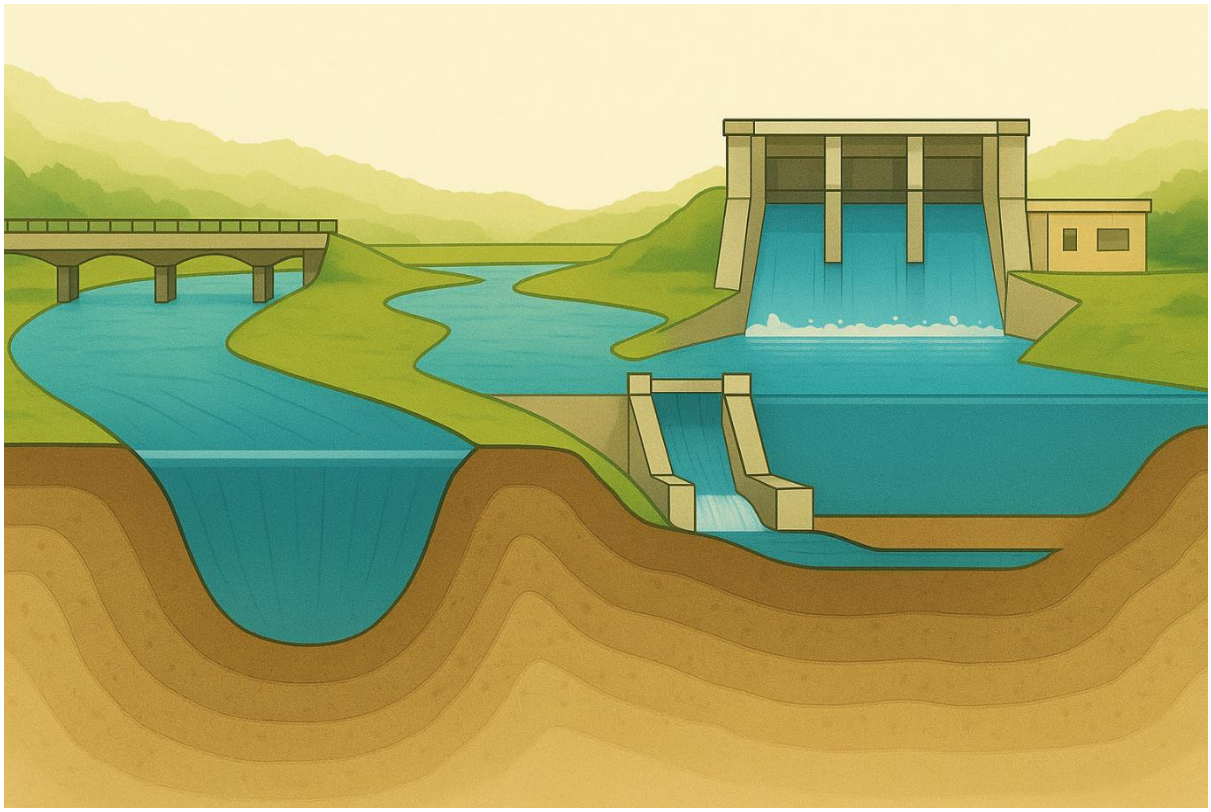
**National River Conservation Directorate**
Ministry of Jal Shakti,
Department of Water Resources,
River Development & Ganga Rejuvenation
Government of India

# Hydraulic Data Report of Krishna River Basin



**April 2025**

# Hydraulic Data Report of Krishna River Basin


## National River Conservation Directorate (NRCD)

The National River Conservation Directorate, functioning under the Department of Water Resources, River Development & Ganga Rejuvenation, and Ministry of Jal Shakti providing financial assistance to the State Government for conservation of rivers under the Centrally Sponsored Schemes of 'National River Conservation Plan (NRCP)'. National River Conservation Plan to the State Governments/ local bodies to set up infrastructure for pollution abatement of rivers in identified polluted river stretches based on proposals received from the State Governments/ local bodies.

**www.nrcd.nic.in**

## Centres for Krishna River Basin Management Studies (cKrishna)

The Centre for Krishna River Basin Management Studies (cKrishna) is a Brain Trust dedicated to River Science and River Basin Management. Established in 2024 by NIT Warangal and NIT Surathkal, under the supervision of cGanga at IIT Kanpur, the centre serves as a knowledge wing of the National River Conservation Directorate (NRCD). cKrishna is committed to restoring and conserving the Krishna River and its resources through the collation of information and knowledge, research and development, planning, monitoring, education, advocacy, and stakeholder engagement.

**www.ckrishna.org**

## Centre for Ganga River Basin Management and Studies (cGanga)

cGanga is a think tank formed under the aegis of NMCG, and one of its stated objectives is to make India a world leader in river and water science. The Centre is headquartered at IIT Kanpur and has representation from most leading science and technological institutes of the country. cGanga's mandate is to serve as think-tank in implementation and dynamic evolution of Ganga River Basin Management Plan (GRBMP) prepared by the Consortium of 7 IITs. In addition to this, it is also responsible for introducing new technologies, innovations, and solutions into India.

**www.cganga.org**


## Acknowledgment

This report is a comprehensive outcome of the project jointly executed by NIT Warangal (Lead Institute) and NIT Surathkal (Fellow Institute) under the supervision of cGanga at IIT Kanpur. It was submitted to the National River Conservation Directorate (NRCD) in 2024. We gratefully acknowledge the individuals who provided information and photographs for this report.


## Disclaimer

This report is a preliminary version prepared as part of the ongoing Condition Assessment and Management Plan (CAMP) project. The analyses, interpretations and data presented in the report are subject to further validation and revision. Certain datasets or assessments may contain provisional or incomplete information, which will be updated and refined in the final version of the report after comprehensive review and verification.

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# Preface

In an era of unprecedented environmental change, understanding our rivers and their ecosystems has never been more critical. This report aims to provide a comprehensive overview of our rivers, highlighting their importance, current health, and the challenges they face. As we explore the various facets of river systems, we aim to equip readers with the knowledge necessary to appreciate and protect these vital waterways.

Throughout the following pages, you will find an in-depth analysis of the principles and practices that support healthy river ecosystems. Our team of experts has meticulously compiled data, case studies, and testimonials to illustrate the significant impact of rivers on both natural environments and human communities. By sharing these insights, we hope to inspire and empower our readers to engage in river conservation efforts.

This report is not merely a collection of statistics and theories; it is a call to action. We urge all stakeholders to recognize the value of our rivers and to take proactive steps to ensure their preservation. Whether you are an environmental professional, a policy maker, or simply someone who cares about our planet, this guide is designed to support you in your efforts to protect our rivers.

We extend our heartfelt gratitude to the numerous contributors who have generously shared their stories and expertise. Their invaluable input has enriched this report, making it a beacon of knowledge and a practical resource for all who read it. It is our hope that this report will serve as a catalyst for positive environmental action, fostering a culture of stewardship that benefits both current and future generations.

As you delve into this overview of our rivers, we invite you to embrace the opportunities and challenges that lie ahead. Together, we can ensure that our rivers continue to thrive and sustain life for generations to come.

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Management Studies (cKrishna)
NIT Warangal (Lead Institute), NIT Surathkal (Fellow Institute)

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# Abbreviations and Acronyms

| | |
|---|---|
| NW | North West |
| SW | South West |
| NE | North East |
| SE | South East |
| Indian WRIS | Indian Water Resources Information System |
| KG Basin | Krishna Godavari Basin |

# 1. Introduction

The Krishna River Basin is one of the largest and most important river basins in peninsular India, covering an area of approximately 258,948 square kilometres across the states of Maharashtra, Karnataka, Telangana, and Andhra Pradesh. Originating in the Western Ghats near Mahabaleshwar in Maharashtra, the Krishna River flows eastward for about 1,400 kilometres before draining into the Bay of Bengal. The basin is home to several major tributaries such as the Bhima, Tungabhadra, Musi, and Munneru rivers, and plays a crucial role in supporting agriculture, drinking water supply, hydropower generation, and sustaining ecosystems across the region.

Hydraulic data such as river discharge, water level (stage), and flow velocity are fundamental for understanding river behaviour and supporting water resources management. Accurate hydraulic assessments are crucial for flood forecasting, reservoir operations, irrigation planning, and climate impact modelling (Gosain, Rao, and Basuray 2006, 2006; Ashok K. Mishra and Coulibaly 2009). Moreover, studies indicate that changes in land use, climatic variability, and increased water abstraction have led to altered flow regimes in many Indian river basins, including the Krishna (Kiran, Rao, and Narasimhan 2018; Venot et al. 2011).

Comprehensive analysis of hydraulic parameters provides insights into the spatio-temporal dynamics of river systems and supports the development of sustainable and climate-resilient water management strategies (Baran-Gurgul and Rutkowska 2024). This report focuses on compiling and analysing hydraulic data from various stations across the Krishna River Basin, aiming to identify trends, variations, and implications for basin-wide water governance. The findings will contribute to more informed decision-making for water allocation, infrastructure planning, and flood risk reduction.

# 2. Data Collection and Sources

In order to conduct a comprehensive hydraulic analysis of the Krishna River Basin, multiple datasets were sourced from official agencies and processed using geospatial tools.

- **Stream Cross-Sections**: Cross-sectional data of the river channels for 40 different stations were obtained from the **Central Water Commission (CWC)**. These cross-sections provide critical geometric inputs for hydraulic modelling, including width,

depth, and bed slope information necessary for flow simulations and capacity assessments.

- **Riverine Structures**: Information related to **dams, canals, command areas, barrages, and major bridges** was collected from the **Indian Water Resources Information System (India-WRIS)**. These structural features are essential for understanding flow regulation, diversions, and control structures influencing the river's hydraulic behaviour.
- **Field-Visible Features**: Locations of **ghats**, **bridges**, and other riverfront developments were digitized using **Google Earth imagery**. These features were georeferenced and processed in a **Geographic Information System (GIS)** environment to support spatial mapping and hydraulic boundary condition inputs.

All datasets were standardized and integrated in GIS to generate hydraulic input layers, structural overlays, and visualization maps. These datasets serve as the foundational input for subsequent flow routing, water level simulation, and river hydraulic assessments.

## 3. Cross Sectional Geometry

The cross-sectional geometry of a river provides essential information about the shape and structure of the river channel at different locations, which is crucial for hydrodynamic modelling, flood risk assessment, and sediment transport studies. In this study, the cross-sections of the Krishna River were obtained from six different sites along the main course of the river. These measurements were recently provided by the Central Water Commission (CWC) in 2024.

