burnt bodies into the water.

Addressing these challenges requires a combination of government policies, community involvement, stricter enforcement of environmental laws, and increased public awareness and education.





VEGETATION ALONG THE GANGA RIVER IN UTTAR PRADESH

The many ecological zones in the area have formed the distinctive and varied flora along the Ganga River in Uttar Pradesh. The vegetation of the state of Uttar Pradesh is divided into three categories: unclassified forest (19.7%), protected forest (14.4%), and reserved forest (64.9%). The three types of tropical forests that cover the state are tropical dry deciduous, tropical moist deciduous, and tropical thorn. In Uttar Pradesh, the Ganga River flows through a number of different ecological zones, each having unique traits and environmental value. The primary ecological zones of Uttar Pradesh along the Ganga River are as follows:

Moist Deciduous Forests: The forests around Bijnor and the neighboring territories, where the river enters Uttar Pradesh, are the main parts of this forest. These regions are known for their damp deciduous forests and leafless trees, which occur throughout winter. Sal

(*Shorea robusta*), the most common tree, may reach a canopy height of 25 to 35 meters. These forests' physiognomy is influenced by the soil, geography, geology, and climate of the area. On higher, more stable alluvial terraces, well-established forests are more common; in contrast, riverine habitats are more vulnerable to erosion and floods. Rich and fertile soil in these woodlands supports extensive agricultural activity. This area has a mixture of riparian vegetation, agricultural land, and forest parts. The major trees include *Terminalia tomentosa*, *Terminalia belerica*, *Lagerstroemia parviflora*, *Adina cordifolia*, *Dillenia pentagyna*, *Stereospermum suaveolens*, and *Ficus* spp. are characteristics in this region.

Tropical Dry Deciduous Forests: Where there is an annual rainfall of 50 to 100 cm, these dense forests flourish. These forests' principal habitats are the plains of the Yamuna, Ganga, and their





tributaries. While they are more common in the Eastern, Central, and Western parts of the plains, these forests are found throughout the plains. These trees are mostly deciduous. Large tracts of these forests have been cleared for cultivation. Valuable trees such as *Shorea robusta*, *Butea monosperma*, *Cassia fistula*, *Aegle marmelos*, and Figs may be found in these forests. Plants such as *Azadirachta indica*, *Ficus religiosa*, *Dalbergia sissoo*, *Mangifera indica*, *Syzygium cumini*, *Vachellia nilotica*, *Tamarindus indica*, and others thrive in moist places, close to rivers.

Tropical Thorny Forests: These forests grow in areas that get 50 to 75 cm of precipitation annually. These forests are largely covered with spurge, prickly legumes, and thorny trees, mainly babool. Here, after rain, short grasses also grow well. Wide, dry forests with little trees are common in this area. Valuable tree species including *Acacia modesta*, *Senegalia catechu*, *Grewia tiliifolia*, *Azadirachta indica*, etc. may be

found in these woodlands. Numerous varieties of gum and resin are derived from these plants. These forests cover a large area of southern Uttar Pradesh, encompassing the cities of Mirzapur, Jhansi, Lalitpur, Mahoba, Banda, Chitrakoot, and Jalaun.

Riparian Vegetation: Riverine vegetation, which includes grasslands, reed beds, and a variety of aquatic plants, may be found along the banks of the Ganga River itself, particularly in the plains and lower hills. These offer home to a variety of birds and fauna. The amphibious species of *Ammannia* spp., *Eclipta* spp., *Polygonum* spp., *Ipomoea* spp., *Rumex* spp., *Saccharum* spp., *Scirpus* spp., and *Tamarix* spp. are among the riparian macrophytes found in the Narora-Kannauj area. The riparian vegetation of Mirzapur-Ballia region species like *Achyranthes aspera*, *Ageratum conyzoides*, *Alhagi pseudalhagi*, *Amaranthus spinosus*, *Argemone Mexicana*, *Calotropis procera*, *Chenopodium album*, *Convolvulus arvensis*, *Convolvulus microphyllus*,



Crotalaria medicaginea, *Croton bonplandianum*, *Croton sparciflorus*, *Cynodon dactylon*, *Desmodium triflorum*, *Dichanthium annulatum*, *Eclipta alba*, *Eclipta Prostrata*, *Euphorbia hirta*, *Euphorbia thymifolia*, *Evolvulus alsinoides*, *Grangea madersapatana*, *Heliotropium indicum*, *Launaea asplenifolia*, *Melilotus indica*, *Phylla nodiflora*, *Polygonum plebeium*, *Ranunculus scleratum*, *Ricinus communis*, *Rumex dentatus*, *Saccharum munja*, *Saccharum spontaneum*, *Tridax procumbens*, *Xanthium strumarium*.

THE RIPARIAN FLORA AND ITS INFLUENCE ON THE GANGA RIVER

The riparian flora along the Ganga River in Uttar Pradesh is a rich tapestry of plant life that plays a vital role in maintaining the ecological balance and supporting local communities. This diverse vegetation includes a variety of medicinal plants, trees, shrubs, and aquatic species, each contributing uniquely to the health of the riverine

ecosystem. With their unique environmental conditions, the banks of the Ganga in Uttar Pradesh provide a nurturing ground for this flora, which thrives in moist, nutrient-rich soil and fluctuating water levels.

