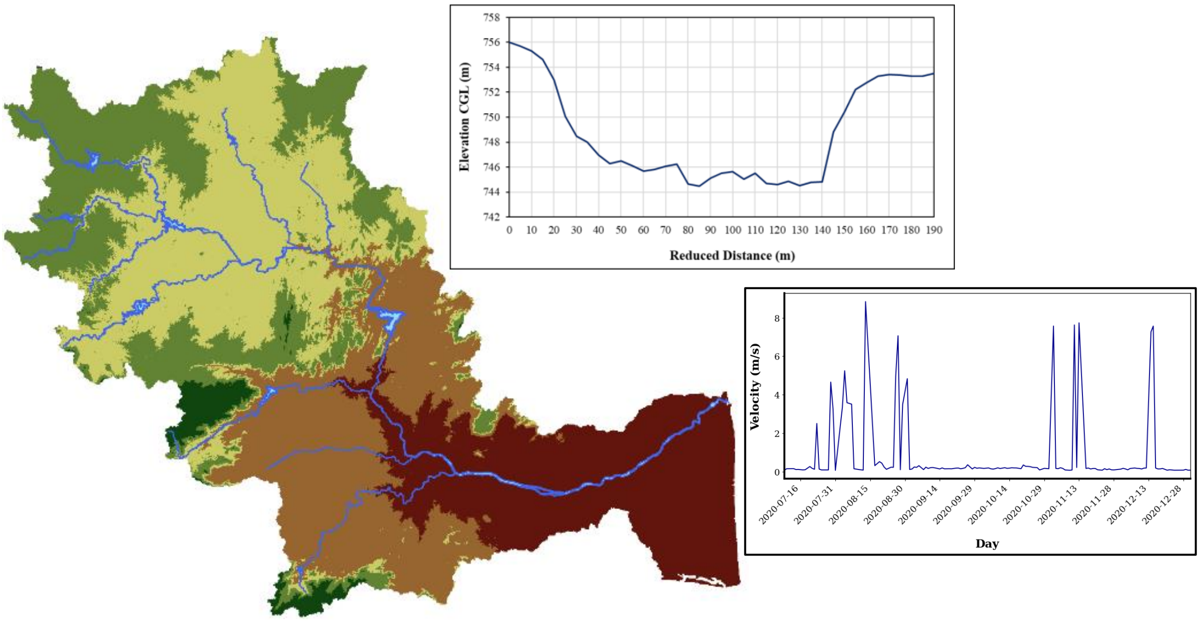
**National River Conservation Directorate**
Ministry of Jal Shakti,
Department of Water Resources,
River Development and Ganga Rejuvenation
Government of India

# Hydraulic Data
# Cauvery River Basin




**December 2024**

© cCauvery, cGanga and NRCD, 2024

**Back of cover page**

**BLANK**

# Hydraulic Data

## Cauvery River Basin

© cCauvery, cGanga and NRCD, 2024

## National River Conservation Directorate (NRCD)

The National River Conservation Directorate, functioning under the Department of Water Resources, River Development and 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 Cauvery River Basin Management Studies (cCauvery)

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

**www.ccauvery.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 IISc Bengaluru (Lead Institute) and NIT Tiruchirappalli (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.

## Team

Prof. Praveen C Ramamurthy, cCauvery, IISc Bengaluru
Prof. Pradeep P Mujumdar, cCauvery, IISc Bengaluru
Prof. Shekhar M, cCauvery, IISc Bengaluru
Prof. Nagesh Kumar Dasika, cCauvery, IISc Bengaluru
Prof. Srinivas VV, cCauvery, IISc Bengaluru
Dr. Lakshminarayana Rao, cCauvery, IISc Bengaluru
Dr. Rajarshi Das Bhowmik, cCauvery, IISc Bengaluru
Dr. Bramha Dutt Vishwakarma, cCauvery, IISc Bengaluru
Dr. Debsunder Dutta, cCauvery, IISc Bengaluru
Dr. Nisha Radhakrishnan, cCauvery, NIT Trichy
Dr. R Manjula, cCauvery, NIT Trichy
Dr. S Saravanan, cCauvery, NIT Trichy
Dr. Aneesh Mathew, cCauvery, NIT Trichy
Dr. Laveti Satish, cCauvery, NIT Trichy
Dr. Prabu P, cCauvery, NIT Trichy
Dr Vinod Tare, cGanga, IIT Kanpur

# 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.

**Prof. Praveen C Ramamurthy**
Centres for CRB
Management and Studies (cCauvery)
IISc Bengaluru (Lead Institute), NIT Tiruchirappalli (Fellow Institute)

**Back of Preface/Blank Page**

# Contents

# List of Figures

# List of Tables

# Continuation of List of Tables/Blank Page

# Abbreviations and Acronyms

| | |
|---|---|
| CRB | Cauvery River Basin |
| CWC | Central Water Commission |
| DEM | Digital Elevation Model |
| GIS | Geographic Information System |
| IWRM | Integrated Water Resource Management |
| KRS | Krishna Raja Sagara |
| RS | Remote Sensing |
| SRTM | Shuttle Radar Topography Mission |

## Continuation of Abbreviations and Acronyms

## /Blank Page

# 1. Introduction

Hydraulic data is a fundamental component in understanding and managing river systems, enabling engineers, hydrologists, and policymakers to assess flow characteristics, identify vulnerabilities, and develop sustainable water resource management strategies. A crucial aspect of hydraulic analysis is the examination of hydraulic cross-sections, which provide detailed information about the shape and flow characteristics of river channels (Chatrabhuj et al., 2024; Rather et al., 2023). Cross-sectional data is instrumental in determining hydraulic parameters such as bed slope, water surface slope, surface roughness, and channel velocity. The bed slope influences the velocity and energy gradient of the river, affecting sediment transport and potential erosion patterns. Water surface slope, on the other hand, provides insights into the river's energy distribution and potential areas of water level fluctuations, which are critical for flood risk assessments. Surface roughness, determined by factors such as vegetation, sediment type, and channel irregularities, plays a significant role in influencing flow resistance and water velocity. The analysis of channel velocity helps in understanding flow dynamics and designing structures that can withstand hydraulic forces while ensuring efficient water conveyance (Sarker, 2021; Tang et al., 2023).

Beyond cross-sectional data, the study also involves an assessment of the longitudinal sections of the mainstream, and major tributaries. Longitudinal profiling is essential in evaluating variations in elevation, gradient, and flow characteristics along the river's course (Sarkar et al., 2021; Qiao et al., 2024). By mapping the longitudinal profile, areas of excessive sediment deposition, erosion-prone regions, and potential bottlenecks that may impact flood propagation and river health, can be identified. Understanding these variations is essential for devising river training measures, bank stabilization efforts, and sediment management strategies (Gaikwad et al., 2024; Sarkar et al., 2021; Zhang et al., 2024).

A significant factor influencing river hydraulics is the presence of infrastructure in and on rivers, including bridges, dams, barrages, intake wells, canal offtakes, sewer outfalls, and ghats (Akter, 2022). These structures serve various functions such as flood control, water supply, irrigation, navigation, and waste disposal. However, they also alter the natural flow regime, leading to potential disruptions in sediment transport, changes in water levels, and ecological consequences. By integrating hydraulic cross-sections, longitudinal section data, and infrastructure assessments, this report offers a holistic perspective on river dynamics and potential challenges. The collected data forms the basis for hydraulic modelling, flood risk assessment, infrastructure planning, and environmental management. Effective interpretation and application of this data are crucial for designing sustainable river management solutions, mitigating flood hazards, and ensuring the optimal utilization of water resources (Perosa et al., 2022; Bakhtiari et al., 2024).

Furthermore, the integration of modern technology, such as remote sensing (RS), geographic information systems (GIS), and hydrodynamic modelling, enhances the accuracy and efficiency of hydraulic studies (Trinh and Molkenthin, 2021; Xing et al., 2022). Advanced tools allow for precise data collection, real-time monitoring, and predictive simulations, enabling decision-makers to develop evidence-based policies and early warning systems to mitigate the adverse impacts of hydrological changes.

This report provides a comprehensive hydraulic assessment of the Cauvery River system, encompassing cross-sectional and longitudinal analyses, as well as infrastructure evaluations. The findings will contribute to sustainable river management, flood mitigation, and effective infrastructure planning, ensuring that hydraulic structures and interventions align with ecological and socio-economic considerations.

# 2. Sources of hydraulic data

In India, hydraulic data is primarily sourced from the Central Water Commission (CWC) and various State Irrigation Departments. The CWC is responsible for monitoring river flows, flood forecasting, and assessing water availability across different river basins through an extensive network of hydrological observation stations. It also provides crucial data on reservoir storage, water resources, and dam operations. On the other hand, State Irrigation Departments manage region-specific irrigation projects, canal networks, and water distribution systems. They maintain records of reservoir levels, irrigation potential, and seasonal water release schedules. Together, these agencies play a vital role in water resource management, supporting agricultural planning, disaster mitigation, and policy formulation across the country. Temporal and spatial data aggregation help in trend analysis, while proper data formatting and storage ensure efficient retrieval and usability for further research.

Due to the unavailability of observed longitudinal profile data from CWC for CRB, the Shuttle Radar Topography Mission (SRTM) Digital Elevation Model (DEM) was utilized to generate the longitudinal river profile required for hydraulic modelling. The SRTM dataset, with a spatial resolution of 30 meters, provides reliable elevation information that enables the extraction of riverbed profiles over large spatial extents. Although it lacks the precision of ground-surveyed data, SRTM DEM serves as a valuable alternative for preliminary assessments and modelling in data-scarce regions.

# 3. Hydraulic data of CRB

## 3.1. Cross sections data

Cross-sectional surveys of the Cauvery River's mainstream and its major tributaries play a vital role in understanding the hydraulic behaviour of the basin. These surveys offer detailed insights into the river’s morphology, flow dynamics, and sediment transport processes, factors that are crucial for informed water resource planning, flood risk mitigation, and ecological preservation within the basin. By systematically analysing cross-sections at strategic locations along the Cauvery River and its tributaries, robust hydrodynamic models can be developed to predict alterations in flow regimes, and evaluate risks associated with erosion, sedimentation, and flooding. The various CWC stations distributed across CRB, providing an overview of the spatial monitoring network, are shown in Fig. 1.