The cross-sectional data includes the reduced horizontal distance from a reference point on the riverbank plotted against the elevation above mean sea level (AMSL)The figures below show the cross-sectional profiles at six measurement sites along the Krishna River. These profiles demonstrate the variability in channel shape, which may be influenced by local geology, sediment load, bank erosion, and anthropogenic activities such as dam construction and sand mining.

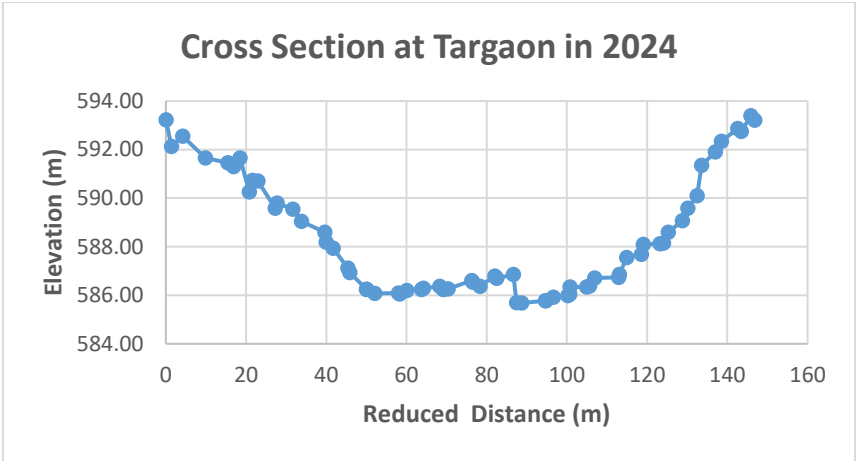


*Figure 3.1 Cross Section at Targaon*

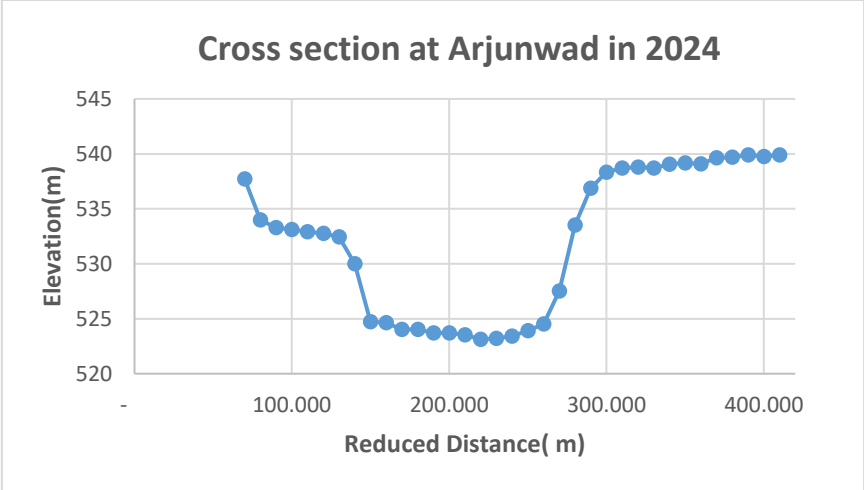


*Figure 3.2 Cross Section at Arjunwad*

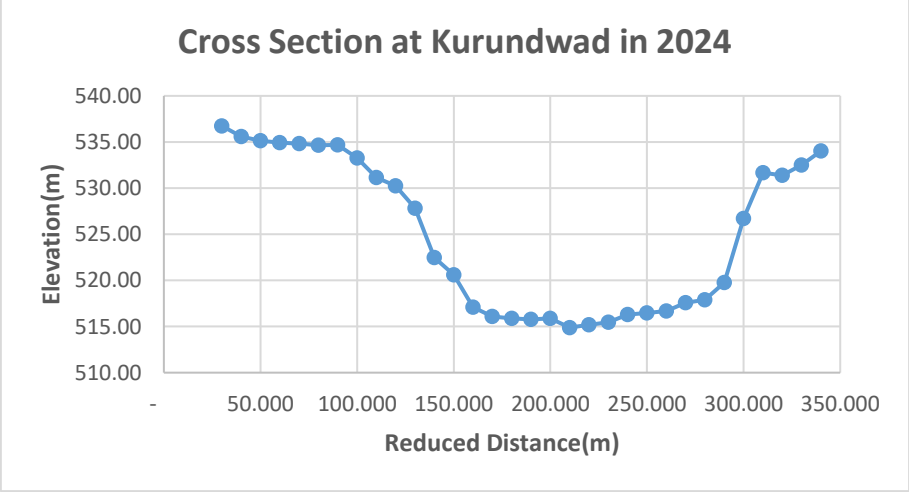


*Figure 3.3 Cross Section at Kurundwad*

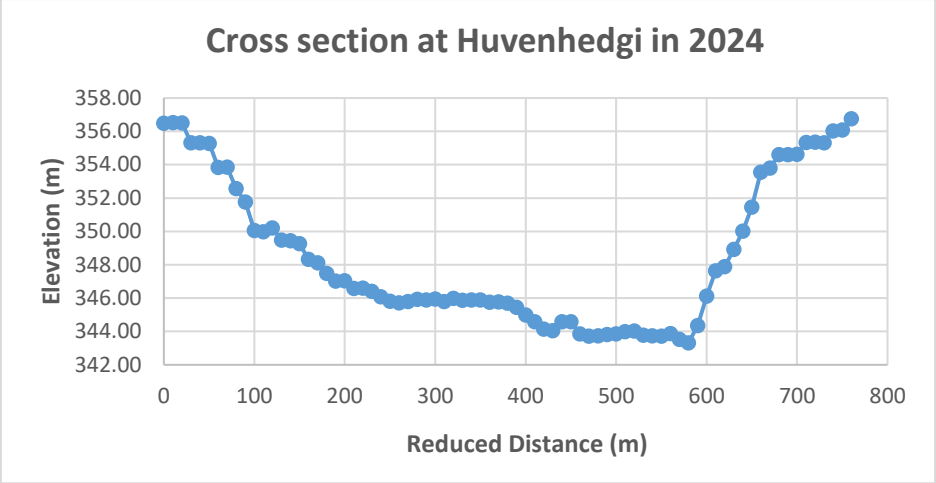


*Figure 3. 4 Cross Section at Huvenhedgi*

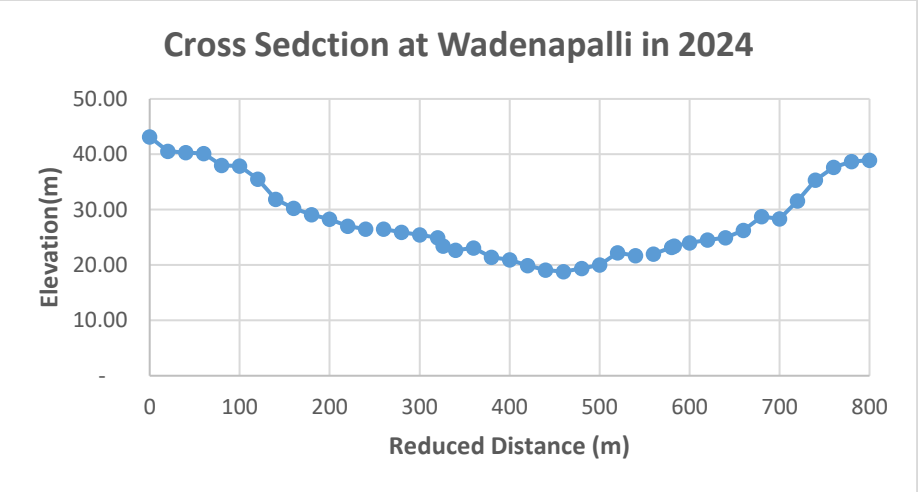


*Figure 3. 5 Cross Section at Wadenapalli*

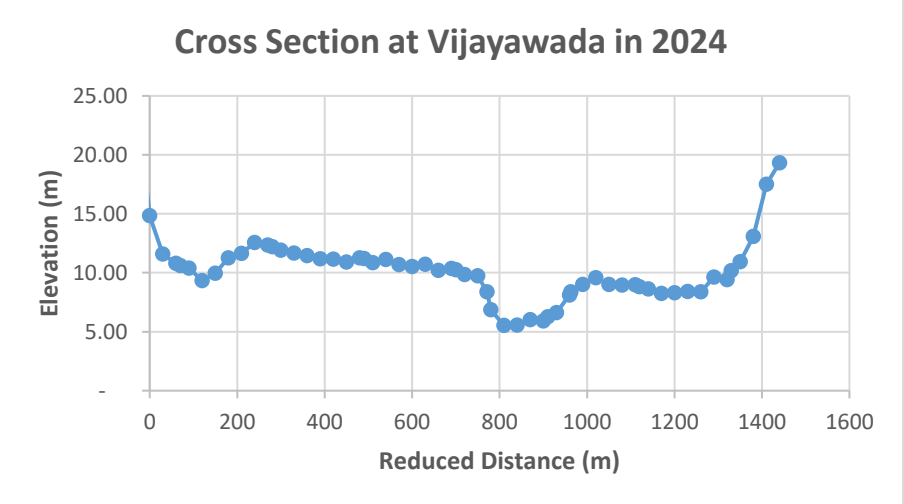


*Figure 3. 6 Cross Section at Vijayawada*

In addition to the main channel of the Krishna River, cross-sectional profiles were also collected for several of its key tributaries. These include the Bhima, Tungabhadra, Musi, and Munneru rivers. Similar to the main channel, the data was obtained from the Central Water Commission (CWC) and represents reduced horizontal distance versus elevation. The following plots present the cross-sectional geometries at selected locations along these tributaries.