Among the notable medicinal plants along the Ganga River are *Terminalia arjuna*, *Bacopa monnieri*, *Asparagus racemosus*, *Centella asiatica*, and *Tinospora cordifolia*. *Terminalia arjuna*, commonly known as Arjuna, is a large tree with bark traditionally used to treat heart diseases. *Bacopa monnieri* or Brahmi, is a creeping herb found in wet, marshy areas and is highly valued in Ayurveda for its cognitive-enhancing properties. *Asparagus racemosus*, known as Shatavari, is a climbing plant known for its roots, which support female reproductive health. *Centella asiatica* or Gotu Kola, is a herb with rejuvenating and wound-healing properties, commonly found in wetlands. *Tinospora cordifolia*, also known as Giloy, is a climber with significant immunomodulatory properties.





In addition to medicinal plants, the Ganga's riparian zone is home to various aquatic and semi-aquatic plants, such as *Nelumbo nucifera* (Indian Lotus), *Typha angustifolia* (Cattail), and *Hydrilla verticillata*. The Indian Lotus, revered in Indian culture, thrives in the slow-moving waters of the Ganga and is used in traditional medicine and cuisine. Cattails are important for their role in water filtration and habitat provision, while *Hydrilla verticillata* helps maintain water quality by providing a habitat for aquatic life.

The riverbanks also support a variety of trees and shrubs, including *Mangifera indica* (Mango), *Ficus religiosa* (Peepal Tree), and various bamboo species. Mango trees are valued not only for their fruit but also for the shade they provide. The Peepal Tree holds significant religious and medicinal value. Bamboo species play a crucial role in soil stabilization and serve as a resource for local communities.

The ecological significance of this riparian flora cannot be overstated. The roots of these plants help bind the soil, preventing erosion and maintaining the integrity of the riverbanks. Many aquatic plants act as natural filters, removing pollutants from the water and improving its quality. Additionally, these plants provide essential habitats and food sources for a wide range of wildlife, including birds, insects, and aquatic organisms, thereby supporting biodiversity.

However, the riparian flora of the Ganga faces numerous challenges, including pollution from industrial discharge, agricultural runoff, and domestic waste. Deforestation and habitat destruction due to urbanization and agricultural expansion pose significant threats to these ecosystems. Climate change also impacts the river flow and the health of the riparian vegetation. To combat these challenges, efforts



are being made to conserve and restore riparian flora through afforestation programs, pollution control measures, and community involvement in conservation activities. Recognizing the medicinal value of these plants also promotes their sustainable use and preservation, ensuring that the Ganga's riparian ecosystems continue to thrive for generations to come.

- **Ecological Significance:** The riparian flora of the Ganga River plays a crucial role in preventing soil erosion. The extensive root systems of these plants bind the soil, reducing the risk of erosion and maintaining the integrity of the riverbanks. Aquatic plants act as natural filters, absorbing pollutants and improving water quality. This flora also provides habitat and food for a wide range of wildlife, including birds, insects, and aquatic organisms, thus supporting biodiversity.
- **Influence on Local Communities:** The riparian vegetation is invaluable to the local communities living along the Ganga. Many

of the medicinal plants are harvested and used in traditional medicine, contributing to the health and well-being of these communities. Trees and shrubs provide fruits, shade, and wood, which are essential for daily living. Additionally, the aesthetic and cultural value of these plants enhances the spiritual and cultural practices of the people living in the region.

- **Habitat Creation and Biodiversity:** The riparian zone provides diverse habitats for wildlife, including birds, fish, amphibians, and insects. It serves as a corridor for species movement and supports breeding, nesting, and foraging activities. The variety of vegetation types, from dense forests to grasslands, supports a rich biodiversity that contributes to the ecological health of the river.
- **Nutrient Cycling and Productivity:** Riparian plants contribute organic matter and nutrients to the river ecosystem through



leaf litter and detritus. Decomposition processes driven by microorganisms help cycle nutrients back into the ecosystem, supporting productivity and food webs in the river and adjacent habitats.

- **Challenges and Conservation Efforts:** Despite its importance, the riparian flora of the Ganga faces significant threats. Pollution from industrial discharge, agricultural runoff, and domestic waste is a major challenge. Deforestation and habitat destruction due to urbanization and agricultural expansion further threaten these ecosystems. Climate change, with its impact on river flow and weather patterns, also poses a risk. Efforts to conserve and restore the riparian flora include afforestation programs, pollution control measures, and active community involvement in conservation activities. Recognizing the medicinal and ecological value of these plants promotes their sustainable use and preservation.

ECOLOGICAL PERSPECTIVE OF PLANT WEALTH ALONG THE GANGA RIVER

The plant wealth along the Ganga River in Uttar Pradesh plays a pivotal role in maintaining ecological balance and sustaining the health of the riverine and surrounding ecosystems. This diverse flora, which includes medicinal plants, trees, shrubs, and aquatic species, significantly influences various ecological processes and interactions within the Ganga River basin.

- **Biodiversity Support:** The riparian zones of the Ganga are characterized by a rich diversity of plant species that contribute to the overall biodiversity of the region. The variety of plants supports a wide range of animal species, including birds, insects, mammals, and aquatic organisms. For instance, the trees and shrubs provide critical habitats and food sources for wildlife. *Mangifera indica* (Mango) trees

offer food for birds and insects, while *Ficus religiosa* (Peepal Tree) provides shelter and sustenance for various species. Aquatic plants like *Nelumbo nucifera* (Indian Lotus) and *Typha angustifolia* (Cattail) support diverse aquatic life forms, including fish and amphibians.