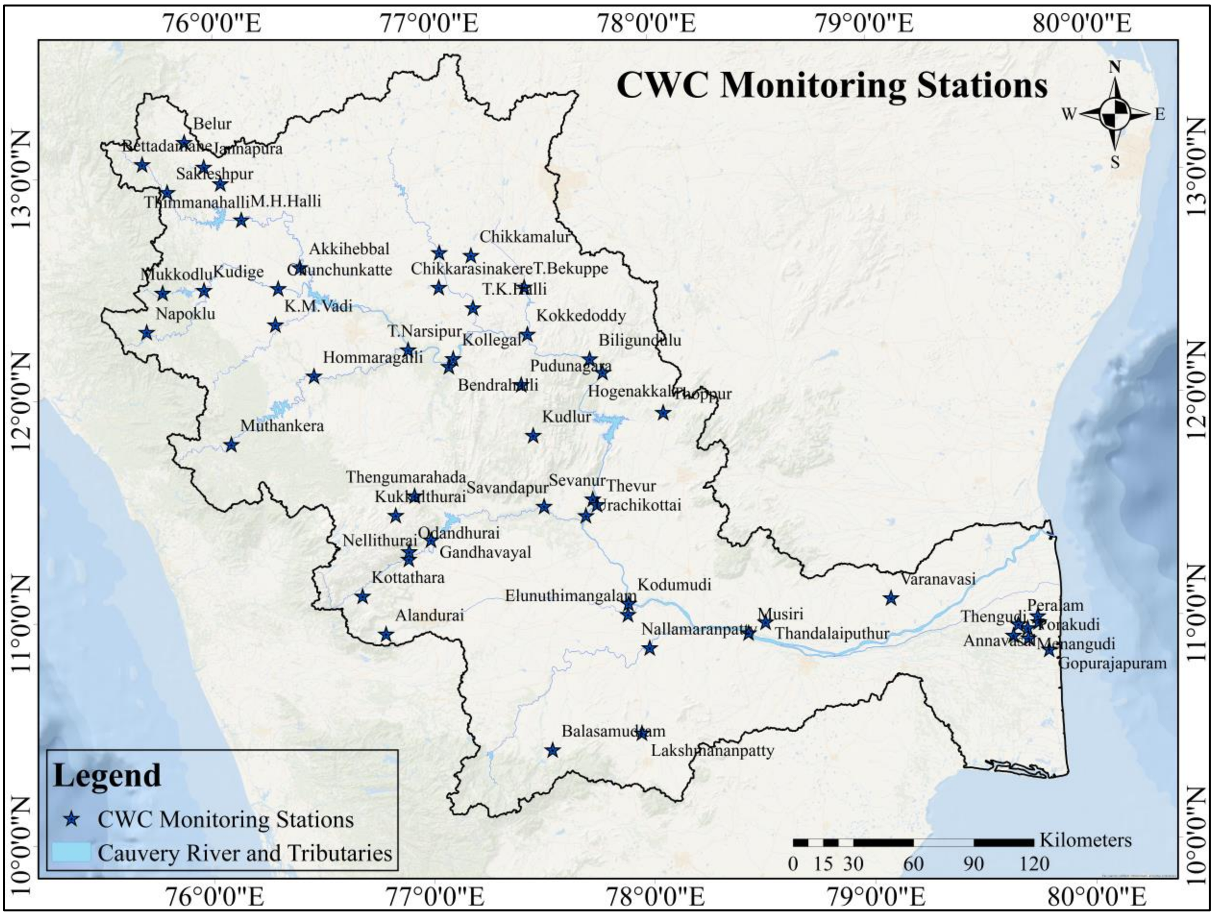



**Fig. 1.** CWC monitoring stations in CRB

**(Source:** CWC)

Moreover, the year-wise availability of cross-sectional data for each monitoring station across the basin, highlighting temporal data coverage and identifying potential gaps in historical records are depicted in Fig. 2.

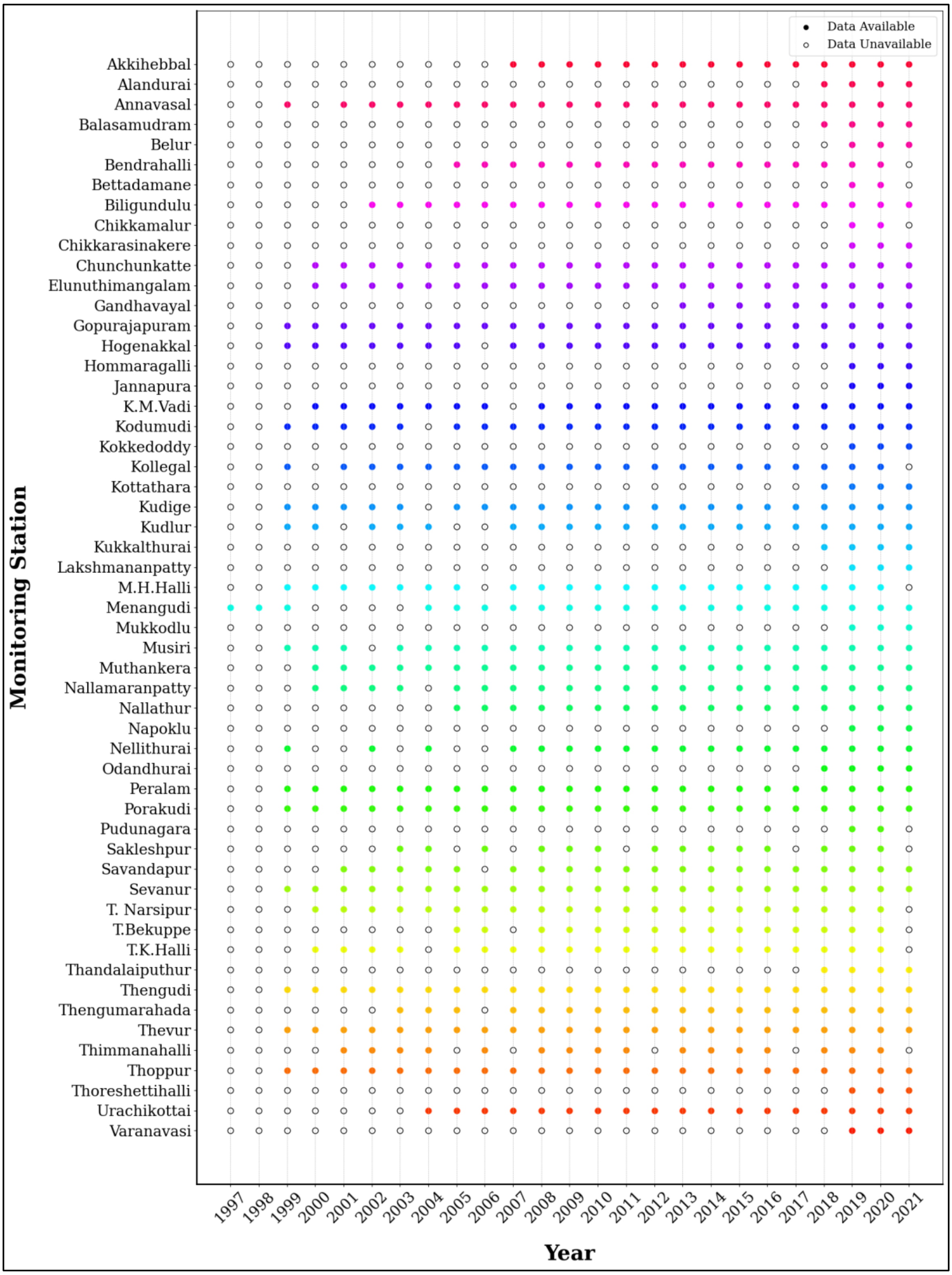



**Fig. 2.** Year-wise availability of cross-section data for each monitoring station

**(Source:** CWC**)**

For illustration, the cross-section data for one (Akkihebbal station) of the monitoring stations in the year 2021 is described in Fig. 3. This holds significant importance as it provides critical information on the river's geometric profile at a specific monitoring station.

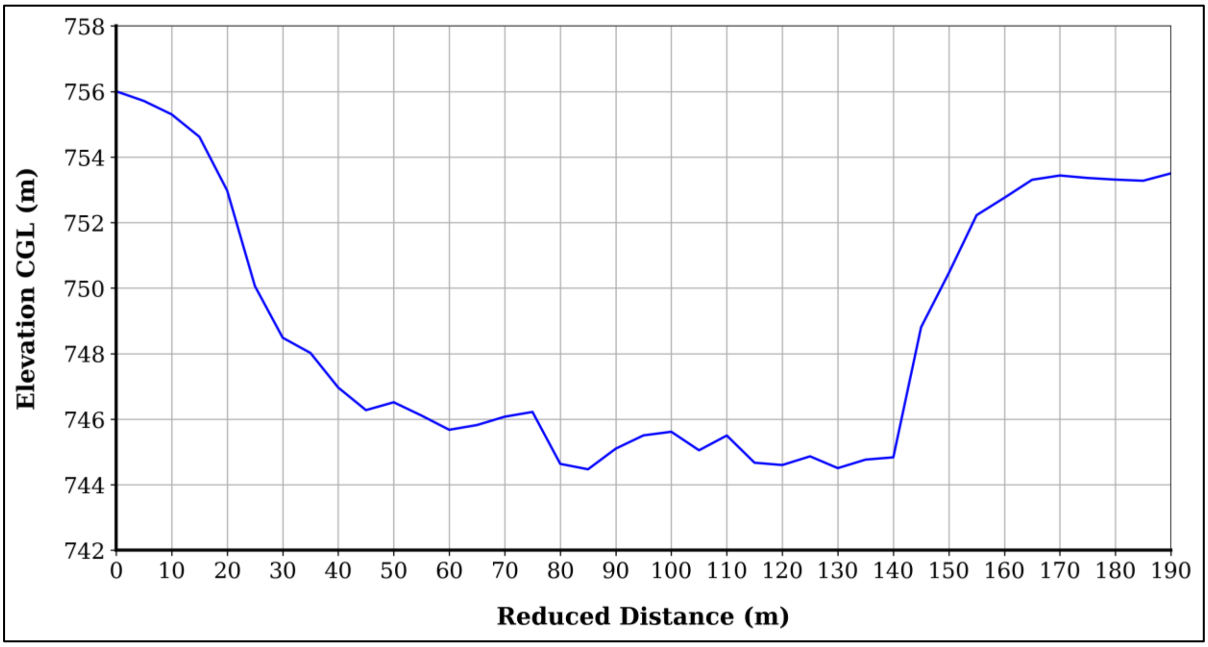



**Fig. 3.** Cross-section at Akkihebbal station
(Sation Code: CCR00B7, Year: 2021)
**(Source:** CWC**)**

One of the primary objectives of cross-sectional surveys in CRB is to determine the shape and size of the river channel. The morphology of a river channel, including its depth, width, and bank slope, significantly influences water movement and sediment transport. Variations in cross-sectional profiles indicate how the Cauvery River and its tributaries adapt to natural and anthropogenic changes over time. For illustration, a narrowing river section with steep banks may suggest ongoing erosion, while a wider and shallower section may indicate sediment deposition. Understanding these variations helps in identifying areas susceptible to erosion and sedimentation, which is crucial for riverbank protection and navigability.

Flow characteristics, including velocity, discharge, and water surface elevation, are also crucial parameters derived from cross-sectional surveys (Gehring et al., 2022; Jesna et al., 2023). By analysing how water moves through different sections of the Cauvery River, it can be predicted that how changes in discharge affect flood levels and water availability. For instance, during high-flow conditions, cross-sectional data can be used to model floodplain inundation and develop mitigation strategies such as embankments, levees, and channel modifications. Similarly, in low-flow conditions, these surveys help assess the impact of water extraction and climate variability on the Cauvery River discharge, ensuring sustainable water use for agriculture, industry, and communities.