- **Bhima**

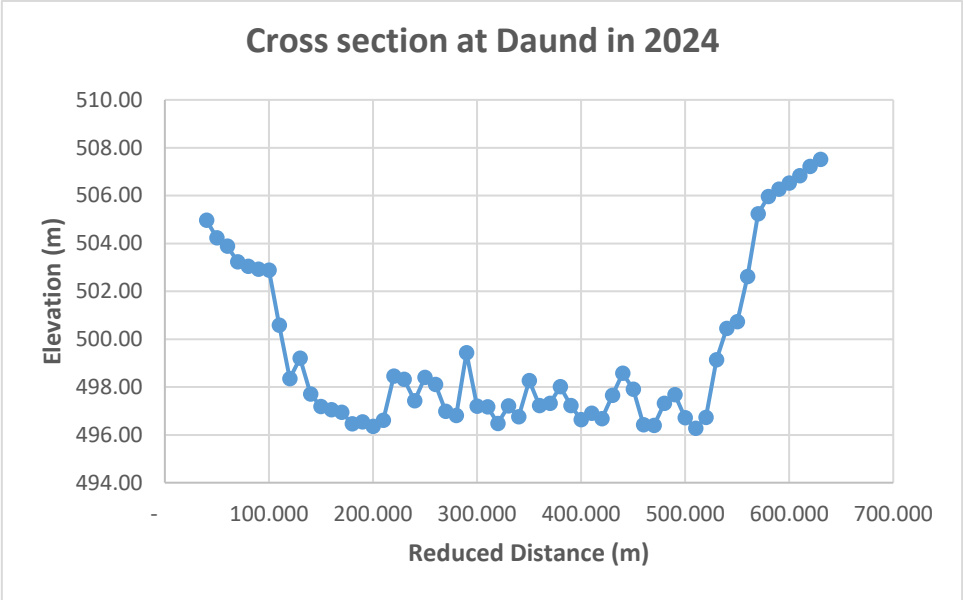


*Figure 3. 7 Cross Section of Bhima at Daund*

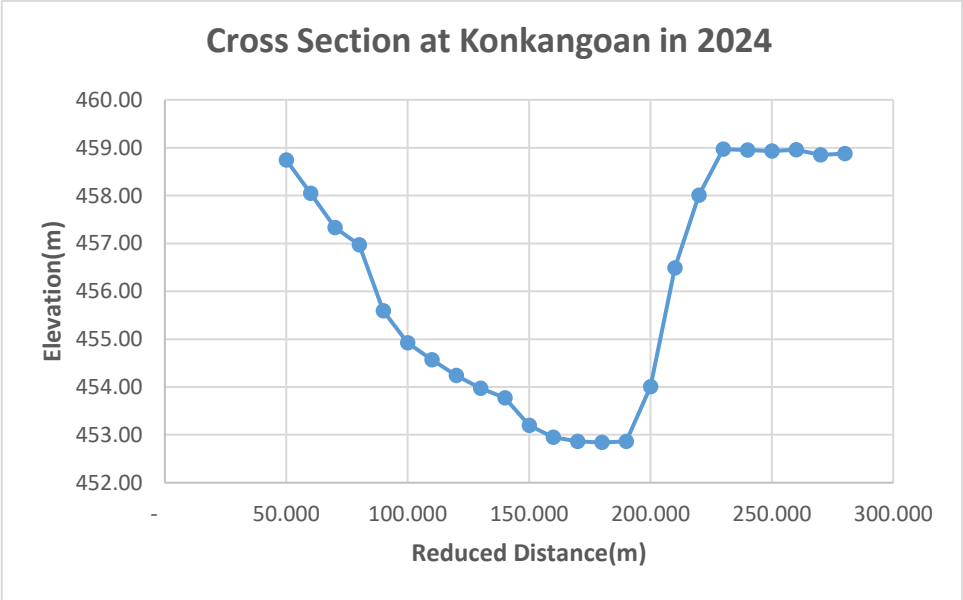


*Figure 3. 8 Cross Section of Bhima at Konkangoan*

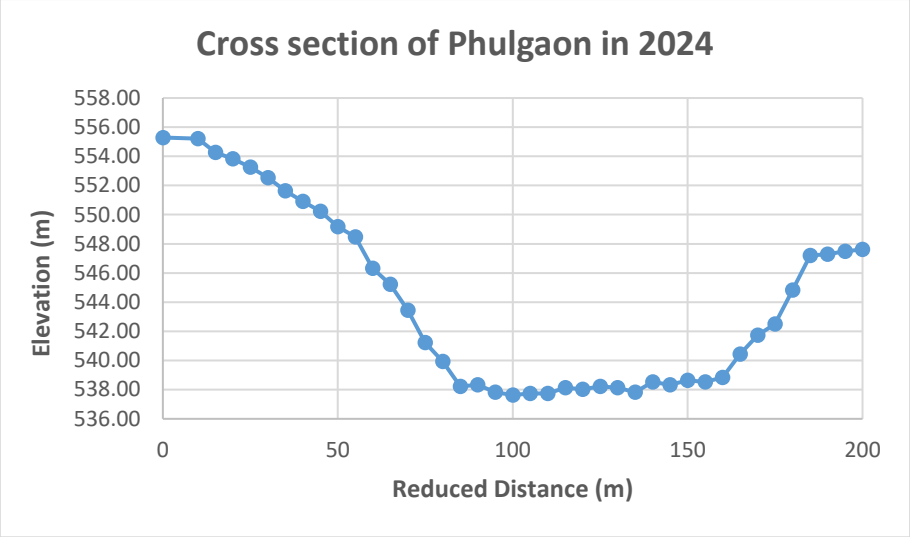


*Figure 3. 9 Cross Section of Bhima at Phulgaon*

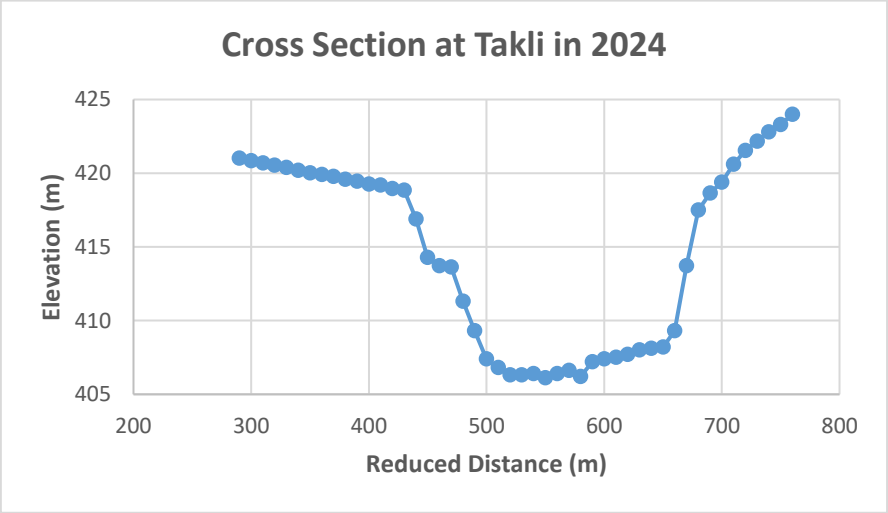


*Figure 3.10 Cross Section of Bhima at Takli*

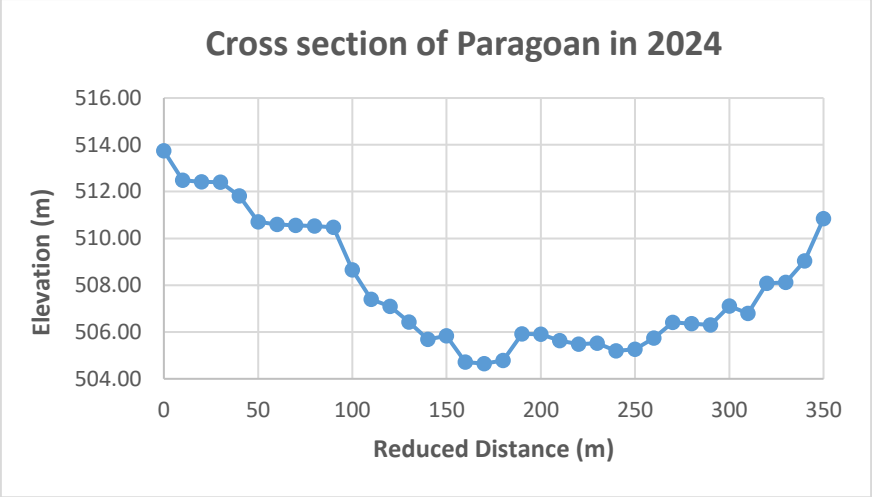


*Figure 3. 11 Cross Section of Bhima at Paragoan*

## ➢ Tungabhadra

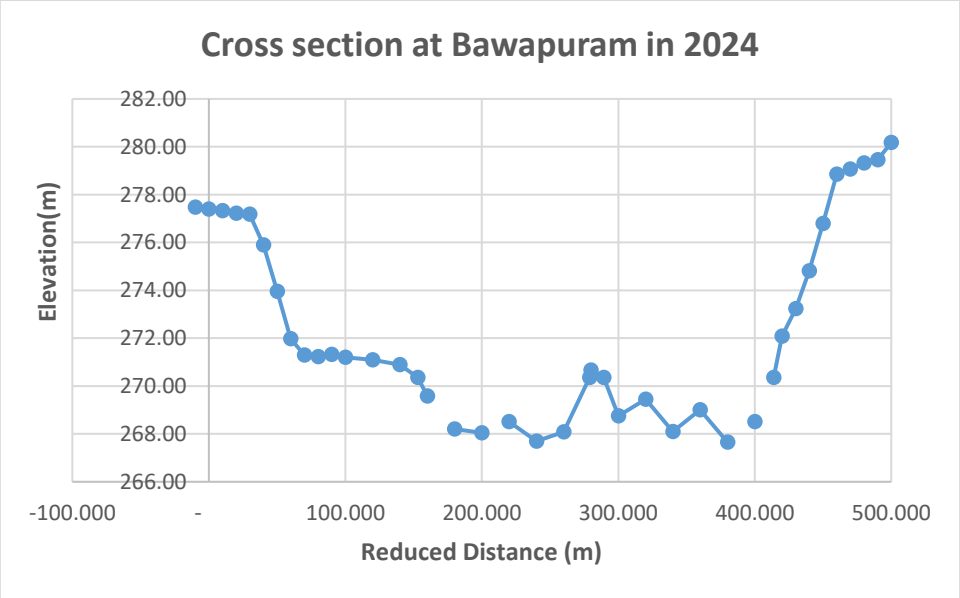


*Figure 3.12 Cross Section of Tungabhadra at Bawapuram*

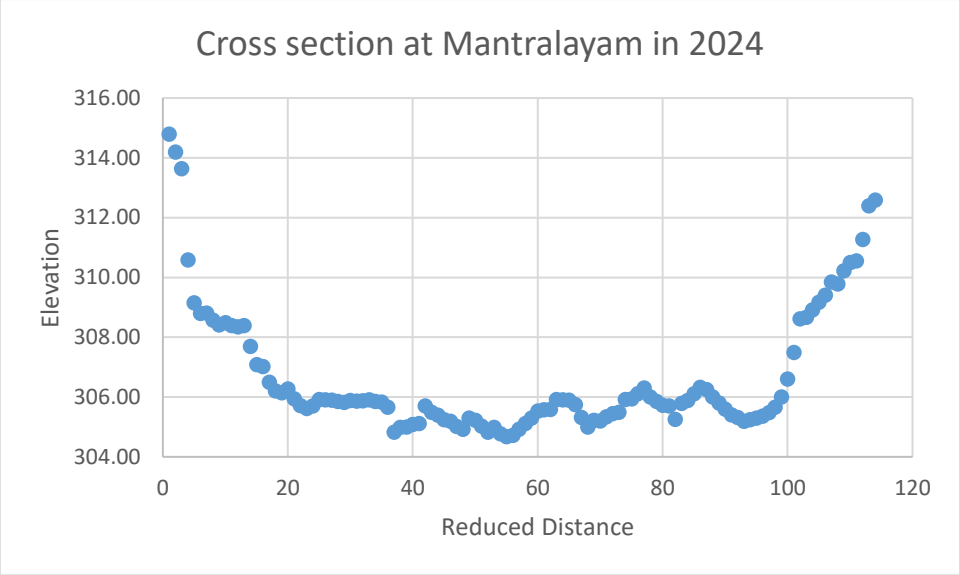


*Figure 3. 13 Cross Section of Tungabhadra at Mantralayam*

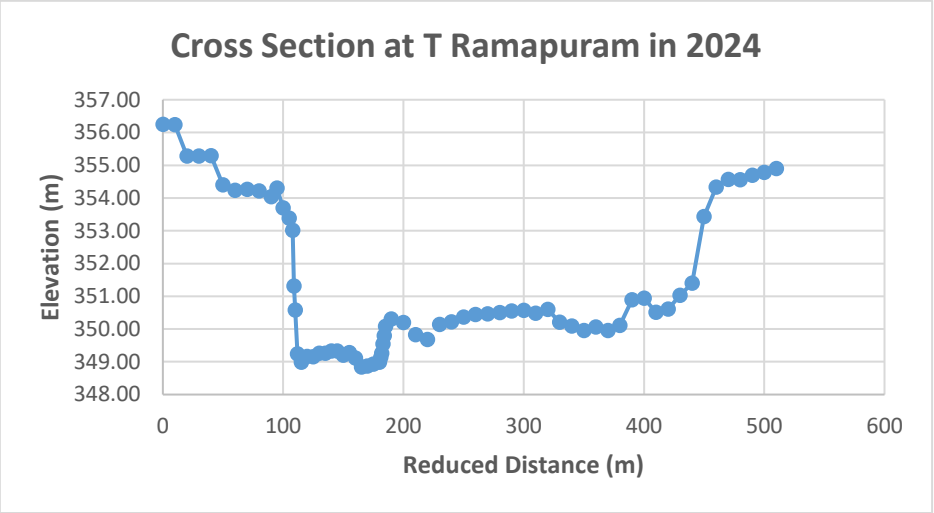


*Figure 3. 14 Cross Section of Tungabhadra at T Ramapuram*

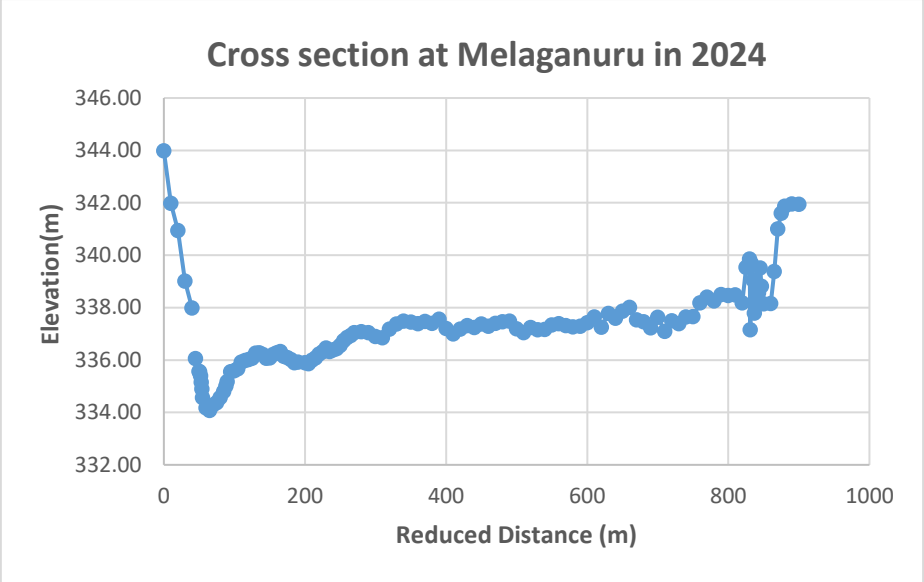


*Figure 3. 15 Cross Section of Tungabhadra at Melaganuru*