- **Soil Stabilization and Erosion Control:** The riparian vegetation along the Ganga River plays a crucial role in soil stabilization and erosion control. The extensive root systems of trees, shrubs, and grasses bind the soil together, reducing the risk of erosion and preventing sediment from entering the river. This is particularly important in maintaining the structural integrity of riverbanks and preventing the loss of fertile topsoil. For example, the roots of bamboo species and *Typha angustifolia* help stabilize the soil along the riverbanks, mitigating erosion caused by water flow and human activities.
- **Water Quality Maintenance:** Aquatic and semi-aquatic plants contribute significantly to the maintenance of water quality in the Ganga River. Plants like *Hydrilla verticillata* and various species of submerged and floating vegetation act as natural filters by absorbing pollutants, excess nutrients, and contaminants from the water. This process, known as phytoremediation, helps in reducing the levels of harmful substances and improving the overall health of the aquatic ecosystem. Additionally, the decomposition of plant matter provides organic material that supports microbial communities essential for nutrient cycling.
- **Climate Regulation:** The riparian flora along the Ganga contributes to climate regulation in several ways. Trees and vegetation in the riparian zones act as

carbon sinks, sequestering carbon dioxide from the atmosphere and helping mitigate the effects of climate change. The presence of dense vegetation also influences local microclimates by providing shade, reducing temperature fluctuations, and increasing humidity. This is particularly beneficial in regulating the temperature of the riverine environment and maintaining favorable conditions for both plant and animal life.

- **Cultural and Spiritual Significance:** Beyond their ecological functions, the plants along the Ganga River hold significant cultural and spiritual value. Many plant species are deeply embedded in local traditions, religious practices, and cultural rituals. For example, the Indian Lotus (*Nelumbo nucifera*) is revered in Hindu and Buddhist traditions, symbolizing purity and enlightenment. The Peepal Tree (*Ficus religiosa*) is considered sacred and is associated with various deities in Hinduism. This cultural connection fosters a sense of stewardship and conservation among local communities, highlighting the importance of preserving the plant wealth along the river.

SACRED GROVES ALONG THE GANGA RIVER

Sacred groves along the Ganga River in Uttar Pradesh represent a unique and culturally significant aspect of the region's environmental and spiritual heritage. These groves are areas of forested land that are preserved due to their religious and cultural importance. They play a crucial role in both biodiversity conservation and community practices, reflecting a harmonious relationship between local traditions and environmental stewardship.



- **Sacred Groves:** Sacred groves, or "sacred forests," are forested patches that are protected and venerated by local communities due to their association with religious beliefs and cultural traditions. These groves are often dedicated to deities, spirits, or ancestral figures, and they serve as places of worship, ritualistic practices, and spiritual reflection. The preservation of sacred groves is deeply rooted in the cultural and religious practices of the communities living along the Ganga River. Some notable examples of sacred groves along the Ganga River in Uttar Pradesh are as follows:
 - **Sarnath Sacred Grove:** It is located near the town of Sarnath, this area is known for its historical and religious significance as the site where Gautama Buddha gave his first sermon. The surrounding grove, though not extensive, is preserved and venerated due to its association with Buddhist teachings.
 - **Varanasi Sacred Groves:** In the holy city of Varanasi, sacred groves can be found in and around temples and ghats. These groves are often associated with Hindu deities such as Lord Shiva, and they serve as places for meditation and religious rituals.
 - **Rajghat Sacred Grove:** Situated near Rajghat in Uttar Pradesh, this grove is associated with local religious practices and is preserved as a sacred site where rituals and offerings are made to local deities.
 - **Other Sacred Grove:** Among these several sacred groves are as in the Uttar Pradesh- Samay Mai Ka Sthan, Murtiha Range - Katarniya Ghat Division; Mota Baba, Katarniya Ghat Range - Katarniya Ghat Division; Pataal Choochi, Katarniya Ghat Range - Katarniya Ghat Division; Chakia

Maata, Chakia Range Bahraich; Bauri Samay, Nanpara Bahraich; Kapoore Baba, Nanpara Bahraich; Soonta Baba, Rupaideeha Bahraich; Samay Mai Ka Sthan, Bhinga Range – Shrivasti; Van Satti Devi, Bhinga Range – Shrivasti; Jagpati Dham, Kakadari Range – Shrivasti; Samay Mai Ka Sthan, Kuana Range - Gonda; Van Satti Devi, Kuana Range – Gonda; Son Pathari, East Sohelwa - Balrampur; Vibhuti Nath, East Sohelwa – Balrampur; Jangali Nath, Basthanwa Bahraich; Shivala bag, Nanpara Bahraich; etc.

- **Cultural and Spiritual Significance:** Sacred groves are deeply embedded in the cultural and spiritual life of communities along the Ganga River. They serve as places for:

- **Religious Worship:** These groves are often dedicated to deities or spirits, and they are used for religious ceremonies, rituals, and festivals. The protection of these groves is a way to honor and maintain the sacred relationship between the community and their deities.
- **Community Gatherings:** Sacred groves often serve as venues for community gatherings, cultural events, and traditional practices. They play a role in fostering community cohesion and preserving local traditions.
- **Spiritual Reflection:** The serene environment of sacred groves provides a space for meditation, prayer, and spiritual reflection, offering a connection to the divine and nature.





MEDICINAL PLANTS ALONG THE GANGA RIVER IN UTTAR PRADESH

The Ganga River, a vital watercourse flowing through Uttar Pradesh, India, is not only a symbol of spiritual and cultural significance but also a cradle of diverse botanical life, including a multitude of medicinal plants. These plants have been integral to traditional health practices and hold immense scientific interest due to their potential therapeutic properties. The rich alluvial soils and varied climatic conditions along the riverbanks create an ideal environment for the growth of a wide range of plant species, many of which have been utilized in traditional medicine systems like Ayurveda for centuries.