Sediment transport dynamics, another vital aspect of river systems, are also assessed through cross-sectional surveys. Sediment movement within the Cauvery River affects channel stability, aquatic habitats, and water quality. Surveys help determine sediment load distribution, identifying areas of excessive sediment accumulation or erosion. This information is crucial for managing reservoir siltation, designing dredging operations, and restoring riverine ecosystems of CRB. In urban and industrial regions, cross-sectional surveys of drains and tributaries help monitor pollution loads, sediment contamination, and their effects on the main river system. By integrating these data with water quality assessments, policymakers can develop strategies to control pollution and maintain ecological balance (Ghosh et al., 2021; Li et al., 2024).

Moreover, cross-sectional surveys provide baseline data for long-term monitoring and management of the Cauvery River. By conducting these surveys periodically, trends in river behaviour can be identified, enabling proactive decision-making. For example, in regions experiencing rapid urbanization, increased surface runoff and sediment load can alter river dynamics, leading to more frequent floods or degradation of aquatic habitats. Cross-sectional data help predict such impacts and guide infrastructure planning to minimize negative consequences (Ahakwa et al., 2023; Ahmadi et al., 2024; Liao et al., 2023). The key hydraulic parameters derived from cross-sectional analysis include:

#### 3.1.1. Bed slope

The bed slope of a river is a fundamental parameter that determines the gradient of the riverbed, directly influencing flow velocity, sediment transport, and channel stability. In CRB, variations in bed slope play a crucial role in hydraulic behaviour, sediment dynamics, and water resource management. The bed slope represents the rate at which the riverbed descends along the river's course, affecting the energy available for water movement.

In the upper reaches of the Cauvery River, originating from Talakaveri in the Western Ghats, the steep bed slope results in high-velocity flow, facilitating rapid sediment transport and erosion. This section of the river, characterized by its rugged terrain, allows for the development of hydropower projects like those at Shivanasamudra Falls, where the steep gradient is harnessed for electricity generation. The high-energy flow in this part of the basin also contributes to the transport of coarse sediments downstream, shaping the riverbed morphology.

As the river progresses through the Deccan Plateau and the fertile plains of Tamil Nadu, the bed slope gradually decreases, leading to a reduction in flow velocity. In this region, particularly around Mysuru, Srirangapatna, and Erode, the moderate to gentle slope supports the development of extensive irrigation networks, such as the Krishna Raja Sagara (KRS) Dam and the Grand Anicut system. These irrigation projects rely on controlled flow conditions, which are influenced by the longitudinal variation in bed slope. The gradual decline in velocity also promotes sediment deposition, which can impact canal efficiency and reservoir storage capacity over time.

In the lower reaches and the Cauvery Delta, near Trichy and Thanjavur, the river's slope becomes extremely gentle, causing a significant drop in flow velocity. This results in increased sediment deposition, contributing to the formation of the fertile deltaic plains, which are essential for agriculture, particularly paddy cultivation. However, excessive sedimentation in this region can lead to siltation of irrigation channels and barrages, necessitating regular dredging and maintenance. The gentle slope also makes the lower basin vulnerable to backwater effects during high tides and extreme rainfall events, increasing the risk of flooding in coastal areas.

Understanding the bed slope distribution across CRB is essential for hydraulic modelling, flood management, and sediment control. A steep slope in the upper reaches requires erosion control measures, while a gentle slope in the lower basin necessitates sediment management strategies to maintain river navigability and irrigation efficiency. Additionally, with climate change affecting river flow and sediment transport, continuous monitoring of bed slope variations is crucial for ensuring sustainable water resource planning and river basin management.

### 3.1.2. Water surface slope

The water surface slope of a river is a crucial parameter that reflects the energy gradient of flowing water, influencing flow velocity, resistance, and flood risks. In CRB, variations in water surface slope significantly impact hydraulic behaviour, sediment transport, and floodplain management. It represents the change in water surface elevation over a given distance and plays a key role in determining flow resistance, discharge capacity, and potential areas of flooding or erosion.

In the upper reaches of the Cauvery River, particularly in the Western Ghats region, the steep water surface slope results in high-energy flow conditions. This leads to rapid water movement, increased turbulence, and active sediment transport. Areas near Shivanasamudra Falls experience a sharp drop in elevation, generating high-velocity currents that are suitable for hydropower generation. However, such steep gradients also increase erosion rates, requiring catchment management strategies to reduce sediment influx into downstream reservoirs.

As the river enters the Deccan Plateau, the water surface slope gradually decreases, leading to moderate flow velocities in regions like Mysuru and Srirangapatna. This section of the river, controlled by structures like KRS Dam, benefits from a balanced energy gradient, allowing for efficient water storage and regulated discharge for irrigation. Here, the water surface slope plays a crucial role in determining flow distribution to irrigation canals and assessing flow resistance due to channel roughness and vegetation.

Further downstream, in the lower reaches of Tamil Nadu, the water surface slope becomes very gentle, especially in the deltaic regions around Trichy and Thanjavur. This reduction in slope leads to lower flow velocities, increasing the risk of sediment deposition and siltation in irrigation canals and barrages like the Grand Anicut. A low water surface slope in these regions can also cause flooding during extreme rainfall events, as the river's capacity to transport excess water diminishes. The backwater effect from tidal influence near the Cauvery Delta further complicates flood risk assessment and requires efficient drainage management strategies.

By analysing water surface slope variations across different sections of CRB, hydrologists can assess how efficiently water moves through the river channel and identify areas prone to flooding, sediment deposition, or erosion. For example, at Akkihebbal station in CRB (Fig. 4), water surface slope variations highlight localized changes in hydraulic conditions, which can impact flood management and riverbank stability. Continuous monitoring of water surface slope is essential for predicting flood risks, optimizing dam operations, and ensuring sustainable water management in the basin.

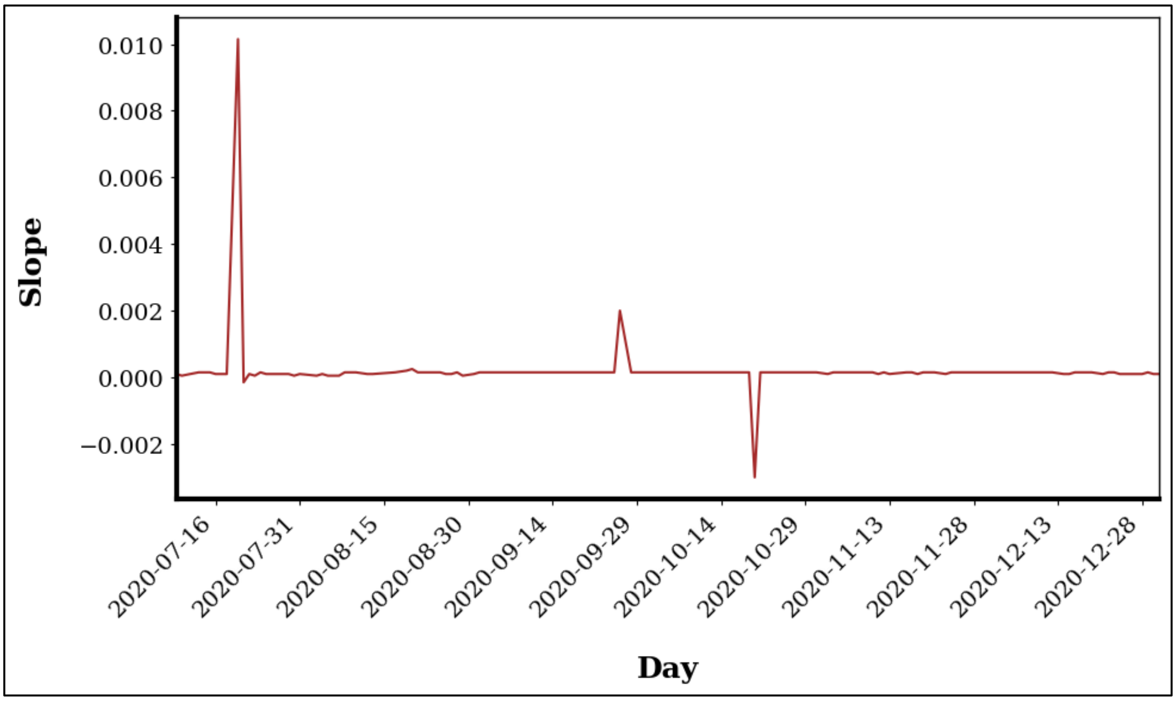



**Fig. 4.** Water surface slope at Akkihebbal station

(Sation Code: CCR00B7, Year: 2020)

**(Source:** CWC**)**

### 3.1.3. Surface roughness

Surface roughness is a critical factor in determining flow resistance in CRB, influencing velocity, discharge, and overall hydraulic behaviour. It refers to the irregularities and obstacles within the river channel that affect how water moves. These include bed material, vegetation, sediment deposits, and artificial structures such as dams, barrages, bridges, and irrigation canals. Understanding surface roughness is essential for accurate hydraulic modelling, flood risk assessment, and river management in the basin.

In the upper reaches of the Cauvery, originating from Talakaveri in the Western Ghats, the river flows through rocky terrain with steep gradients, resulting in a relatively rough riverbed. The presence of boulders, coarse sediments, and natural rapids increases flow resistance, reducing velocity fluctuations but also leading to high-energy erosion. This rugged surface roughness significantly influences sediment transport, particularly in monsoon seasons, when increased runoff dislodges large particles and carries them downstream. The Shivanasamudra Falls, a key location in this section, experiences turbulent flow and energy dissipation due to high roughness.

As the Cauvery River moves through the Deccan Plateau, it encounters a more stable, alluvial channel with sand and silt deposits. In regions around Mysuru and Erode, the riverbed roughness decreases due to finer sediment composition and regulated water flow from reservoirs. However, vegetation growth along the banks and mid-channel sediment bars can increase roughness, affecting flow velocity and water conveyance capacity. This variation in surface roughness is crucial for managing irrigation channels and flood control structures, as excess roughness can slow water movement and increase deposition rates in irrigation canals.

In the lower reaches of the Cauvery Delta, near Trichy and Thanjavur, surface roughness is largely influenced by sediment deposition and tidal interactions. The gentle gradient and fine-grained sediment result in a smoother channel, but seasonal vegetation, sandbars, and human-made obstructions such as embankments and sluice gates can significantly alter flow resistance. During monsoons, increased sediment loads, and aquatic vegetation growth can raise roughness, impacting discharge efficiency and floodplain inundation patterns. The Cauvery Delta's irrigation network, crucial for agriculture, requires constant monitoring of surface roughness to ensure efficient water distribution and prevent clogging in distributary channels.

The role of artificial structures such as dams, barrages, and bridges also contribute to surface roughness variability in CRB. Hydraulic structures like the Mettur Dam and Grand Anicut create flow obstructions, leading to turbulent flow zones, energy dissipation, and altered sediment transport patterns. Understanding and managing roughness around these structures is vital to maintain hydraulic efficiency, minimize sediment accumulation, and optimize water distribution for irrigation and drinking water supply.