## ➢ Musi

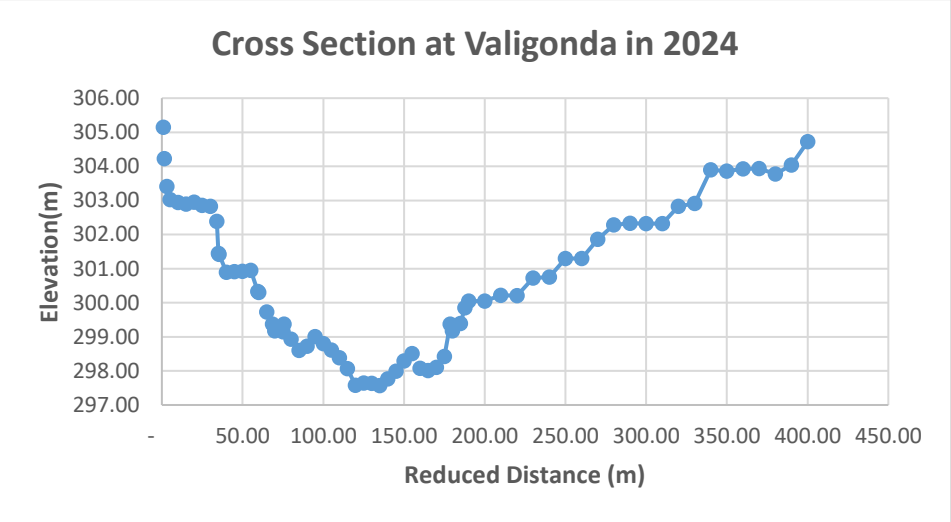


*Figure 3. 16 Cross Section of Musi at Valigonda*

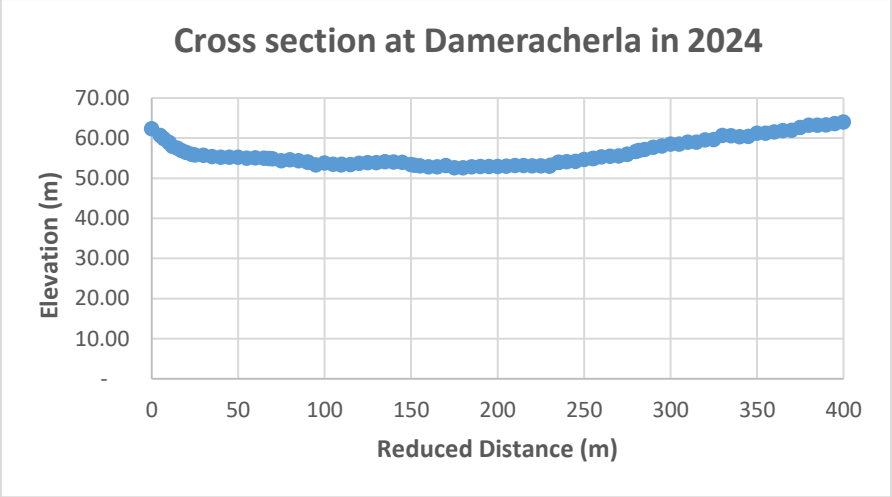


*Figure 3. 17 Cross Section of Musi at Dameracherla*

## ➢ Munneru

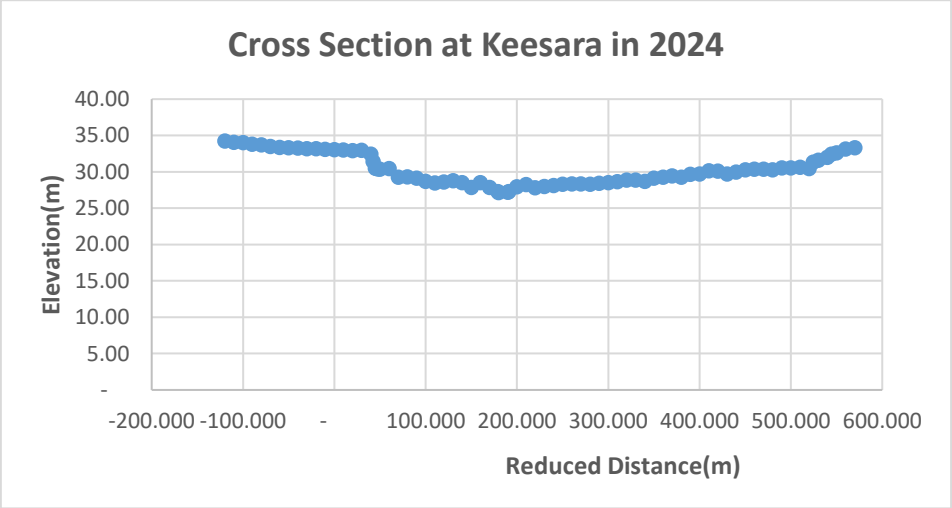


*Figure 3. 18 Cross Section of Munneru at Keesara*

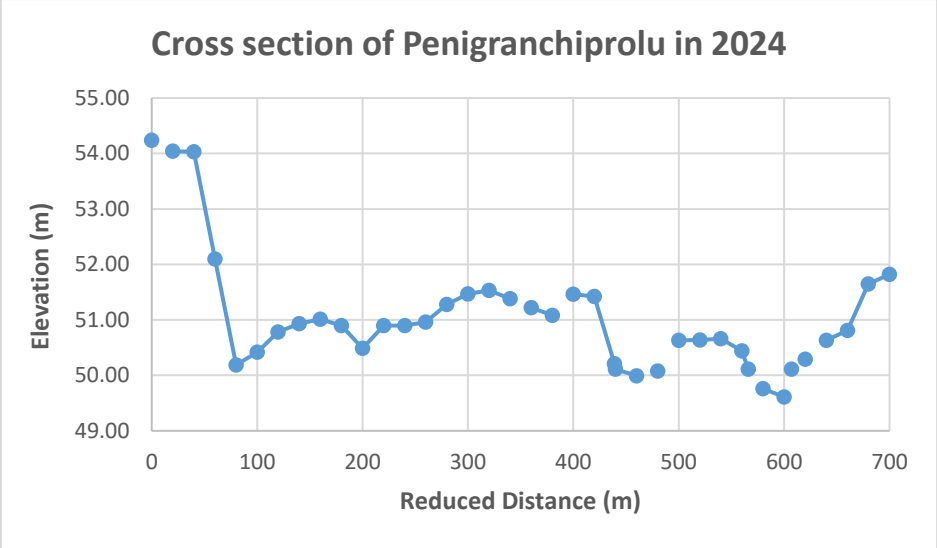


*Figure 3. 19 Cross Section of Munneru at Penigrachiprolu*

## 4. Longitudinal Profile

In addition to the transverse cross-sections, longitudinal profiles of the Krishna River and its major tributaries were delineated using the Shuttle Radar Topography Mission (SRTM) Digital Elevation Model (DEM) with 30-meter spatial resolution. These profiles represent the change in elevation along the river course. Longitudinal sections were extracted for the main stem of the Krishna River as well as its key tributaries, including the Bhima, Tungabhadra, Musi, and Munneru rivers.