The medicinal flora along the Ganga River reflects a blend of ancient wisdom and modern scientific exploration. Historically, the plants found in this region have been deeply intertwined with local health practices, contributing to a well-established tradition of herbal medicine. Ancient Ayurvedic texts, such as the *Charaka Samhita* and *Sushruta Samhita*, document the use of these plants for treating various ailments, highlighting their significance in maintaining health and well-being.

In contemporary science, these traditional uses are being increasingly validated through rigorous research. Modern phytochemical studies have isolated and identified numerous bioactive compounds in these plants, confirming their efficacy in treating a range of health conditions. The scientific examination of plants like *Terminalia arjuna*, *Bacopa monnieri*, and *Withania somnifera* has revealed their potential in addressing cardiovascular diseases, cognitive disorders, and stress-related conditions, respectively.

The integration of traditional knowledge with modern scientific methods offers a comprehensive understanding of the medicinal plants along the Ganga River. This fusion of ancient practices and contemporary research not only underscores

the historical importance of these plants but also enhances their relevance in modern medicine. As research continues to uncover new therapeutic applications, the medicinal plants of the Ganga River region represent a valuable resource for developing effective treatments and promoting holistic health.

CULTIVATION OF MEDICINAL PLANTS ALONG THE GANGA RIVER

The cultivation of medicinal plants along the Ganga River in Uttar Pradesh is a vital practice that intertwines traditional knowledge with modern agricultural techniques. This region, blessed with fertile alluvial soils and a diverse climatic environment, provides an ideal setting for growing a wide array of medicinal herbs. These plants not only support local health practices but also contribute to sustainable development and economic growth.

Agro-Climatic Conditions and Soil Requirements

The Ganga River basin in Uttar Pradesh encompasses a variety of agro-climatic zones, ranging from humid subtropical to semi-arid regions. This diverse climatic range, combined with nutrient-rich alluvial soils, creates a favorable environment for the cultivation of medicinal plants. The alluvial soil, characterized by its high fertility and moisture retention, supports the growth of a broad spectrum of medicinal herbs. In the riverine floodplains and wetlands, plants that thrive in moist conditions can be successfully cultivated, while the drier regions accommodate those that require less water. The cultivation of medicinal plants along the Ganga River in Uttar Pradesh represents a harmonious blend of traditional knowledge and modern agricultural practices. By leveraging the region's favorable agro-climatic conditions

and implementing sustainable practices, this cultivation not only supports local health practices but also contributes to environmental conservation and economic development.

Sustainable Cultivation Practices

The adoption of sustainable cultivation practices is essential for maintaining the health of the ecosystem and ensuring the long-term viability of medicinal plant cultivation. Key practices include:

- **Soil Management:** To maintain soil fertility and prevent erosion, techniques such as mulching, composting, and crop rotation are employed. These practices help in sustaining the soil quality and promoting healthy plant growth.
- **Water Management:** Efficient irrigation methods, such as drip irrigation, are used to conserve water and minimize soil erosion. Proper water management is particularly

important for plants like Brahmi and Gotu Kola, which thrive in moist conditions.

- **Pest and Disease Control:** Integrated pest management (IPM) strategies are employed to manage pests and diseases. This includes using biological controls and organic pesticides to reduce the impact on the environment and ensure healthy plant growth.
- **Biodiversity Conservation:** Cultivating a diverse range of medicinal plants helps support local biodiversity and reduces the risks associated with monoculture. Practices such as companion planting and maintaining natural habitats contribute to ecological balance.

Economic and Social Impact

The cultivation of medicinal plants along the Ganga River provides significant economic





benefits. It offers livelihood opportunities for local farmers and supports the growth of the herbal medicine industry. By integrating traditional knowledge with modern agricultural practices, farmers can enhance their income and contribute to the local economy. Community-based initiatives, such as cooperatives, help in processing and marketing medicinal plants, ensuring fair trade and equitable distribution of benefits. Moreover, the cultivation of these plants supports rural development by enhancing agricultural productivity and providing alternative income sources. The practice helps in preserving traditional knowledge while fostering sustainable development in the region.

Challenges and Future Prospects

Despite the benefits, the cultivation of medicinal plants along the Ganga River faces several challenges:

- **Climate Change:** Variations in climate patterns can impact plant growth and productivity. Adapting cultivation practices to changing climatic conditions is essential for maintaining crop yields and quality.
- **Land Degradation:** Issues such as deforestation and soil degradation can affect the availability of suitable cultivation areas. Implementing sustainable land management practices is crucial to address these challenges.
- **Market Access:** Small-scale farmers may face difficulties accessing markets and fair trade opportunities. Building efficient supply chains and improving market access are important for the success of medicinal plant cultivation.

Looking ahead, the future prospects for medicinal plant cultivation include

the development of advanced cultivation techniques, expanded research on plant-based medicines, and the promotion of sustainable practices. Addressing these challenges and leveraging opportunities can ensure the continued growth and success of medicinal plant cultivation along the Ganga River.

COMMERCIAL AND ECONOMIC VALUE OF MEDICINAL PLANTS

The medicinal plants of Uttar Pradesh, particularly those cultivated along the Ganga River, hold substantial commercial and economic value. This value is rooted in their extensive use in traditional and modern medicine, their role in supporting local economies, and their contribution to sustainable agricultural practices. The integration of these plants into various industries, such as pharmaceuticals, cosmetics, and dietary supplements, has created significant economic opportunities for the region.