Accurate representation of surface roughness in hydraulic models helps predict flooding, sediment transport, and river channel stability in CRB. With climate change affecting rainfall patterns and river discharge, continuous assessment of roughness parameters is necessary to implement effective flood mitigation, erosion control, and sustainable river management strategies.

### 3.1.4. Channel velocity

Channel velocity refers to the speed at which water flows through a river channel and is a critical parameter in hydraulic modelling, flood assessment, sediment transport analysis, and river engineering interventions. In CRB, variations in channel velocity significantly influence water distribution, flood risks, and river morphology, making it an essential aspect of river monitoring and management.

The channel velocity of the Cauvery River is primarily governed by factors such as bed slope, water surface slope, surface roughness, and channel shape. In the upper reaches of the Cauvery, near Talakaveri in the Western Ghats, the steep bed slope and narrow channel morphology result in high-velocity flows. This allows for the rapid transport of sediments and nutrients, shaping the river's course as it moves downstream. The high-energy flows in this region have also been harnessed for hydropower generation, such as at Shivanasamudra Falls, where the velocity is utilized to generate electricity.

As the river enters the Deccan Plateau, flowing through Mysuru and Mandya districts, the channel velocity decreases due to a reduction in bed slope and widening of the river channel. This moderate flow regime supports the major irrigation networks of the Cauvery, including KRS Dam and the Hemavathi Reservoir, ensuring efficient water distribution for agriculture. However, fluctuations in velocity in this stretch can impact sediment deposition and reservoir sedimentation, necessitating periodic dredging and water flow regulation.

Further downstream, in the Tamil Nadu plains and the Cauvery Delta, the channel velocity slows down significantly due to the gentle bed slope and increased river width. This results in enhanced sediment deposition, contributing to the formation of fertile alluvial plains that sustain intensive agriculture in districts such as Erode, Trichy, and Thanjavur. However, reduced velocity in these regions also increases flood risks, particularly during monsoon seasons, when high inflows from upstream can cause backwater effects and localized flooding. The Grand Anicut and Lower Bhavani Project depend on precise velocity control measures to optimize irrigation efficiency and prevent waterlogging.

At Akkihebbal station (Fig. 5) in CRB, variations in channel velocity have been observed, influenced by seasonal flow changes, sediment accumulation, and anthropogenic modifications to the river channel. Understanding channel velocity variations across different segments of the Cauvery River is essential for flood control, irrigation planning, hydropower optimization, and sediment transport studies. With changing climate patterns affecting rainfall distribution and river flow, regular velocity assessments can help predict extreme hydrological events, enabling better water resource planning and disaster preparedness in CRB.

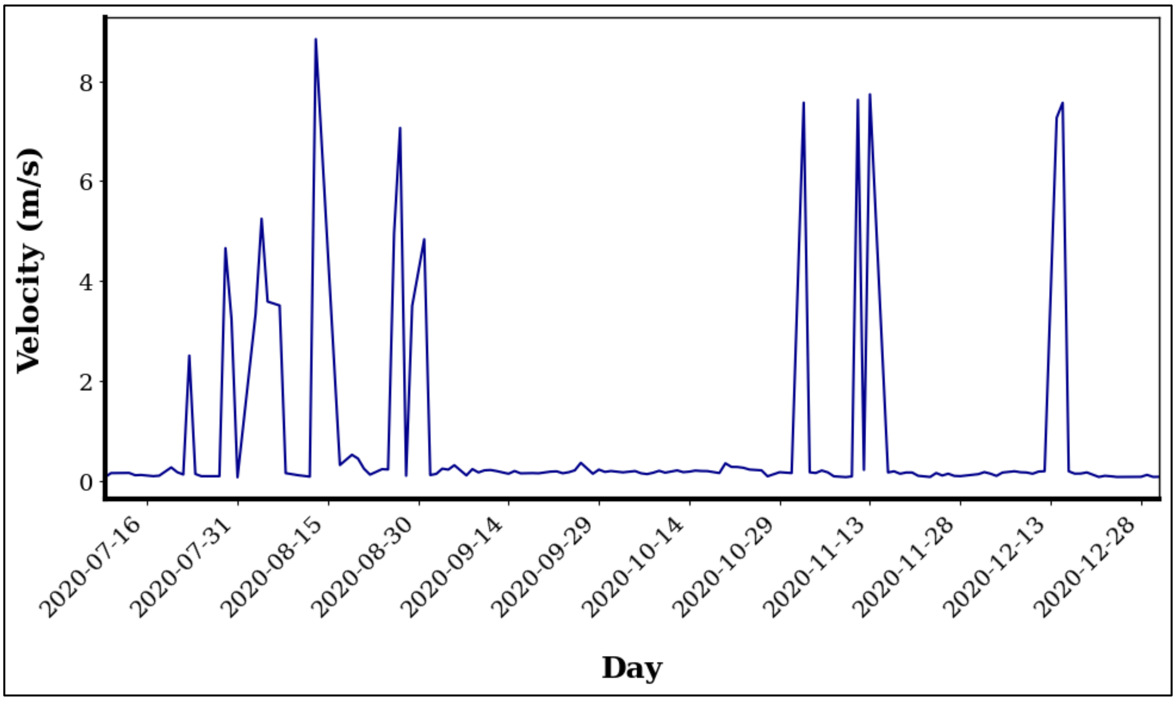



**Fig. 5.** Channel velocity at Akkihebbal station
(Sation Code: CCR00B7, Year: 2020)
**(Source:** CWC**)**

### 3.2. Longitudinal section data

The longitudinal section of the Cauvery River, which represents the continuous elevation profile of the riverbed and water surface along its course, plays a critical role in hydraulic modelling, river management, and planning. When generated for the mainstream and major tributaries, this data provides essential insights into flow behaviour, sediment transport, flood risks, and water resource allocation. In this study, longitudinal section data of the river has been generated using the SRTM DEM (Figs. 6 – 15). This offers a cost-effective approach for large-scale river profiling, helping determine key hydraulic parameters such as bed slope, water surface slope, and flow resistance. These parameters significantly influence water velocity, discharge capacity, and flood wave propagation.