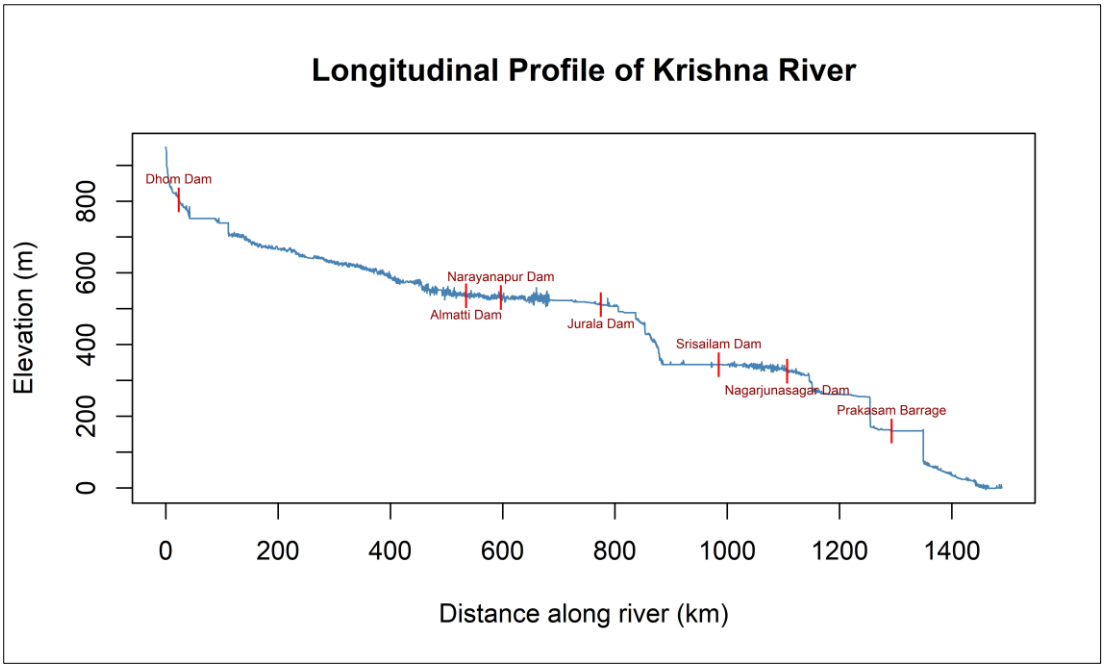


*Figure 4. 1 Longitudinal Profile of Krishna River*

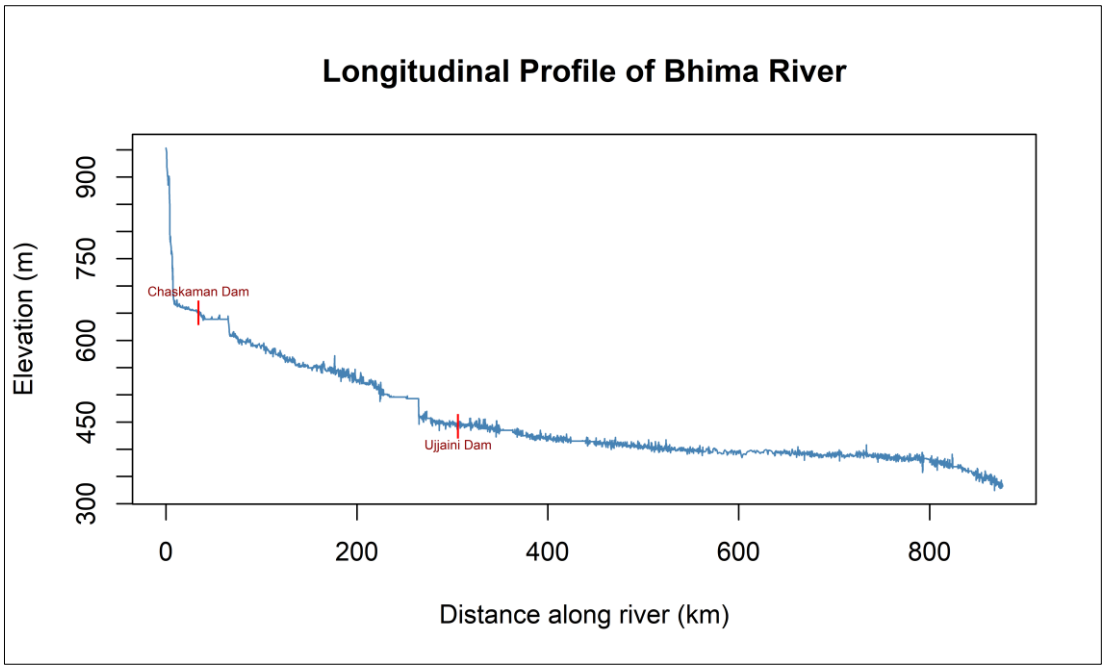


*Figure 4. 2 Longitudinal Profile of Bhima River*

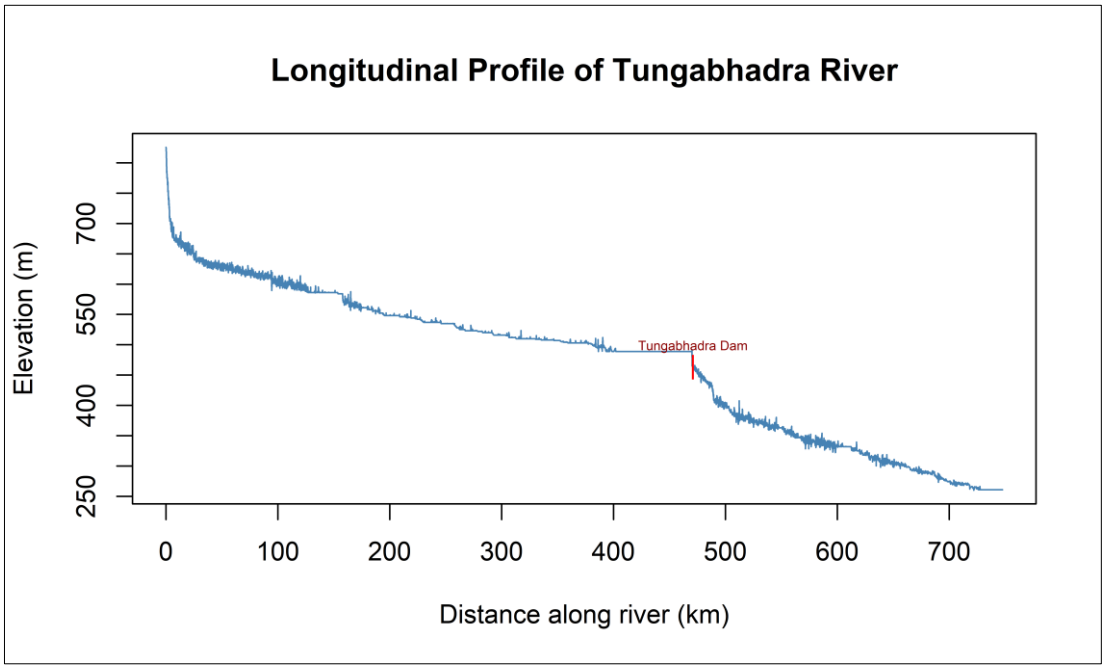


*Figure 4. 3 Longitudinal Profile of Tungabhadra River*

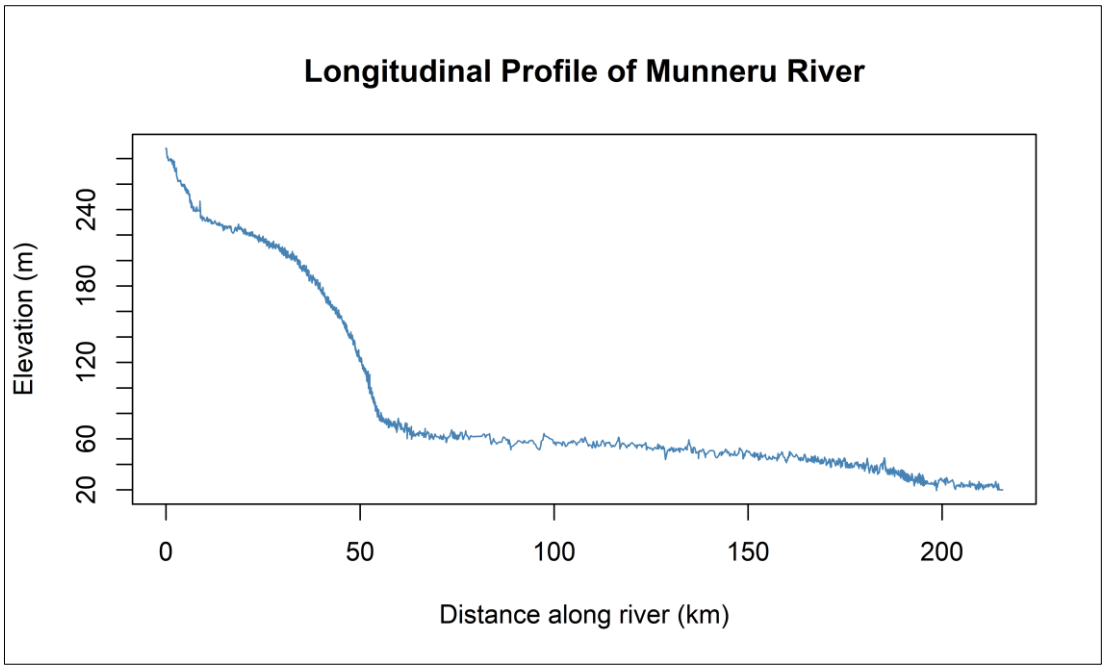


*Figure 4. 4 Longitudinal Profile of Munneru River*

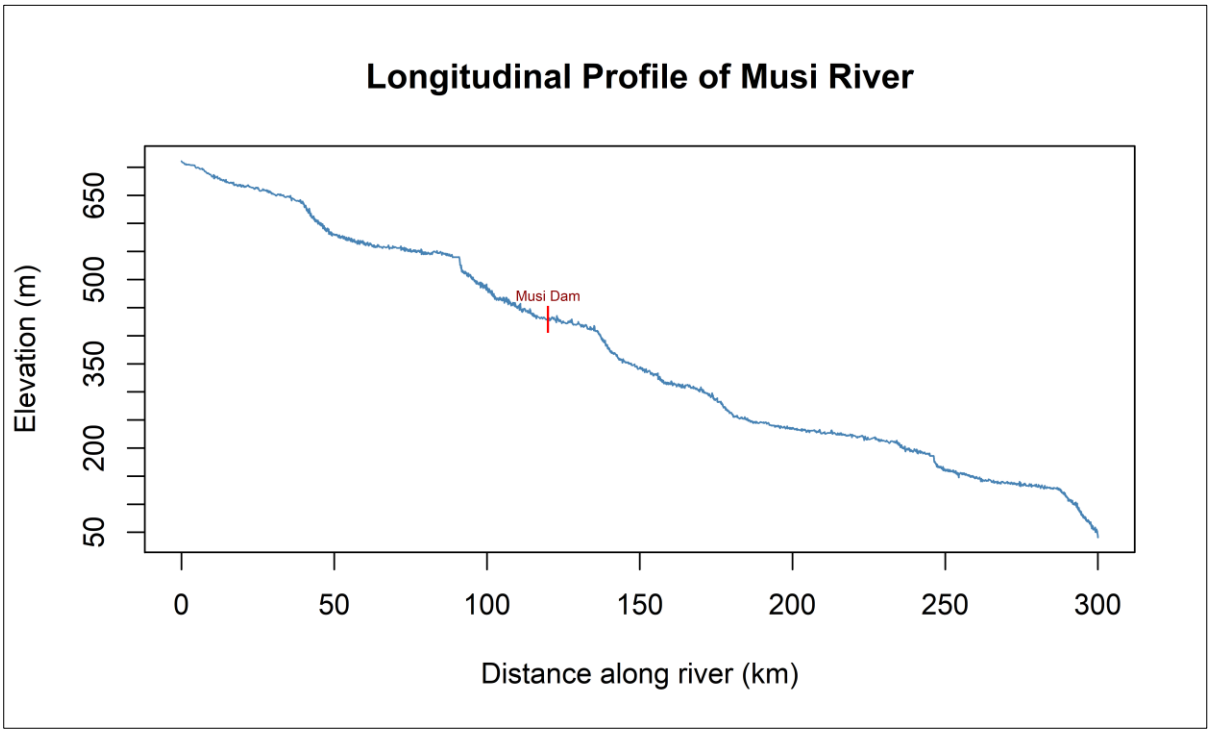


*Figure 4. 5 Longitudinal Profile of Musi River*

# 5. Riverine Infrastructure

The Krishna River Basin hosts a well-developed and complex system of riverine infrastructure, essential for the management and distribution of its water resources across the four major states it traverses—Maharashtra, Karnataka, Telangana, and Andhra Pradesh. Key components of this infrastructure include large and medium-scale dams, reservoirs, canal networks, and barrage systems, which are strategically constructed to facilitate irrigation, hydropower production, urban and rural water supply, and flood mitigation. Major reservoirs formed by these structures not only act as storage systems but also help regulate flow during dry and wet seasons, enhancing water availability throughout the year. Complementing these are numerous check dams, weirs, bridges, and riverfront Ghats, which serve both engineering and socio-cultural purposes. The coordinated functioning of these hydraulic structures is crucial for the basin's water security and agricultural productivity. The subsequent sections detail the major dams, reservoirs, canal systems, and other infrastructure present along the Krishna River and its tributaries.

## 5.1 Dams and Reserviors

Dams and reservoirs constitute the cornerstone of water resource management in the Krishna River Basin. Strategically located across the main river and its tributaries, these structures are designed to store, regulate, and divert water for various uses such as irrigation, hydropower generation, municipal supply, and flood control. The basin features several major and medium-scale dams, each forming significant reservoirs that play a crucial role in balancing seasonal flow variations and supporting year-round water demands. A total of 718 dams are located across the Krishna River and its tributaries as presented in the figure 6. Among these, the Bhima River hosts the highest number, with 354 dams, followed by the Krishna River itself, which accounts for 293 dams. The following section presents an overview of the major dams and their associated reservoirs within the Krishna River Basin, focusing on their geographical distribution, storage capacities, and functional significance, including roles in irrigation, hydroelectric power generation, flood control, and water supply.

### Nagarjuna Sagar Dam and Reservoir

The Nagarjuna Sagar Dam, constructed across the Krishna River between the states of Telangana and Andhra Pradesh, is one of the largest masonry dams in the world. It forms the Nagarjuna Sagar Reservoir, which has a gross storage capacity of approximately 11.56

billion cubic meters (BCM). The reservoir is crucial for storing monsoonal runoff and ensuring regulated water supply throughout the year. It plays a critical role in irrigation, providing water to over 1.2 million hectares in the command areas of both states. Additionally, it supports hydropower generation, supplies drinking water, and maintains ecological balance in the downstream reaches.