Market Demand and Economic Impact: The global demand for natural and herbal products has been steadily increasing, driven by a growing preference for organic and plant-based remedies. This trend has elevated the commercial value of medicinal plants cultivated in Uttar Pradesh. Key medicinal plants such as *Terminalia arjuna* (Arjuna), *Withania somnifera* (Ashwagandha), and *Bacopa monnieri* (Brahmi) are in high demand for their therapeutic properties. The economic impact of this demand is significant. Medicinal plant cultivation provides direct income to farmers and cultivators through the sale of raw materials. Additionally, it supports ancillary industries involved in the processing, packaging, and distribution of these products. Local economies benefit from job creation in both agricultural and non-agricultural sectors, thereby enhancing rural livelihoods.

Pharmaceutical Industry Integration: The pharmaceutical industry is one of the primary beneficiaries of the medicinal plant sector. Plants like Ashwagandha and Giloy are extensively





used in the production of various health supplements and medications. The bioactive compounds extracted from these plants are formulated into products that cater to a wide range of health issues, from stress and anxiety to immune support and cardiovascular health. This integration has led to significant investments in research and development, focusing on the efficacy and safety of plant-based medicines. The commercial production of standardized extracts and formulations has opened new markets both domestically and internationally, further boosting the economic value of medicinal plants.

Cosmetic and Personal Care Industry: The cosmetic and personal care industry also capitalizes on the therapeutic properties of medicinal plants. Ingredients like *Aloe vera*, Turmeric (*Curcuma longa*), and Neem (*Azadirachta indica*) are highly sought after for their skin-healing, anti-inflammatory, and antimicrobial properties. These plants are used in a variety of products, including skincare lotions, hair care products, and natural

cosmetics. The rising consumer awareness about the benefits of natural ingredients has driven the demand for plant-based cosmetic products. This demand has translated into increased cultivation of medicinal plants, fostering economic growth and encouraging sustainable agricultural practices in Uttar Pradesh.

Nutraceuticals and Dietary Supplements: Nutraceuticals and dietary supplements represent another significant market for medicinal plants. Products containing herbs like Brahmi, Shatavari (*Asparagus racemosus*), and Tulsi (*Ocimum sanctum*) are marketed for their health-boosting properties. These supplements are popular for improving cognitive function, enhancing reproductive health, and supporting overall wellness. The nutraceutical industry's reliance on high-quality, organic medicinal plants has prompted local farmers to adopt better cultivation practices. This shift not only improves the economic returns for farmers but also ensures the sustainability of medicinal plant resources.





Export Potential: The export potential of medicinal plants from Uttar Pradesh is considerable. Countries around the world recognize the therapeutic value of traditional Indian herbs, leading to a robust international market. Medicinal plants and their derivatives, such as extracts and essential oils, are exported to various countries for use in pharmaceuticals, cosmetics, and nutraceuticals. The government's support in terms of export incentives and quality control measures has further bolstered the economic prospects of this sector. The establishment of export-oriented units and certification of organic produce have enhanced the global competitiveness of medicinal plants from Uttar Pradesh.

Socio-Economic Development: The commercial cultivation of medicinal plants contributes significantly to the socio-economic development of Uttar Pradesh. It provides an alternative income source for farmers, reducing dependence on traditional crops and mitigating risks associated with agricultural variability. The industry also

promotes gender inclusivity, as women often play a crucial role in the cultivation and processing of medicinal plants. Moreover, the emphasis on organic and sustainable farming practices associated with medicinal plant cultivation supports environmental conservation. This alignment with sustainable development goals further enhances the socio-economic impact, making medicinal plant cultivation a viable and beneficial agricultural practice.

IMPORTANT MEDICINAL PLANTS AROUND THE GANGA RIVER

The Ganga River in Uttar Pradesh nurtures a diverse array of medicinal plants, many of which have been used in traditional medicine for centuries and are now recognized for their significant therapeutic properties. These plants thrive in the nutrient-rich soils and varied climatic conditions along the riverbanks, making the region a valuable source of medicinal flora. The important medicinal plants around the Ganga River in Uttar Pradesh are:



Achyranthes aspera L.



- ☞ **Vernacular name:** Latjira, Chirchita
- ☞ **Medicinal Uses:** Whole plant decoction treats renal discomfort. The paste of overnight-soaked roots treats piles. Eye, ear, and throat issues are treated by leaf extract, while skin problems by paste.

Acmella oleracea (L.) R.K.Jansen



- ☞ **Vernacular name:** Ninai
- ☞ **Medicinal Uses:** The flowers are chewed in mouth ulcers.

Albizia lebbeck (L.) Benth.



- ☞ **Vernacular name:** Siris
- ☞ **Medicinal Uses:** The leaves decoction along with *Justicia adhatoda* and *Solanum xanthocarpum* is very effective in asthma

Allium sativum L.



- ☞ **Vernacular name:** Lehsun
- ☞ **Medicinal Uses:** decoction of bulb along with cloves and mustard oil effective against the cough.

Aloe vera (L.) Burm.f.



- ☞ **Vernacular name:** Ghritkumari
- ☞ **Medicinal Uses:** The leaves sap directly taken in stomachaches. The sap used as a halwa (a sweet dish) for headache.

Amomum subulatum Roxb.