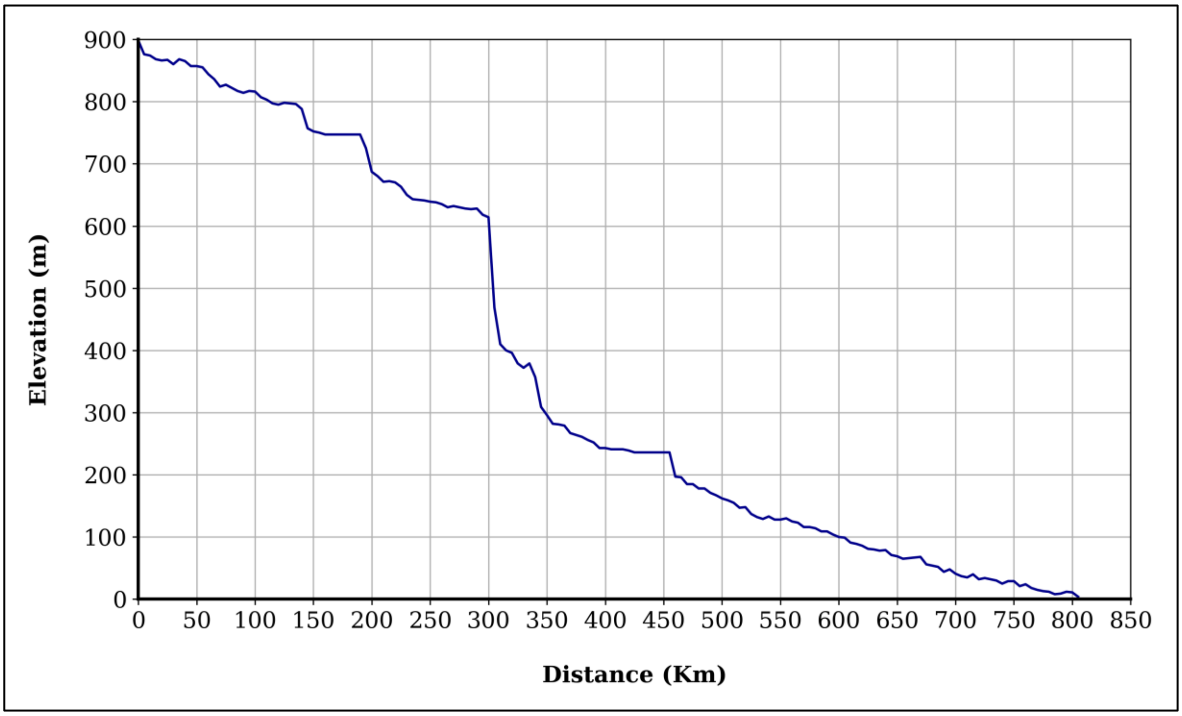



**Fig. 6.** Longitudinal profile of the Cauvery River (Main stream)

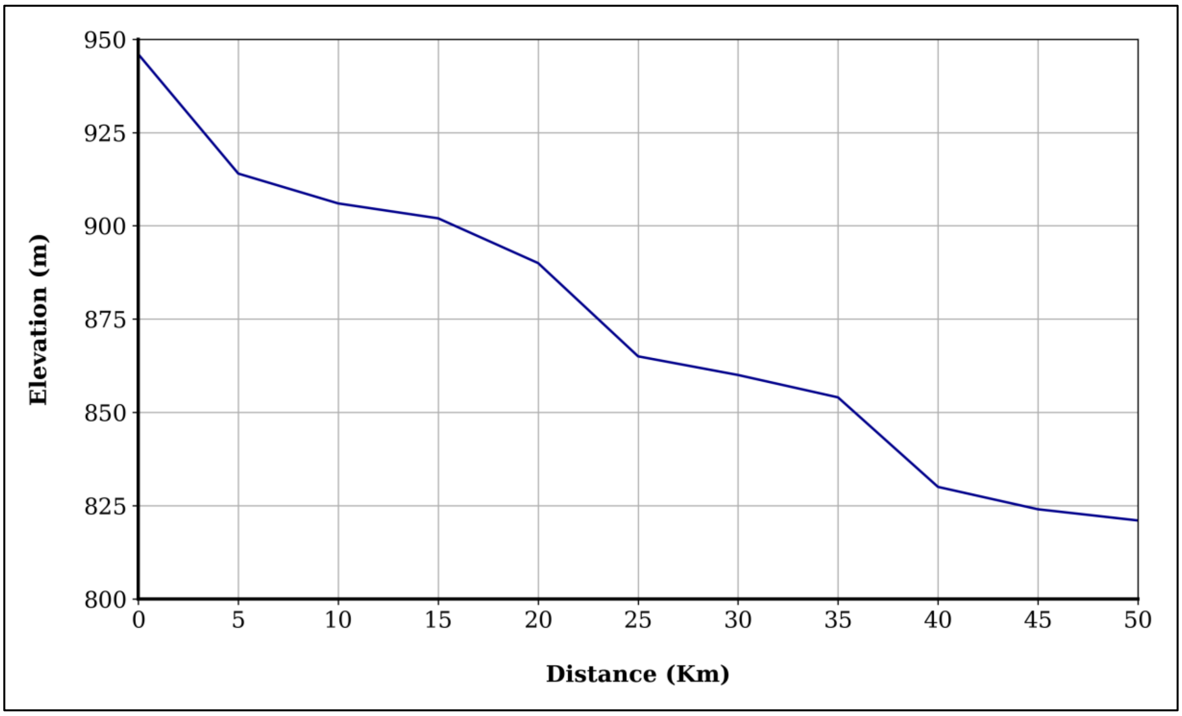



**Fig. 7.** Longitudinal profile of the Harangi River (Tributary)

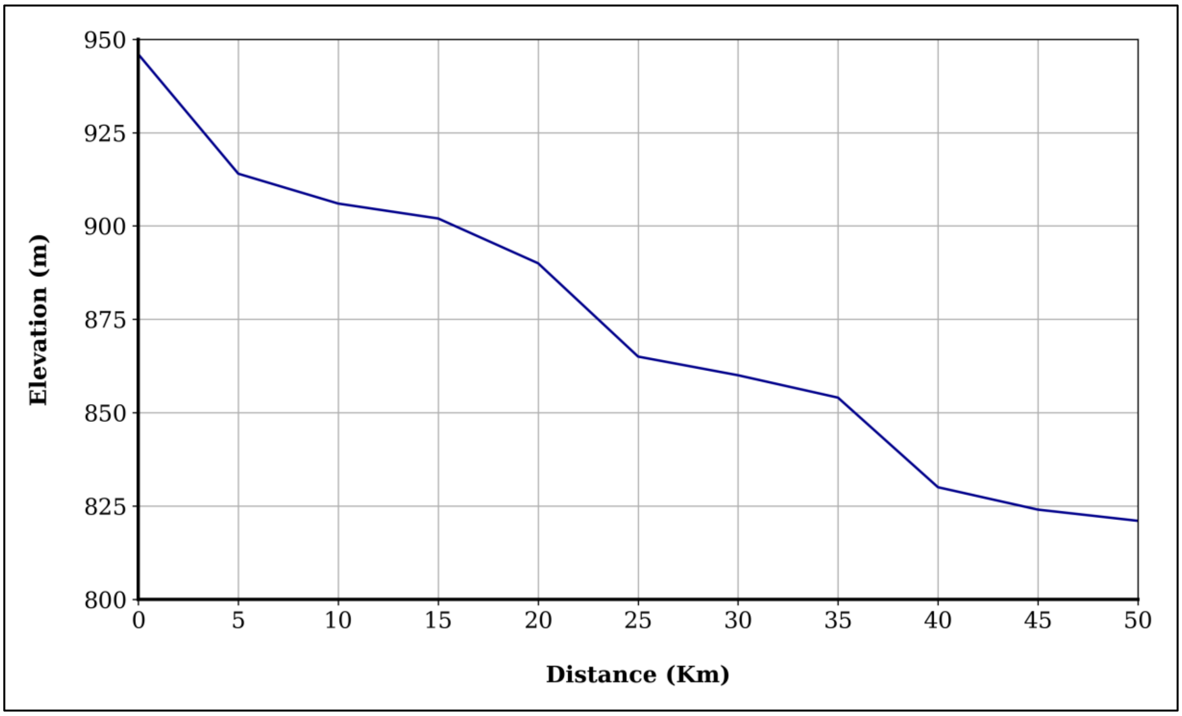



**Fig. 8.** Longitudinal profile of the Hemavati River (Tributary)

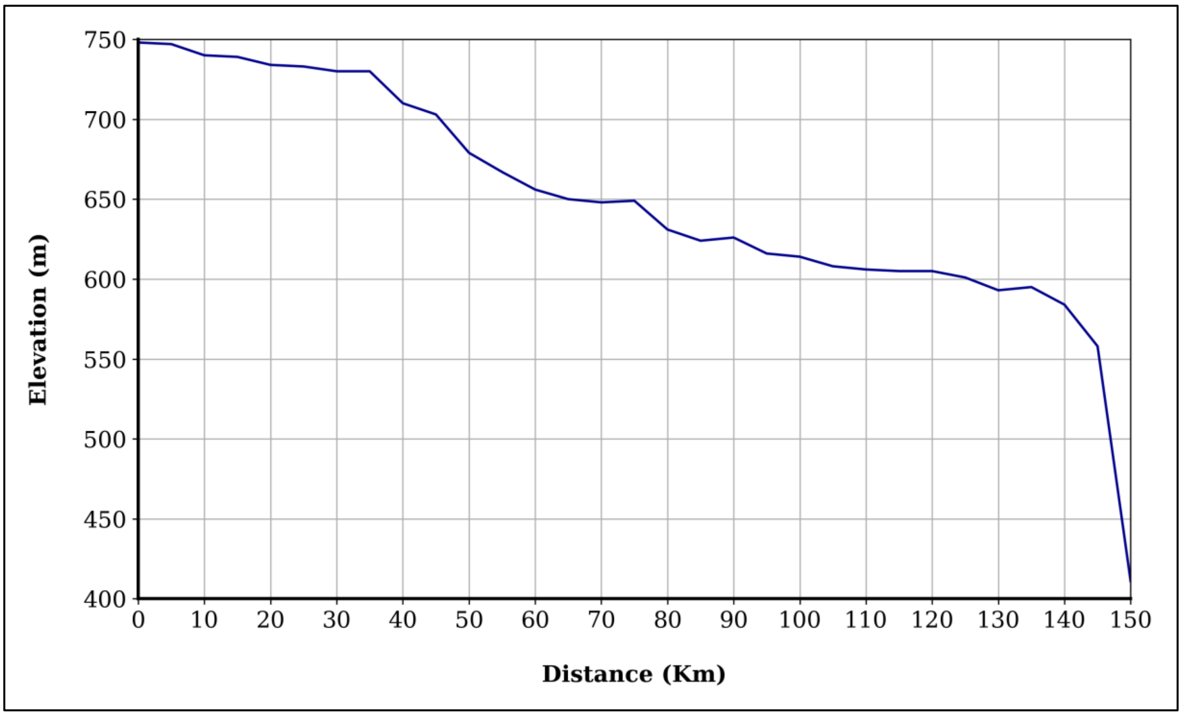



**Fig. 9.** Longitudinal profile of the Shimsha River (Tributary)

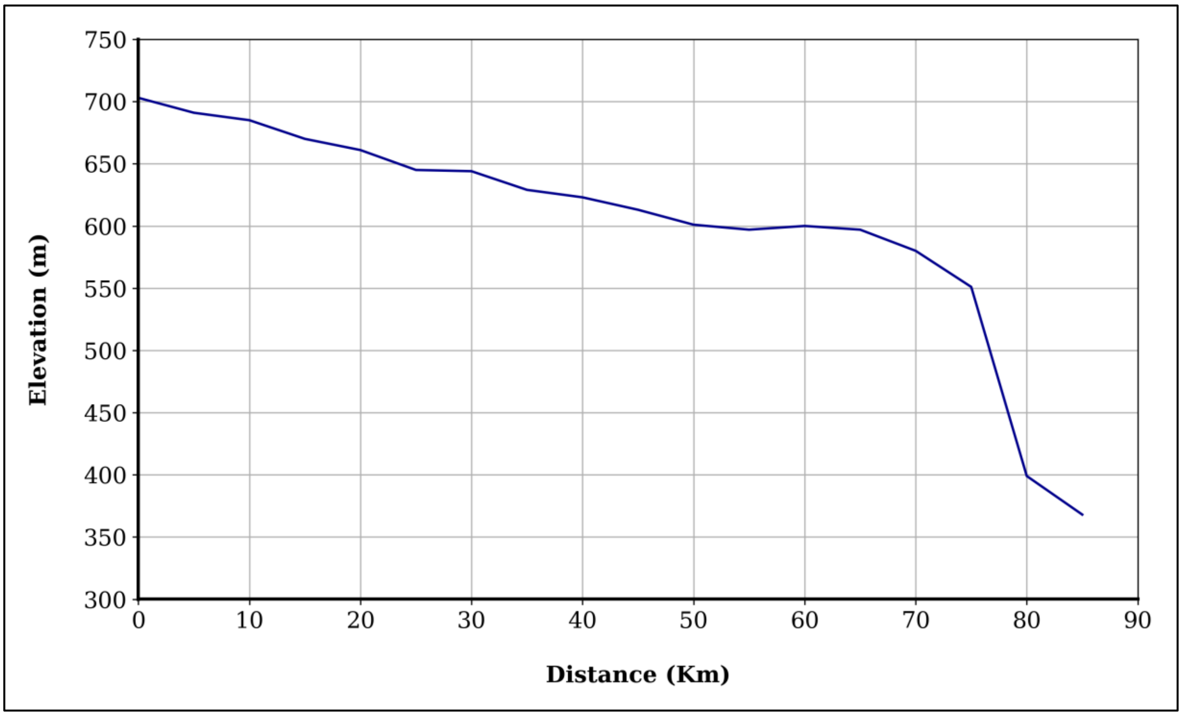



**Fig. 10.** Longitudinal profile of the Arkavathi River (Tributary)

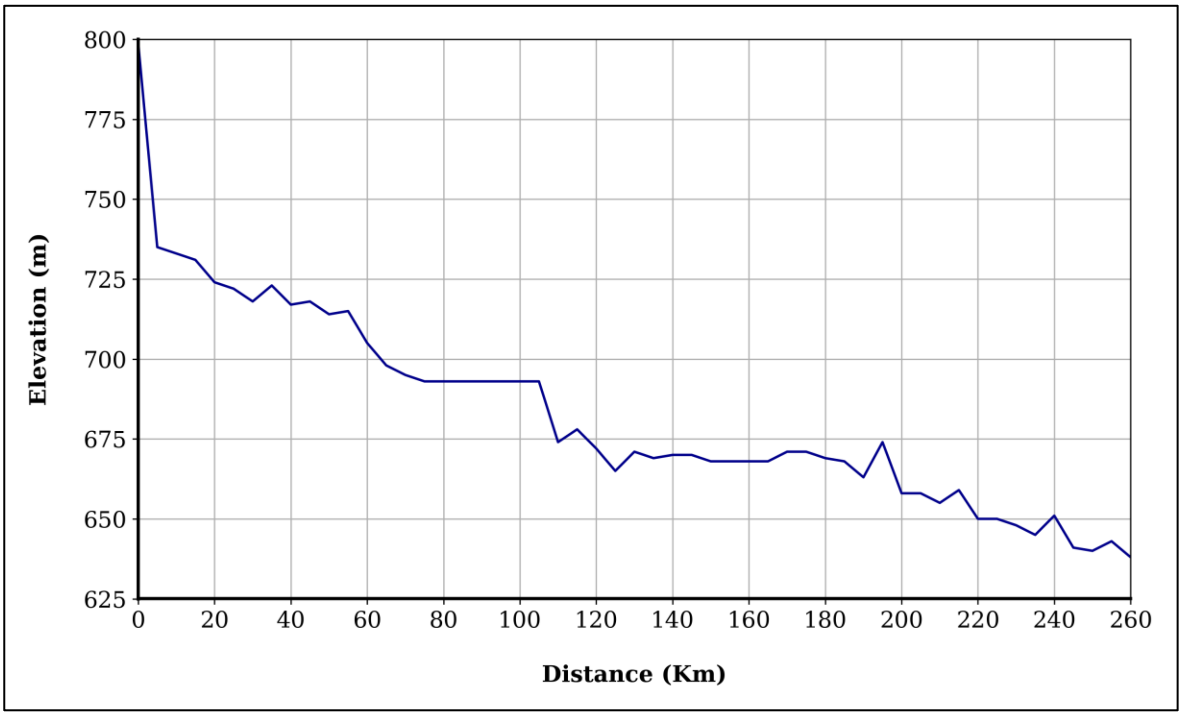



**Fig. 11.** Longitudinal profile of the Kabini River (Tributary)

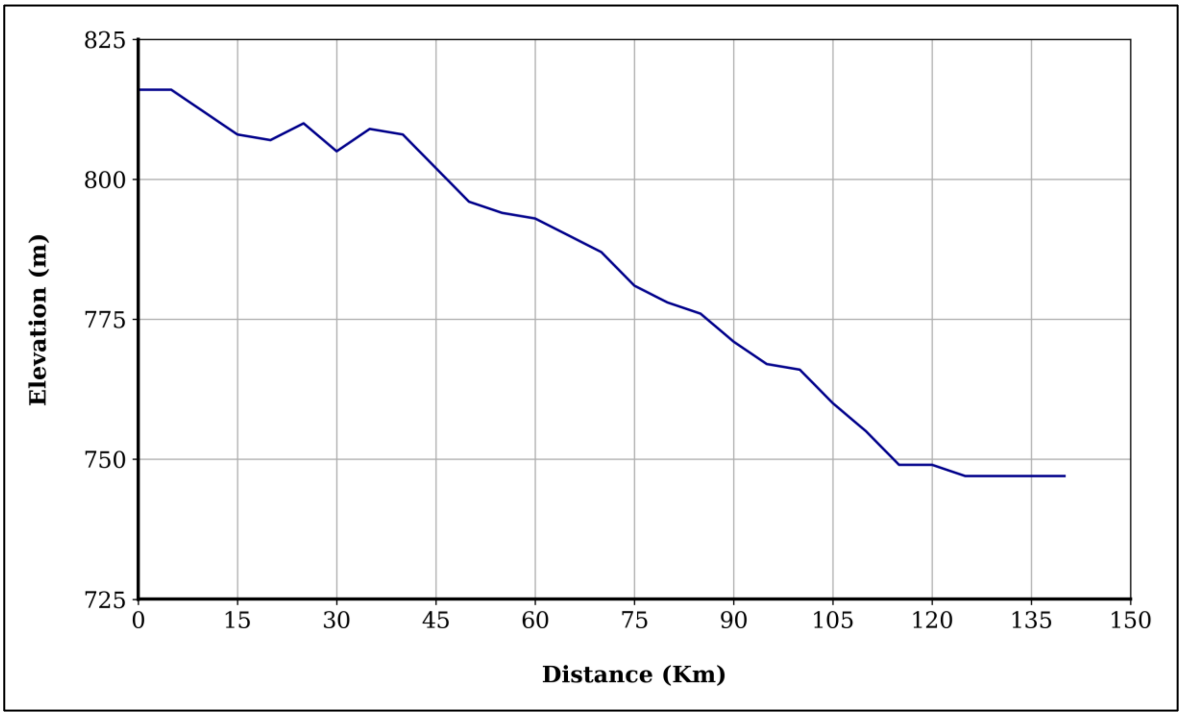



**Fig. 12.** Longitudinal profile of the Lakshmantirtha River (Tributary)

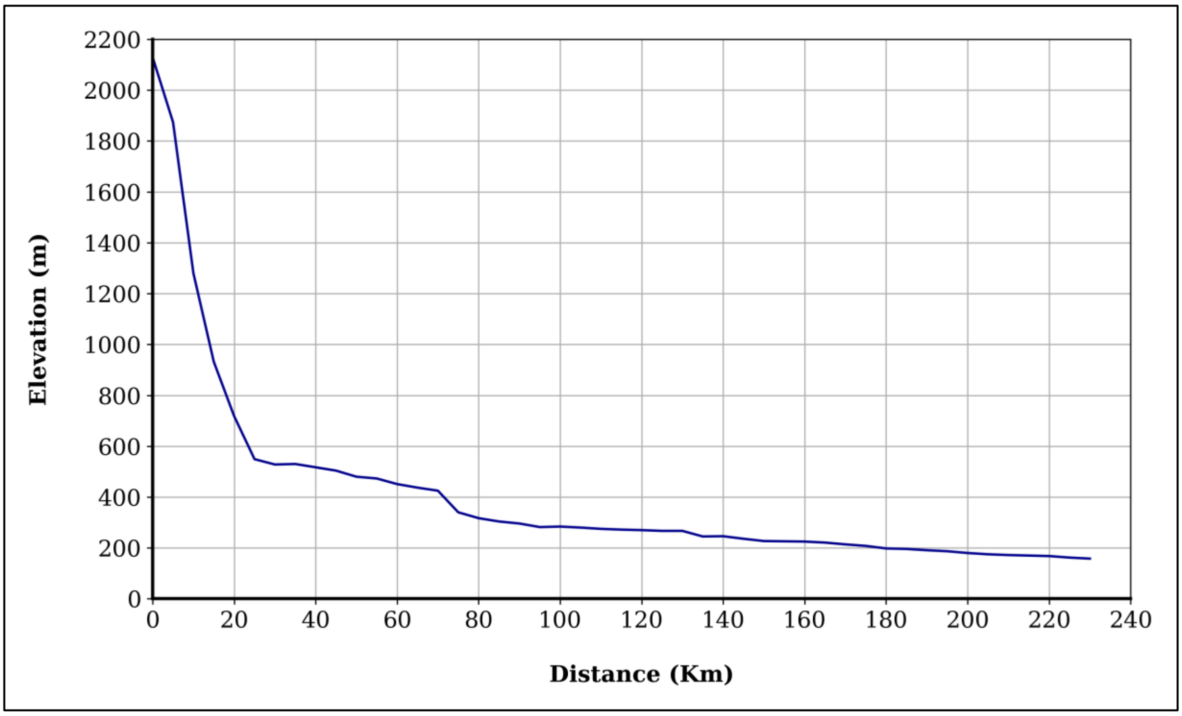



**Fig. 13.** Longitudinal profile of the Bhavani River (Tributary)

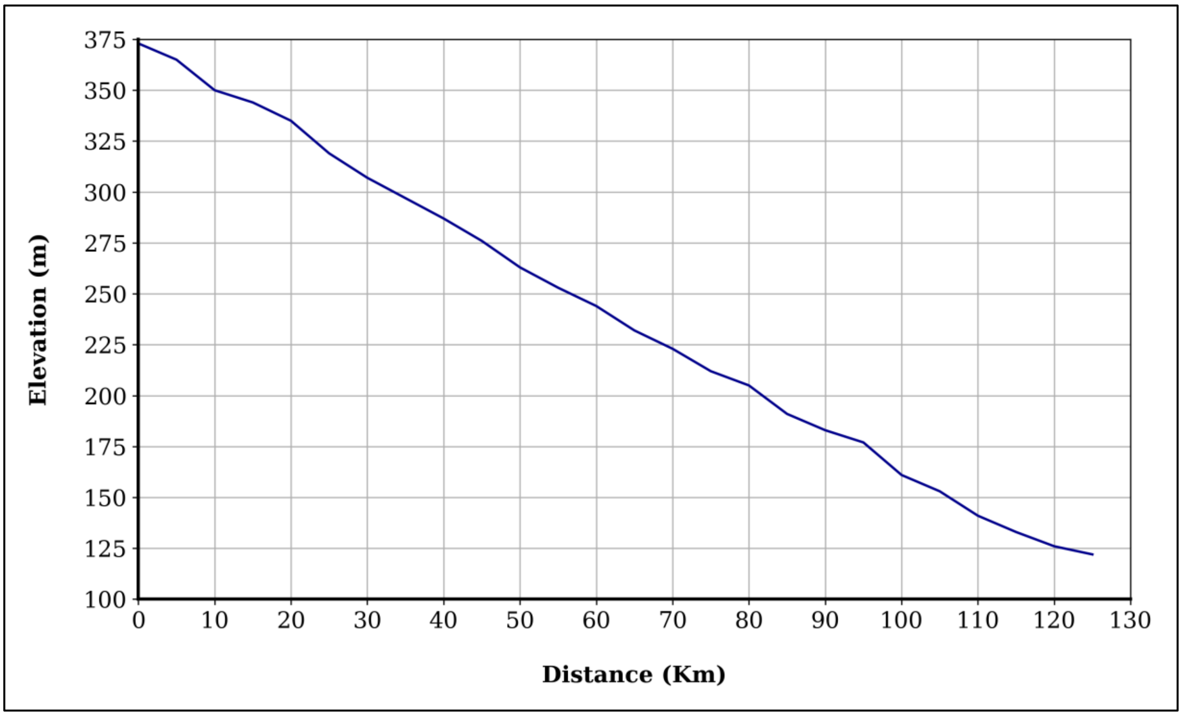



**Fig. 14.** Longitudinal profile of the Noyyal River (Tributary)

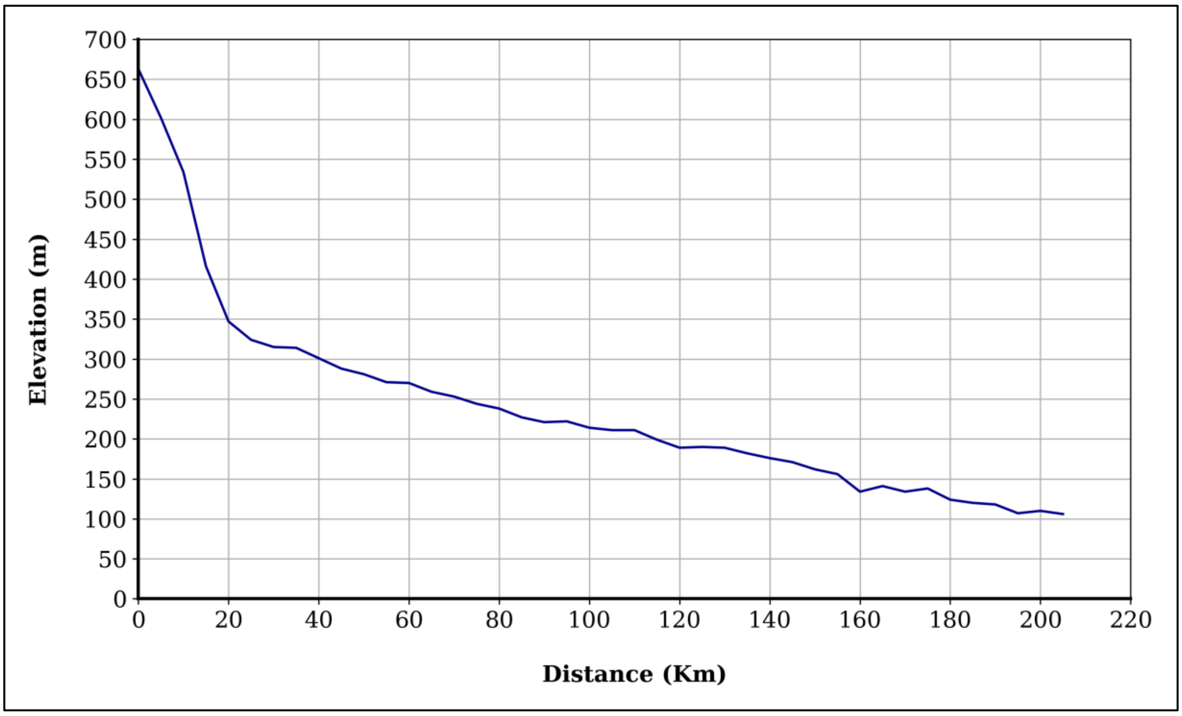



**Fig. 15.** Longitudinal profile of the Amaravathi River (Tributary)

Though CRB is not as flood prone as some other Indian basins, extreme rainfall events, especially in the monsoon season, can lead to localized flooding in urban and agricultural areas. Cities like Mysuru, Bengaluru (via Vrishabhavathi stream), and Trichy have experienced urban flooding due to poor drainage and encroachments on natural watercourses. By analysing longitudinal section data, authorities can identify low-lying flood-prone zones, simulate flood wave propagation, and plan for effective flood mitigation measures such as embankments, flood storage reservoirs, and improved drainage networks.

The Cauvery River carries a significant sediment load, particularly from erosion-prone areas in the Western Ghats and the Deccan Plateau. Sedimentation issues at barrages, canals, and reservoirs reduce water storage capacity and disrupt river flow. The longitudinal section of the river and its drains helps in identifying sediment deposition and erosion hotspots, which is crucial for dredging operations, reservoir management, and preventing riverbank instability. Sediment management is particularly vital in deltaic regions like Thanjavur, where excessive siltation impacts agriculture and fisheries.

Several key hydraulic structures, including bridges, barrages, intake wells, and irrigation canals, depend on an accurate understanding of the river's longitudinal profile. The Cauvery's irrigation network is one of the largest in India, with systems like the Grand Anicut Canal System and Lower Bhavani Project, supplying water to thousands of farmers. Proper longitudinal section analysis ensures that irrigation canals maintain adequate gradients for efficient water conveyance while minimizing waterlogging or seepage losses. Additionally, hydropower projects such as Shivanasamudra Falls benefit from detailed hydraulic studies, optimizing energy generation and water discharge patterns.

Water resource allocation and management also rely on longitudinal section data for optimizing water storage, distribution, and inter-basin water transfers. It enables better decision-making in interstate water-sharing agreements, reducing conflicts over river flow distribution. Additionally, it supports the integration of surface water and groundwater management, ensuring sustainable usage of water resources for agriculture, drinking water supply, and industrial purposes.