**Srisailam Dam and Reservoir**

Situated upstream of the Nagarjuna Sagar Dam, the Srisailam Dam is located in the Nallamala Hills of Andhra Pradesh. It creates the Srisailam Reservoir, with a live storage capacity of around 8.29 BCM. The reservoir serves as a major water source for hydroelectric power generation, irrigation schemes, and water supply projects. The dam also plays a vital role in inter-state water sharing agreements and flood control. The scenic landscape of the reservoir and the proximity to religious sites contribute to tourism in the region.

**Almatti Dam and Reservoir**

The Almatti Dam is located in the state of Karnataka on the Krishna River and is a major component of the Upper Krishna Project. The dam forms the Almatti Reservoir, with a storage capacity of about 3.15 BCM. This reservoir ensures consistent water availability for irrigation in the drought-prone districts of northern Karnataka. It also supports a hydropower station with a capacity of 290 MW and plays a key regulatory role in managing downstream releases and water availability.

**Ujjani Dam (Bhima Dam) and Reservoir**

Located on the Bhima River in Maharashtra, the Ujjani Dam, also known as Bhima Dam, forms the Ujjani Reservoir with a capacity of around 3.32 BCM. This large reservoir is vital for storing seasonal flows and distributing water for irrigation, domestic, and industrial use in the Solapur and Pune regions. It also supports aquaculture and sustains bird habitats, contributing to biodiversity conservation.

**Narayanpur Dam and Reservoir**

Also known as the Basavasagara Dam, the Narayanpur Dam is constructed on the Krishna River in Karnataka. It forms the Narayanpur Reservoir, with a gross storage capacity of around 1.06 BCM. The reservoir is a crucial component of the Upper Krishna Project Phase I and supports extensive irrigation schemes in the Raichur and Gulbarga districts, along with providing water for drinking and other municipal uses.

**Tungabhadra Dam and Reservoir**

The Tungabhadra Dam is constructed across the Tungabhadra River, a tributary of the Krishna, near Hospet in Karnataka. The dam forms the Tungabhadra Reservoir, which has a gross storage capacity of approximately 3.73 BCM. The reservoir facilitates irrigation for multiple districts in both Karnataka and Andhra Pradesh. It is also used for hydroelectric power generation and water supply, and it enhances groundwater recharge. Its proximity to the Hampi World Heritage Site boosts tourism and local economic development.

**Ghataprabha Dam and Reservoir**

Constructed across the Ghataprabha River in Karnataka, the Ghataprabha Dam supports the Ghataprabha Project aimed at irrigating over 300,000 hectares. The reservoir ensures seasonal and off-season irrigation and enhances water availability in the Belagavi and Bagalkot districts. It is instrumental in stabilizing agriculture and promoting economic resilience.

**Malaprabha Dam and Reservoir**

The Malaprabha Dam, built on the Malaprabha River in Karnataka near Navilatirtha, creates a reservoir with a storage capacity of about 1.0 BCM. This reservoir is pivotal for irrigation in the dry zones of Dharwad, Belagavi, and Gadag districts. It also aids in municipal water supply and regional environmental balance.

**Jurala Dam and Reservoir**

The Jurala Dam, also known as the Priyadarshini Jurala Project, is constructed across the Krishna River in the Jogulamba Gadwal district of Telangana. It creates the Jurala Reservoir, with a gross storage capacity of about 0.36 BCM. This multipurpose project supports irrigation for thousands of hectares, contributes to hydroelectric power generation with an installed capacity of 234 MW, and ensures water availability for domestic and industrial uses in the surrounding areas. The reservoir also helps in maintaining base flows in the downstream stretches of the river.