- ☞ **Vernacular name:** Badi Elaichi
- ☞ **Medicinal Uses:** The fruits are directly taken in nerve blockage.

Asparagus racemosus Willd.



- ☞ **Vernacular name:** Satawar
- ☞ **Medicinal Uses:** The root powder is mixed with milk and taken for stomachaches. The mixed root powder with *Boerhavia diffusa* is taken with cow milk in spermatorrhoea.

Azadirachta indica A.Juss.



- ☞ **Vernacular name:** Neem
- ☞ **Medicinal Uses:** The leaves are boiled in water and taken bath for psoriasis.



Boerhavia diffusa L.



- ☞ **Vernacular name:** Gadapunna
- ☞ **Medicinal Uses:** The root decoction is effective in jaundice. The root powder is taken with cow milk twice daily for spermatorrhoea. The root decoction is useful in fever.

Calotropis procera (Aiton) W.T.Aiton



- ☞ **Vernacular name:** Madar
- ☞ **Medicinal Uses:** The latex is applied over the scorpion-affected parts. The leaves are dipped in warm sesame oil and wrapped in eczema and pain-affected parts.

Clerodendrum infortunatum L.



- ☞ **Vernacular name:** Bhatesh
- ☞ **Medicinal Uses:** Leaves decoction and tooth brushing by stem useful in diabetes.

Convolvulus prostratus Forssk.



- ☞ **Vernacular name:** Shankpushpi
- ☞ **Medicinal Uses:** The whole plant is used as a tonic that helps in nervous diseases and mental disorders.

Cordia myxa L.



- ☞ **Vernacular name:** Lasoda
- ☞ **Medicinal Uses:** A leaf decoction is useful in cough.

Curcuma longa L.



- ☞ **Vernacular name:** Haldi
- ☞ **Medicinal Uses:** A decoction of rhizome alone or along with *Zingiber officinale*, *Piper nigrum*, and jaggery useful in cough, cold, joint pain, and arthritis.

Cyanthillium cinereum (L.) H. Rob.



- ☞ **Vernacular name:** Sahdevi
- ☞ **Medicinal Uses:** A decoction of the whole plant is useful in fever.

Cynodon dactylon (L.) Pers.



- ☞ **Vernacular name:** Doobghas
- ☞ **Medicinal Uses:** The juice of the whole plant is useful in menstrual problems. Root powder is taken in piles. The paste of overnight soaked root is taken in spermatorrhoea.



Datura stramonium L.



- ☞ **Vernacular name:** Dhatura
- ☞ **Medicinal Uses:** Leaves with warm oil applied in the boils and eczema.

Eclipta prostrata (L.) L.



- ☞ **Vernacular name:** Ghamira
- ☞ **Medicinal Uses:** The whole plant pastes or the cooked mixture of the whole plant with black paper in mustard oil useful in boils and swelling.

Euphorbia hirta L.



- ☞ **Vernacular name:** Godan
- ☞ **Medicinal Uses:** The powder of the whole plant is useful in stomachaches, diarrhoea, and dysentery.

Ficus benghalensis L.



- ☞ **Vernacular name:** Bargad
- ☞ **Medicinal Uses:** The raw use of fruit is helpful in eye diseases.

Gymnema sylvestre (Retz.) R.Br. ex Sm.



- ☞ **Vernacular name:** Gudmaar
- ☞ **Medicinal Uses:** The direct use of leaves useful in diabetes.

Hibiscus rosa-sinensis L.



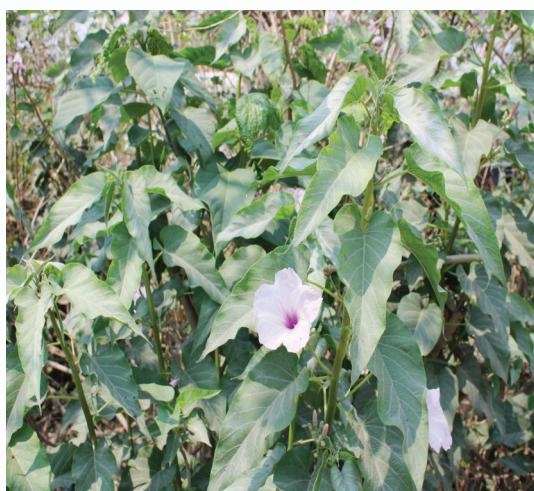
- ☞ **Vernacular name:** Gudhal
- ☞ **Medicinal Uses:** Regular use of flower buds improves lactation and helps with spermatorrhea issues.

Holoptelea integrifolia (Roxb.) Planch.



- ☞ **Vernacular Name:** Chilbil
- ☞ **Medicinal Uses:** A paste of leaf and bark is applied locally for skin disease. The cooked fruit powder in oil is used in boils and eczema.

Ipomoea carnea subsp. fistulosa
(Mart. ex Choisy) D.F.Austin



- ☞ **Vernacular name:** Behaya
- ☞ **Medicinal Uses:** The leaves are wrapped in warm mustard oil during pain and swelling.



Justicia adhatoda L.



- ☞ **Vernacular name:** Arus
- ☞ **Medicinal Uses:** The mix leaves decoction along with *Albizia lebbek* and *Solanum xanthocarpum* helpful in asthma. After having this cow milk is taken necessary; water is prohibited.

Launaea procumbens (Roxb.) Ramayya & Rajagopal



- ☞ **Vernacular name:** Gobhi Phool
- ☞ **Medicinal Uses:** The leaf extract is applied on affected parts during snakebite and scorpion sting.