With changing rainfall patterns, increasing temperatures, and unpredictable monsoon variability, CRB is witnessing fluctuations in water availability. The longitudinal section of the river, tributaries, and drains helps assess how climate change affects river gradients, flow patterns, and sediment movement. This information is crucial for designing adaptive measures such as riverbank restoration, wetland conservation, and improved water storage systems. Long-term monitoring of the river's longitudinal profile can help track geomorphological changes and inform future water management strategies.

## 3.3. Infrastructure in/on rivers

CRB is one of the most important and extensively utilized river systems in southern India, spanning Karnataka, Tamil Nadu, Kerala, and Puducherry. The basin supports agriculture, hydropower generation, drinking water supply, and cultural activities, making it vital for millions of people. Over time, various infrastructures have been developed in and along the Cauvery River and its tributaries to regulate water flow, facilitate irrigation, manage floods, and support economic activities. These infrastructures include bridges, dams, barrages, intake wells, canals, sewer outfalls, and ghats, each playing a critical role in water management and socio-economic development.

### 3.3.1. Bridges

Bridges are essential river-crossing structures that facilitate transportation and connectivity across regions. Their design considers factors like river flow velocity, flood levels, and sediment transport to ensure stability and longevity. Improperly designed bridges can obstruct flow, cause scouring at piers, and impact floodplain dynamics.

Several bridges cross the Cauvery River, providing road and rail connectivity between different regions (Table 1). Examples include the Srirangapattana Bridge in Karnataka and the Kaveri Bridge in Tamil Nadu. These bridges are crucial for transportation but also require careful structural design to withstand flood events and river erosion. Improperly designed bridges can cause local scouring, sediment buildup, and changes in flow patterns.

**Table 1.** Bridges on the Cauvery River

| Sr. No. | Name | Region | State |
|---|---|---|---|
| 1 | Wellesley Bridge | Mandya (Srirangapatna) | Karnataka |
| 2 | Cauvery Bridge/Cauvery Bridge (Chennai-Trichy Bypass) | Tiruchirappalli | Tamil Nadu |
| 3 | Kaveri Bridge/ Srirangapattana Bridge - (Kaveri Hole) | Mandya (Srirangapattana) | Karnataka |
| 4 | Uratchikottai Barrage/Kaveri River Bridge | Urachikottai | Tamil Nadu |
| 5 | New Bridge (Nerur-Unniyur) | Karur, Tiruchi | Tamil Nadu |
| 6 | High-Level Bridge (Srirangam-Trichy) | Tiruchirappalli, Srirangam | Tamil Nadu |

| | | | |
|---|---|---|---|
| 7 | Kaveri River Bridge at Madikeri-Napoklu Rd | Hoddur | Karnataka |
| 8 | Kaveri River Bridge/ Balamberi Bridge | Balamuri | Karnataka |
| 9 | Kondangeri Bridge | Sodluru Kattemadu | Karnataka |
| 10 | Cavery Bridge at Karadigodu | Karadigodu | Karnataka |
| 11 | Kaveri River Bridge at Kushalanagar | Kushalanagar | Karnataka |
| 12 | Hanging Bridge (Kanive) | Kanive | Karnataka |
| 13 | Kaverihole Bridge | Chamarayanakote | Karnataka |
| 14 | Kadavina Hosahalli Bridge | Hosahalli | Karnataka |
| 15 | Ramanathapura Kaverihole Bridge | Kotavalu | Karnataka |
| 16 | Keralapura Kaverihole Bridge | Karthalu | Karnataka |
| 17 | Chunchanakatte Kaveri Hole Bridge | Haliyur | Karnataka |
| 18 | River Kaveri Bridge at Mysore-Hassan Rd | Katnalhantha | Karnataka |
| 19 | Hale Kaverihole Bridge | Manuganahalli | Karnataka |
| 20 | Degganahalli Bridge | Galigekere | Karnataka |
| 21 | Kaveri Hole Bridge at KRS-Pandavapura Main Rd | KRS-Pandavapura Main Rd | Karnataka |
| 22 | Kaveri River Sunset Viewpoint SriRangapatana/ North Kaveri Rail Bridge | Srirangapatna | Karnataka |