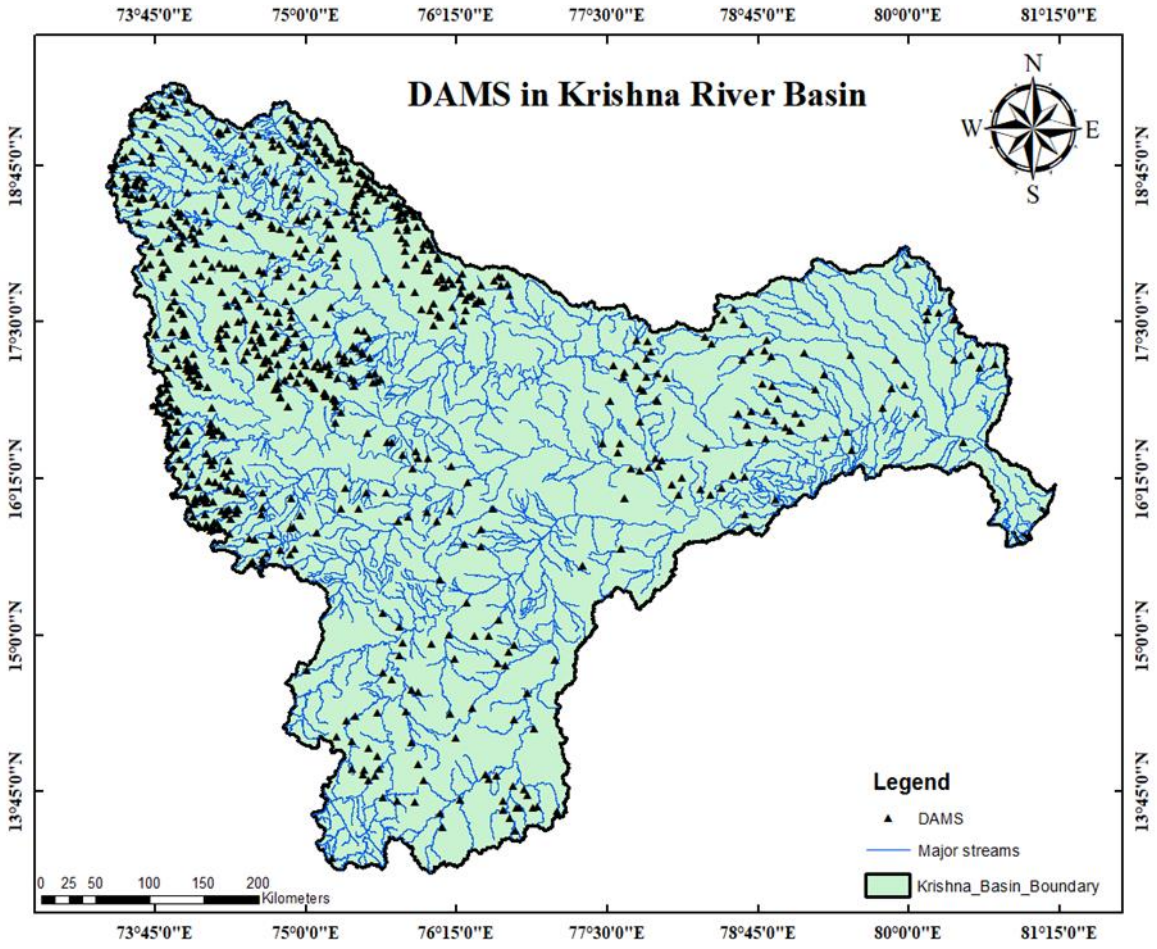


*Figure 5. 1 Locations of dams in Krishna River Basin*

### 5.2 Barrages

A total of 370 barrages and weirs are constructed across the Krishna River and its tributaries shown in figure 6, playing a crucial role in irrigation diversion, river regulation, and water distribution. Of these, **183 are located on the Krishna River** and **185 on the Bhima River**, making them two of the most hydraulically managed rivers in peninsular India. The following

section outlines significant barrages that contribute extensively to water management and agricultural productivity in the Krishna Basin.

**Prakasam Barrage**

Located in Vijayawada, Andhra Pradesh, the Prakasam Barrage is the most prominent diversion structure on the Krishna River. Originally constructed in the mid-19th century and later modernized, it regulates the flow of the Krishna into the Eastern and Western Delta canal systems. Spanning more than 1,200 meters, the barrage supports irrigation across over 1.2 million hectares in the fertile Krishna Delta, facilitates drinking water supply, and functions as a key road link across the river.

**Sunkesula Barrage**

The Sunkesula Barrage is an old yet vital structure situated near Kurnool in Andhra Pradesh. It was constructed to meet drinking water and irrigation needs in the Kurnool district and is one of the earliest river diversion schemes in the Krishna Basin. Though smaller in capacity, it is historically significant and continues to support local agricultural activity and water supply.

**Siddheshwar Barrage**

Constructed on the Bhima River in Maharashtra, the Siddheshwar Barrage plays a crucial role in diverting flows upstream of the Ujjani Dam. It contributes to irrigation in the drought-prone areas of Solapur and Osmanabad districts and enhances groundwater recharge in the nearby command areas. It is one of the key water regulation structures on the upper Bhima.

**Nira-Bhima Barrage**

Located at the confluence of the Nira and Bhima Rivers, this barrage is instrumental in diverting water for the Nira Right Bank Canal, which irrigates large agricultural tracts in western Maharashtra. It supports water distribution for sugarcane cultivation and horticulture, helping to stabilize yields in regions affected by variable rainfall.

**Tungabhadra Low-Level Barrage**

Positioned downstream of the Tungabhadra Dam, this low-level barrage diverts regulated releases into command areas in Andhra Pradesh and Karnataka. It supplements water

availability for tail-end farmers who rely on assured irrigation and facilitates better water management in the lower Tungabhadra basin.

**Ghataprabha Barrage**

Part of the Ghataprabha irrigation scheme, this barrage manages releases from the upstream reservoir and diverts water into well-structured canal systems serving northern Karnataka. It supports command area development, including cultivation of commercial crops like sugarcane and cotton.

**Malaprabha Barrage**

The Malaprabha Barrage, constructed downstream of the Malaprabha Dam, ensures efficient diversion of flows into the left and right bank canals. It is key to irrigation scheduling in the Gadag and Dharwad districts, improving cropping intensity in semi-arid zones.

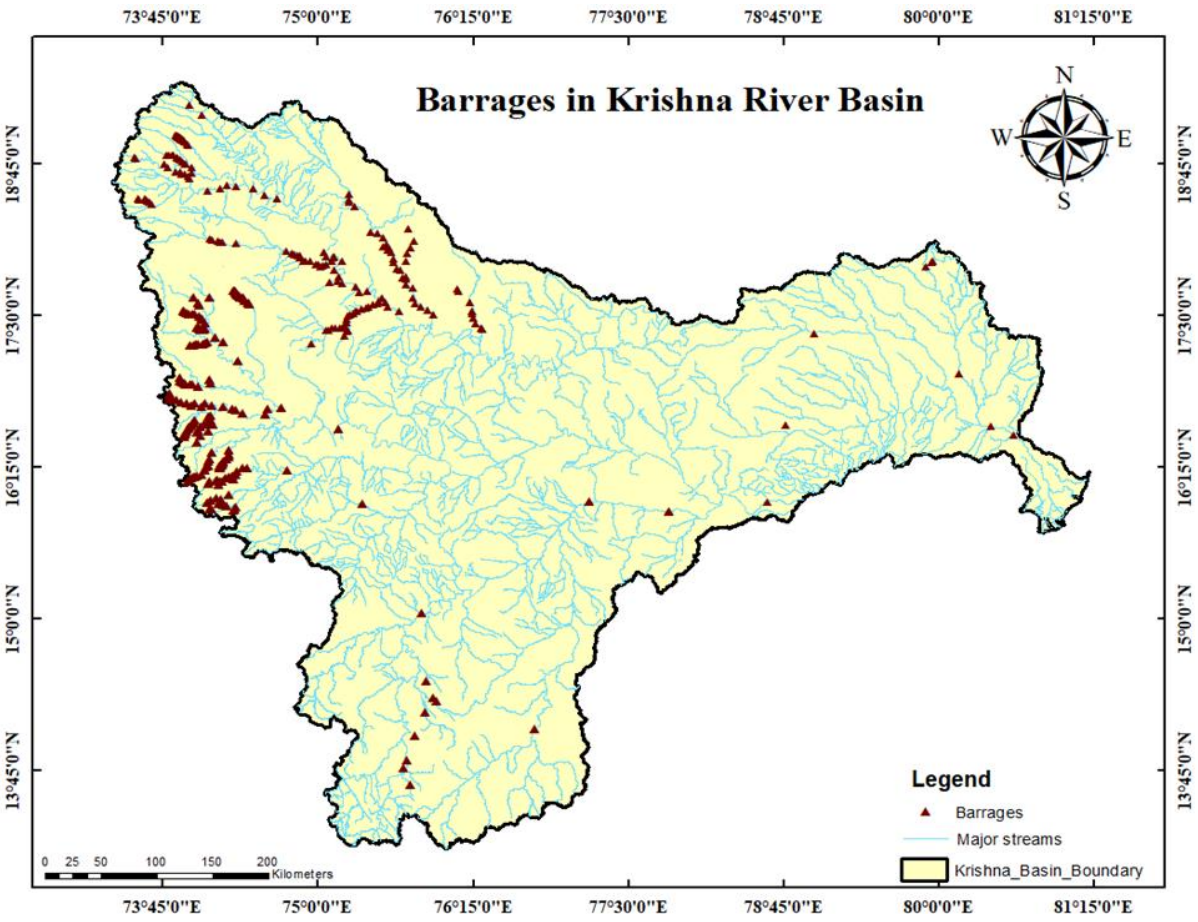


*Figure 5. 2 Locations of Barrages in Krishna River Basin*

### 5.3 Bridge

The Krishna River is a vital watercourse in southern India, traversing several states and supporting extensive agricultural, industrial, and urban infrastructure. Bridges across the Krishna and its tributaries are crucial for enabling transportation, connecting remote regions, and supporting economic development. In addition to their functional significance, many of these bridges are critical during flood events for emergency access and relief operations. According to the compiled dataset, a total of 52 bridges are identified on the Krishna River. These include road bridges, rail bridges, and multipurpose utility bridges located across different stretches of the river. The data serves as a vital input for hydrological and flood modelling, especially in understanding flow obstructions, floodplain connectivity, and structural vulnerability assessments during extreme weather events. Figure 1 presents the spatial distribution of these bridges along the Krishna River.