Moringa oleifera Lam.



- ☞ **Vernacular Name:** Sahjan
- ☞ **Medicinal Uses:** The seed oil is applied externally in pain and swelling.

Morus alba L.



- ☞ **Vernacular name:** Shahtoot
- ☞ **Medicinal Uses:** The leaves paste is effective in boils and piles.

Nyctanthes arbor-tristis L.



- ☞ **Vernacular name:** Parijat
- ☞ **Medicinal Uses:** The leaves and flower decoction are useful in fever and joint pain. A mix decoction with *Tinospora cordifolia*, *Tinospora crispa* and *Piper nigrum* is useful in cough.

Ocimum americanum L.



- ☞ **Vernacular name:** Vijya Tulsi
- ☞ **Medicinal Uses:** 2-3 drops of the leaves distilled extract useful in cough, toothache and stomachaches. The paste of the whole plant is applied topically to piles, acne, and pimples.

Phyllanthus amarus Schumach. & Thonn.



- ☞ **Vernacular name:** Bhumi Amla
- ☞ **Medicinal Uses:** The juice of the whole plant is useful in hepatic disorders.

Piper betle L.



- ☞ **Vernacular name:** Kapuri
- ☞ **Medicinal Uses:** For spermatorrhoea, a mixture of its leaves, Punarnava roots, and Gudhal flowers is beneficial. Neuro diseases are treated using a decoction of leaves.



Piper nigrum L.



- ☞ **Vernacular name:** Kali Mirch
- ☞ **Medicinal Uses:** The seed powder used as a gargle for mouth ulcer. A mix decoction of its seeds along with rhizome of *Zingiber officinale* and *Curcuma longa* is taken at night for cough.

Pontederia crassipes Mart.



- ☞ **Vernacular name:** Jalkumbhi
- ☞ **Medicinal Uses:** A decoction of the whole plant is useful in stomachaches, anemia, and jaundice.

Psidium guajava L.



- ☞ **Vernacular name:** Amrood
- ☞ **Medicinal Uses:** The direct use of fruits useful in jaundice. The fruit cooked in fire and taken in nasal problems.

Solanum nigrum L.



- ☞ **Vernacular name:** Makoi
- ☞ **Medicinal Uses:** A decoction of the whole plant is used in jaundice, stomachaches, stones, and anemia. The juice of the whole plant is used for gargling in mouth problems.

Solanum virginianum L.



- ☞ **Vernacular Name:** Bhatkatiya
- ☞ **Medicinal Uses:** The burning fumes of seeds or seed paste or boiled seed in oil used in toothache. A root decoction is useful in fever.

Syzygium cumini (L.) Skeels



- ☞ **Vernacular name:** Jamun
- ☞ **Medicinal Uses:** Regular usage of fruits or fermented juice, either on its own or in conjunction with *Phyllanthus emblica* is useful in diabetes and gastric problems.

Terminalia bellirica (Gaertn.) Roxb.



- ☞ **Vernacular name:** Baheda
- ☞ **Medicinal Uses:** The seed powder is useful for cough and cold. A mixed fruit powder named Triphala is useful for stomach problems.

Terminalia chebula Retz.



- ☞ **Vernacular name:** Haritaki
- ☞ **Medicinal Uses:** A mixed fruit powder (Triphala) along with *Phyllanthus emblica* and *Terminalia bellirica* is useful for stomach problems.



Tinospora cordifolia (Willd.) Hook.f. & Thomson



- ☞ **Vernacular Name:** Giloy
- ☞ **Medicinal Uses:** A mix decoction with *Nyctanthes arbor-tristis*, *Tinospora crispa* and *Piper nigrum* is useful in fever, cold, cough, asthma, malaria, dengue, diabetes, and blood pressure.

Tridax procumbens L.



- ☞ **Vernacular name:** Bharwa
- ☞ **Medicinal Uses:** The leaf extract applied externally for boils and eczema. A decoction of the whole plant is useful in diarrhoea.

Wrightia tinctoria (Roxb.) R.Br.



- ☞ **Vernacular name:** Indrajao
- ☞ **Medicinal Uses:** A paste of cooked fruits relieves joint pain. Fruit decoction aids liver issues, bark decoction helps with piles, and leaf juice is applied to the scalp for hair problems.

Zingiber officinale Roscoe



- ☞ **Vernacular Name:** Adrak
- ☞ **Medicinal Uses:** A decoction of rhizome either alone or in combination with *Piper nigrum* and *Curcuma longa* or taken with honey is useful for the cough.

GOVERNMENT INITIATIVES FOR GANGA RIVER CONSERVATION

The Ganga River, revered as a lifeline in India, faces significant pollution and ecological challenges. In Uttar Pradesh, where the river traverses a substantial length, various government initiatives have been undertaken to address these issues and conserve the river's health. These efforts aim to reduce pollution, enhance water quality, and promote sustainable practices among local communities.

Namami Gange Programme: To clean up the Ganga and other small rivers in the Ganga basin, the Government of India launched the Namami Gange Program in 2014-15. This program combines a basin approach with a variety of interventions, including capacity building, research and monitoring, and public awareness campaigns. This flagship program integrates various efforts to tackle pollution, conserve and

rejuvenate the river, and promote sustainable development. Additionally, the program aims to improve ecological flows, conserve biodiversity, and afforestation, and improve riverbank amenities and sanitation. Some key actions of this program as:

- **Waste Management:** Establishing sewage treatment plants (STPs) to treat municipal sewage before it enters the river. This includes upgrading existing STPs and constructing new ones.
- **Industrial Pollution Control:** Implementing stringent regulations and monitoring systems for industries discharging effluents into the Ganga. Industries are required to adopt zero-liquid discharge (ZLD) systems.