| 23 | Bengaluru-Mysuru Expressway | Ganjam | Karnataka |
| 24 | Ganjam Karighatta Bridge | Baburayanakoppal | Karnataka |
| 25 | Mahadevapura Kaverihole Bridge | Mysuru | Karnataka |
| 26 | Bannuru Kaveri Bridge | Bannur Rural | Karnataka |
| 27 | Thirumakudalu Kaverihole Bridge | Belakavadi - T Narasipura Rd | Karnataka |
| 28 | Talakadu Bridge | Shambudevanapura | Karnataka |
| 29 | Talakadu - Tadimalangi Bridge | Tadimalangi | Karnataka |
| 30 | Kaveripura Bridge | Holesalu | Karnataka |
| 31 | Yadakuriya Bridge | Chamarajanagar | Karnataka |
| 32 | Satthegala New Bridge/Sathyagala Kaveri river Bridge | Sathyagala | Karnataka |
| 33 | Kaveri Old Bridge | Cauvery Beat | Karnataka |
| 34 | Hanging Bridge | Hogenakkal | Tamil Nadu |
| 35 | Kaveri Bridge \| Mettur Dam | Mettur | Tamil Nadu |

| | | | |
|---|---|---|---|
| 36 | Kaveri River Bridge Mettur | Mettur | Tamil Nadu |
| 37 | Cavery Cross Bridge | Navappatti | Tamil Nadu |
| 38 | Chekkanur Bridge\|Chekkanur Dam | Navappatti | Tamil Nadu |
| 39 | Nerinjipettai Barrage | Poolampatti | Tamil Nadu |
| 40 | Kaveri River Bridge | Koneripatti | Tamil Nadu |
| 41 | Bhavani-Komarapalayam New Kaveri Bridge | Bhavani | Tamil Nadu |
| 42 | Bhavani Kumaraplayam British Old Bridge | Bhavani | Tamil Nadu |
| 43 | Bhavani Komarapalayam Highway Bridge | Komarapalayam | Tamil Nadu |
| 44 | Bhavani Kattalai Barrage | Erode | Tamil Nadu |
| 45 | Brahmana Periya Agraharam (Kaveri River) Bridge | Agraharam | Tamil Nadu |
| 46 | Kaveri Railway Bridge | Pallipalayam | Tamil Nadu |
| 47 | Vendipalayam Barrage | Erode-Kokkarayanpettai Rd | Tamil Nadu |
| 48 | Kaveri River Bridge at Erode - Velur Rd | Nanjailakkapuram | Tamil Nadu |
| 49 | Nattatreeswarar Temple Bridge | Sathambur | Tamil Nadu |
| 50 | Solasiramani-Pasur Road (Kaveri River) Bridge | Solasiramani - Pasur | Tamil Nadu |
| 51 | Velur (Kaveri River) Bridge at Velur-Velayuthampalayam-Noyyal Rd | Nanjai Pugalur | Tamil Nadu |
| 52 | Vangal - Mohanur Kaveri River Bridge | Mohanur | Tamil Nadu |
| 53 | Mayanur Bridge | Seelaipillaiyarputhur | Tamil Nadu |
| 54 | Thanthai Periyar Cauvery Bridge/Kulithalai bridge Kaveri River | Kulithalai | Tamil Nadu |
| 55 | Kaveri Palam/Cauvery Bridge at Killa Chinthamani | Tiruchirappalli | Tamil Nadu |
| 56 | Kaveri Railway Bridge | Tiruchirappalli | Tamil Nadu |
| 57 | Kallanai Dam Bridge | SH22 | Tamil Nadu |
| 58 | Kaveri Bridge | Puduchatram | Tamil Nadu |
| 59 | Thirukattupalli Dam | Thirukkattupalli | Tamil Nadu |
| 60 | Thiruvaiyaru kaveri Bridge | Thiruvaiyaru | Tamil Nadu |
| 61 | Kaveri Bridge Ayyampettai | Eachankudi | Tamil Nadu |
| 62 | Baburajapuram Kaveri bridge | Kumbakonam | Tamil Nadu |

| | | | |
|---|---|---|---|
| 63 | Melacauvery Bridge | Kumbakonam | Tamil Nadu |
| 64 | Palakarai Bridge | Kumbakonam | Tamil Nadu |
| 65 | Veppathur kaveri Bridge | Veppathur | Tamil Nadu |
| 66 | Manalur Bridge | Manalur | Tamil Nadu |
| 67 | Thuhili Bridge | Kottur | Tamil Nadu |
| 68 | Karuppur Bridge | Karuppur | Tamil Nadu |
| 69 | Kuttalam Bridge | Melaiyur Thulasenthirapuram | Tamil Nadu |
| 70 | Cauvery bridge | Katuvalavu | Tamil Nadu |
| 71 | Kaveri river single bridge | Mayiladuthurai | Tamil Nadu |
| 72 | Cavery bridge | Mannampandal | Tamil Nadu |
| 73 | Cavary bridge | Alaveli | Tamil Nadu |
| 74 | Cavary maliyur bridge | Kiluer | Tamil Nadu |
| 75 | Parasalur Bridge | Parasalur | Tamil Nadu |
| 76 | Keezhaiyur Cauvery Bridge | Nadukkarai Keelapathi | Tamil Nadu |
| 77 | Keelaiyur Bridge | Kiluer | Tamil Nadu |
| 78 | NH karuvi cavary brige | Radhanallur | Tamil Nadu |
| 79 | Kavery final destination Melaiyur Bridge | Melaiyur | Tamil Nadu |
| 80 | Vanagiri Bridge | Vanagiri | Tamil Nadu |