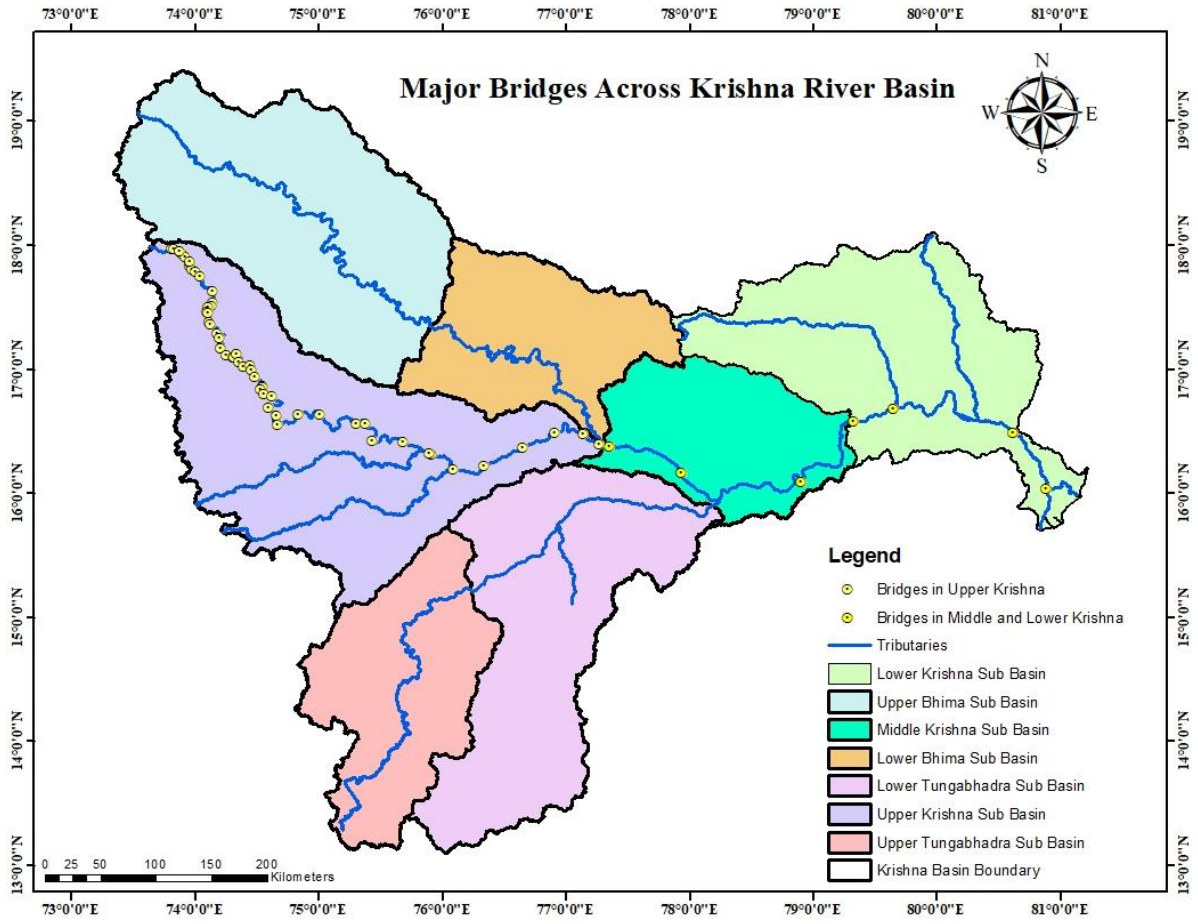


*Figure 5. 3 Locations of Bridges on Krishna River*

### 5.4 Ghats

A total of **38 major ghats** have been identified along the Krishna River in the Upper Krishna sub-basin. These ghats play a significant role in the religious, cultural, and social life of the region. They are often located adjacent to temples and serve as important centres for pilgrimage, ritual bathing, and local festivals. Many small ghats also function as crucial water access points for daily activities such as washing, bathing, and occasionally small-scale ferrying.

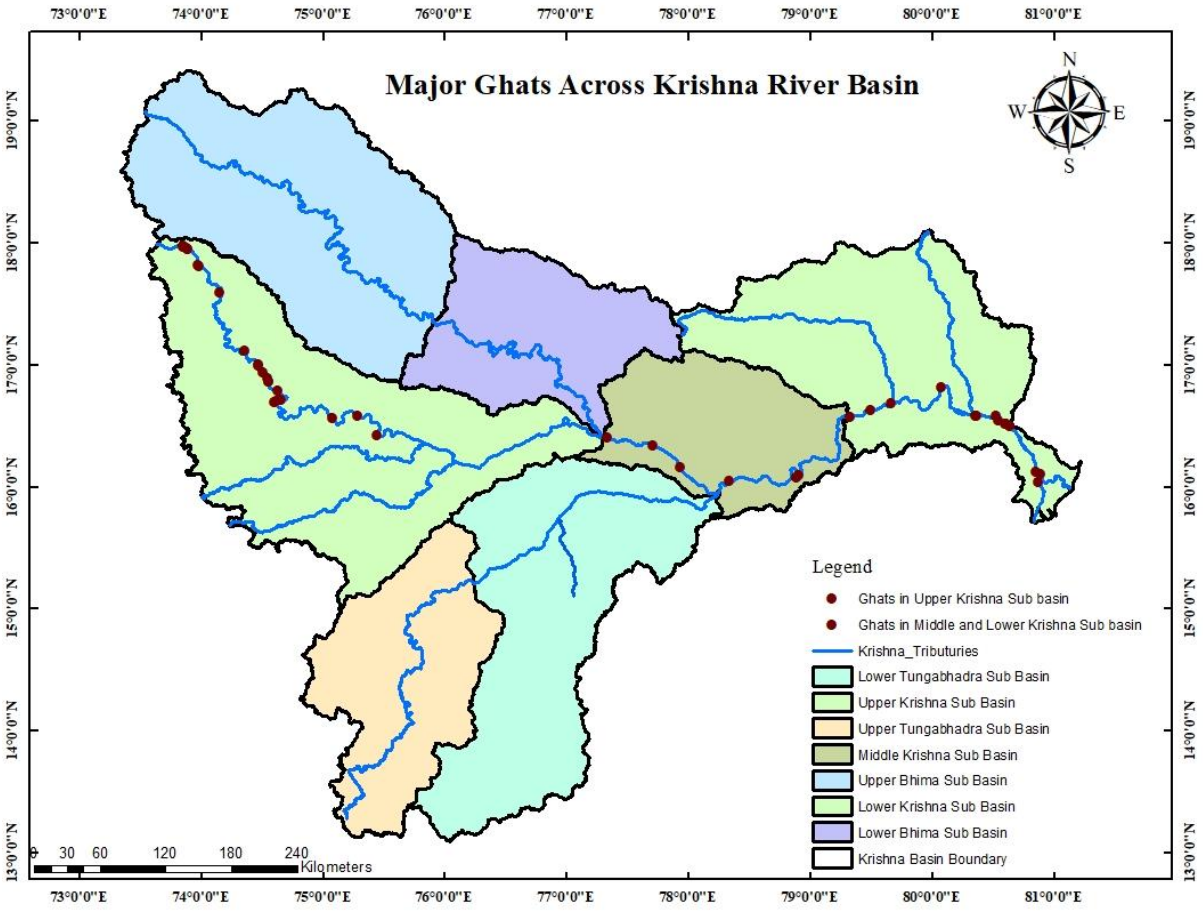


*Figure 5. 4 Locations of Ghats on Krishna River*

## 6. Canals and Command Area

The Krishna River Basin is one of the major river basins in peninsular India, encompassing parts of Andhra Pradesh & Telangana, Maharashtra, and Karnataka. The basin supports a complex and dense canal irrigation infrastructure aimed at enhancing agricultural productivity across its vast expanse.

### 6.1 Major Canal Networks

The map illustrates several major canal systems originating from the Krishna River and its tributaries. Prominent canal networks in the basin include:

1. Krishna Delta System (in A.P. & T.G.):
    - One of the most extensive canal networks, serving the fertile eastern plains.
    - Includes systems like the Prakasam Barrage canals and others which help irrigate vast command areas in the coastal region.
2. Tungabhadra Left and Right Bank Canals (Karnataka and A.P.):
    - Fed by the Tungabhadra Dam, these canals are crucial for irrigation in both Karnataka and parts of Andhra Pradesh.
3. Ghataprabha and Malaprabha Canals (Karnataka):
    - Serve the northern part of Karnataka with water diverted from tributaries of the Krishna.
4. Koyna and Bhima Canal Systems (Maharashtra):
    - These systems cater to irrigation and drinking water needs in the western upland regions.
5. Nagarjuna Sagar Canals (A.P. & T.G.):
    - Though primarily on the Krishna's tributary (the Musi), these canals are pivotal for central and southern Telangana.

### 6.2 Command Areas

The command area refers to the land area that is irrigated or is capable of being irrigated from a canal system.

- Total Command Area in Krishna Basin: 96,900.74 sq. km
- State-wise distribution:
    - Andhra Pradesh & Telangana: 37,466.38 sq. km
    - Maharashtra: 28,662.59 sq. km
    - Karnataka: 30,771.77 sq. km

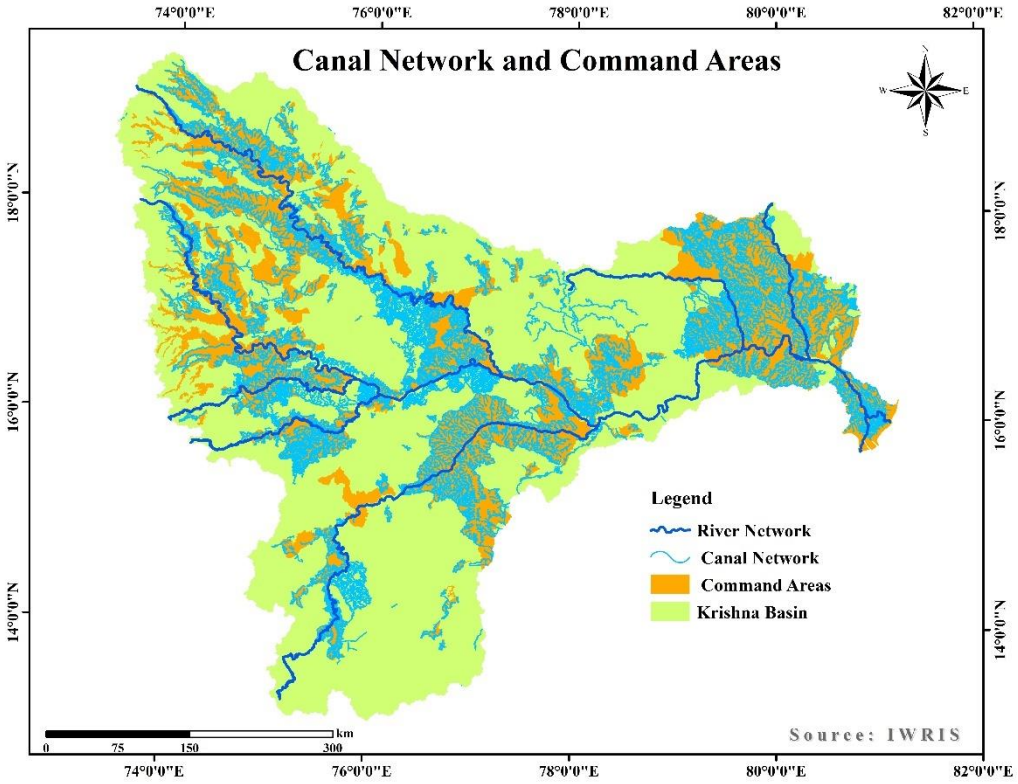


*Figure 6. 1 Canal Network and Command Areas in the Krishna River Basin*

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