- **Rural Sanitation:** Promoting the construction of toilets and the implementation of solid and liquid waste management systems in rural areas to prevent open defecation and untreated waste discharge.
- **River Surface Cleaning:** Deploying specialized equipment and personnel for cleaning the river's surface and removing floating debris.

Under the program, 457 projects totaling an estimated ₹ 38,438.05 crore have been approved; 280 projects have been finished and put into service. At a total expenditure of ₹ 31,575.84 crore, 198 sewerage infrastructure projects have been undertaken to create and renovate 6,208.12 MLD of Sewage Treatment Plant (STP) capacity. 2,844.00 MLD of sewage treatment capacity have been created and renovated due to the 111 sewerage projects

that have been completed. Five industrial Common Effluent Treatment Plants (CETPs) have been approved by NMCG thus far: Jajmau (20 MLD), Banther (4.5 MLD), Unnao (2.65 MLD), Mathura (6.25 MLD), and Gorakhpur (7.5 MLD). The Mathura CETP (6.25 MLD) project is the most advanced. Additionally, on December 30, 2023, the Hon. Prime Minister officially opened CETP Jajmau. Four projects totaling ₹12.53 crore have been approved under the "Namami Gange" initiative to conserve wetlands in the states of Uttar Pradesh, Bihar, and Jharkhand. For Rs. 24.97 crore, the NMCG has approved the creation of four Ganga Biodiversity Parks—one in each of the Uttar Pradesh districts of Mirzapur, Bulandshahar, Hapur, and Budaun—to preserve the riverine environment.

Ganga Action Plan (GAP): It is initiated in 1985, the Ganga Action Plan was one of the earliest efforts to clean the Ganga River. Although it

faced several challenges, it laid the foundation for subsequent initiatives. Some key actions of this program as

- **Sewage Treatment:** Setting up STPs and improving sewage infrastructure in key cities along the Ganga.
- **Public Awareness:** Conducting awareness campaigns to educate the public about the importance of keeping the river clean.
- **Afforestation:** Promoting tree plantation along the riverbanks to prevent soil erosion and enhance the river's ecological balance.

Ganga Gram Yojana: This initiative focuses on transforming villages situated along the Ganga River into model villages with sustainable sanitation practices and waste management systems. Some key actions of this program as:

- **Sanitation Infrastructure:** Building toilets and community sanitation facilities to achieve Open Defecation Free (ODF) status.
- **Solid and Liquid Waste Management:** Implementing systems for managing solid and liquid waste, including composting and wastewater treatment.
- **Community Engagement:** Involving local communities in conservation efforts through awareness programs and capacity-building initiatives.

Clean Ganga Fund: The Clean Ganga Fund is a mechanism to attract voluntary contributions from individuals, corporations, and institutions for the conservation and rejuvenation of the Ganga River. Some key actions of this program as:

- **Funding Projects:** Financing projects related to river surface cleaning, afforestation, conservation of aquatic life, and public awareness.

- **Corporate Social Responsibility (CSR):** Encouraging corporate participation in river conservation efforts through CSR activities.

Jal Shakti Abhiyan: The Jal Shakti Abhiyan is a nationwide water conservation campaign launched in 2019, focusing on water-stressed districts, including those along the Ganga River in Uttar Pradesh. Some key actions of this program as:

- **Water Conservation:** Promoting water harvesting, groundwater recharge, and efficient water use practices.
- **Agricultural Practices:** Encouraging sustainable agricultural practices that reduce water consumption and prevent runoff pollution.
- **Public Participation:** Mobilizing community participation in water conservation efforts through awareness drives and local initiatives.

Biodiversity Conservation: It efforts to conserve the rich biodiversity of the Ganga River ecosystem, focusing on the protection of endangered species and the restoration of natural habitats. Some key actions of this program as:

- **Dolphin Conservation:** Implementing specific programs for the conservation of the endangered Ganga river dolphin, including monitoring and habitat protection.
- **Fish Sanctuaries:** Establishing fish sanctuaries and regulating fishing practices to ensure sustainable fish populations.
- **Wetland Restoration:** Restoring and protecting wetlands along the river to support diverse flora and fauna.

Afforestation and Green Corridor Development: Afforestation and green corridor development



are critical components of river conservation efforts, aiming to create a natural buffer zone along the Ganga River. Some key actions of this program as:

- **Tree Plantation:** Large-scale tree plantation drives along the riverbanks to prevent soil erosion and improve air quality.
- **Green Corridors:** Developing green corridors to enhance biodiversity and provide ecological stability to the river ecosystem.

Monitoring and Research: Continuous monitoring and research are essential for the effective management and conservation of the Ganga River. Some key actions of this program as:

- **Water Quality Monitoring:** Establishing monitoring stations along the river to

regularly assess water quality and identify pollution sources.

- **Research Programs:** Supporting scientific research on the river's ecology, hydrology, and pollution dynamics to inform policy and conservation strategies.

The government initiatives for Ganga River conservation in Uttar Pradesh are multifaceted and comprehensive, addressing various aspects of pollution control, biodiversity conservation, and sustainable development. Through these concerted efforts, significant progress has been made in rejuvenating the Ganga River and improving its ecological health. Continued commitment and community participation are essential to sustain these achievements and ensure the long-term preservation of this vital river.