Source: Google Earth

### 3.3.2. Dams

Dams are built across rivers to store water for irrigation, hydropower generation, and flood control. They regulate river flow, ensuring water availability during dry seasons while preventing excessive flooding. However, dams also alter sediment transport, affect downstream flow regimes, and can lead to environmental disruptions if not managed properly.

One of the most significant dams in CRB is KRS Dam, built across the river in Karnataka. This dam serves as a major irrigation source for the Mysuru region and parts of Tamil Nadu, supplying water to thousands of farmers. Additionally, it helps regulate river discharge, preventing sudden floods during heavy rainfall. Similarly, the Mettur Dam in Tamil Nadu, another major reservoir on the Cauvery, plays a critical role in irrigating the fertile deltaic regions, particularly in Thanjavur, Nagapattinam, and Tiruvarur districts. By ensuring a steady flow of water, these dams have been instrumental in agricultural development across the basin.

Apart from irrigation, hydropower generation is another key function of dams in CRB. Projects such as the Shivanasamudra Hydroelectric Station, one of India's first hydroelectric plants, harness the river's flow to generate renewable energy. Other dams, including the Kabini and Lower Bhavani Dam (Bhavanisagar Dams), contribute to both power generation and irrigation, making them vital for regional development.

However, the construction and operation of dams in CRB have also brought environmental and hydrological challenges. One of the major concerns is the alteration of sediment transport. Dams trap sediments that would naturally replenish downstream riverbeds and deltas, leading to coastal erosion and reduced soil fertility in agricultural lands. The Cauvery Delta, a highly productive agricultural zone, has been experiencing declining sediment supply, affecting soil health and crop yields. Dams also impact river ecology and biodiversity by altering natural flow patterns. Reduced downstream flows can affect aquatic habitats, fish migration, and wetland ecosystems, which depend on seasonal water level variations. A list of dams in CRB is available in Table 2.

**Table 2.** Dams in CRB

| Sr. No. | Name | Purpose | River | District | State |
|---|---|---|---|---|---|
| 1 | Alalur Dam | Irrigation | Lakshmanathirtha | Mysore | Karnataka |
| 2 | Albur Kere Dam | | | Tumkur | Karnataka |
| 3 | Amaravathi Dam | Hydroelectric , Irrigation | Amaravati | Tiruppur | Tamil Nadu |
| 4 | Arkavathy Dam | Irrigation | Arkavathy | Ramanagara | Karnataka |
| 5 | Avalanche Dam | Hydroelectric | Avalanche & Emerald Streams | The Nilgiris | Tamil Nadu |
| 6 | Byramangala Dam | Irrigation | Vrishabhavathy | Ramanagara | Karnataka |
| 7 | Chakena Hally Dam | Irrigation | Hemavathy River | Hassan | Karnataka |
| 8 | Chickkahole Dam | Irrigation | Chickkahole | Chamarajanagar | Karnataka |
| 9 | Chikkagondanahally Dam | Irrigation | Arkavathy | Ramanagara | Karnataka |
| 10 | Chiklihole Dam | Irrigation | Chiklihole | Kodagu | Karnataka |
| 11 | Deepambudikere Dam | Irrigation | Nagini | Tumkur | Karnataka |
| 12 | Doddaladahalli Dam | Irrigation | Arkavathy | Ramanagara | Karnataka |
| 13 | East Varahapallam dam | | East varahapallam | The Nilgiris | Tamil Nadu |
| 14 | Emerald Dam | Hydroelectric | Emerald | The Nilgiris | Tamil Nadu |
| 15 | Glenmorgan | Hydroelectric | Glenmorgan St | The Nilgiris | Tamil Nadu |
| 16 | Glenmorgan Forbay Dam | Hydroelectric | | The Nilgiris | Tamil Nadu |
| 17 | Gopinatham Dam | Irrigation | Cauvery Basin | Chamarajanagar | Karnataka |
| 18 | Gowdahally Dam | Irrigation | K.K.Halla | Chamarajanagar | Karnataka |
| 19 | Gundal Dam | Irrigation | Gundal | Chamarajanagar | Karnataka |
| 20 | Gunderipallam Dam | | Gunderipallam | periyar | Tamil Nadu |
| 21 | Harangi Dam | Hydroelectric ,Irrigation | Harangi | Kodagu | Karnataka |
| 22 | Hebbahalla Dam | Irrigation | Hebballa | Mysore | Karnataka |
| 23 | Hemavathy Dam | Irrigation | Hemavathy | Hassan | Karnataka |
| 24 | Hesaraghatta Dam | Drinking / Water Supply | Arkavathy | Bangalore | Karnataka |

| | | | | | |
|---|---|---|---|---|---|
| 25 | Hosahalli Dam | Irrigation | K.K.Halla | Chamarajanagar | Karnataka |
| 26 | K.Honnamachanahalli Dam | Irrigation | Local Halla | Tumkur | Karnataka |
| 27 | Kabini Dam | Hydroelectric ,Irrigation | Kabini | Mysore | Karnataka |
| 28 | Kachavanahalli Dam | Irrigation | Karigale & Hebbahalla | Mysore | Karnataka |
| 29 | Kadaba Dam | Irrigation | Shimsha Valley | Tumkur | Karnataka |
| 30 | Kalikatte Dam | Irrigation | Kalikattehalla | Chamarajanagar | Karnataka |
| 31 | Kamarahalli Dam | Irrigation | K.Hallihalla | Chamarajanagar | Karnataka |
| 32 | Kamraju Sagar (Sandy Nalla) Dam | | Sandynallah | The Nilgiris | Tamil Nadu |
| 33 | Kanva Dam | Irrigation | Kanva | Ramanagara | Karnataka |
| 34 | Karapuzha (Id) Dam | Irrigation | Karapuzha | Wayanad | Kerala |
| 35 | Karimuddenahalli Dam | Irrigation | Lakshman Theertha | Mysore | Karnataka |
| 36 | Kesarigulihalla Dam | Irrigation | K.gulihalla | Dharmapuri | Tamil Nadu |
| 37 | Kodaganar Dam | Irrigation | | Dindigul | Tamil Nadu |
| 38 | Kothagere Dam | | | Tumkur | Karnataka |
| 39 | Kowlihalla Dam | Irrigation | Cauvery Basin | Chamarajanagar | Karnataka |
| 40 | Krishnarajasagar Dam | Irrigation | Cauvery | Mandya | Karnataka |
| 41 | Kundah Palam Dam | Hydroelectric | Kundah | The Nilgiris | Tamil Nadu |
| 42 | Kunigal Dodakere Dam | Irrigation | Nagini | Tumkur | Karnataka |
| 43 | Kuppareddy Dam | | | Bangalore | Karnataka |
| 44 | Kuthiraiyar Dam | Irrigation | Kuthiraiyar | Dindigul | Tamil Nadu |
| 45 | Kuttiyadi Spillway Dam | Hydroelectric ,Irrigation | Panamarampuzha | Wayanad | Kerala |
| 46 | Lower Bhavani Dam | Hydroelectric ,Irrigation | Bhavani | Erode | Tamil Nadu |
| 47 | Maidal Amanikere Dam | Irrigation | Agasarahalli nala | Tumkur | Karnataka |
| 48 | Mallaghatta Dam | Irrigation | Shimsha Valley | Tumkur | Karnataka |
| 49 | Manchanabele Dam | Irrigation | Arkavathy | Ramanagara | Karnataka |
| 50 | Mangala I Dam | Irrigation | Nagini River | Tumkur | Karnataka |

| | | | | | |
|---|---|---|---|---|---|
| 51 | Mangala II Dam | Irrigation | Cauvery | Chamarajanagar | Karnataka |
| 52 | Maralvadi Dam | Irrigation | Arkavathy | Ramanagara | Karnataka |
| 53 | Maravakandi Forbay Dam | Hydroelectric | Aravarihalla | The Nilgiris | Tamil Nadu |
| 54 | Marconahally Dam | Irrigation | Shimsha Valley | Tumkur | Karnataka |
| 55 | Marudhanadi Dam | Irrigation | Maurdhanadhi | Dindigul | Tamil Nadu |
| 56 | Mayasandra Dam | Irrigation | Shimsha Valley | Tumkur | Karnataka |
| 57 | Mettur Dam | Hydroelectric, Irrigation | Cauvery | Salem | Tamil Nadu |
| 58 | Moyar Forebay Dam | Hydroelectric | | The Nilgiris | Tamil Nadu |
| 59 | Mukurthy Dam | | Mukurthi | The Nilgiris | Tamil Nadu |
| 60 | Muthurayanakere Dam | Irrigation | Local Nala | Tumkur | Karnataka |
| 61 | Nagavathi Dam | Irrigation | Nagavathy | Dharmapuri | Tamil Nadu |
| 62 | Nallathangal Odai Dam | | Nallathangal Odai | Tiruppur | Tamil Nadu |
| 63 | Nallur Amanikere Dam | Irrigation | Gundlu | Chamarajanagar | Karnataka |
| 64 | Nanganjiyar Dam | Irrigation | Nanganjiyar | Dindigul | Tamil Nadu |
| 65 | Near Kottagiri Saddle Dam | Hydroelectric | | Wayanad | Kerala |
| 66 | Nelligudda Dam | Irrigation | Bidadi Halla | Ramanagara | Karnataka |
| 67 | Neralatti Kere Dam | | | Ramanagara | Karnataka |
| 68 | New Amachawadi Dam | Irrigation | Yennehole Stream | Chamarajanagar | Karnataka |
| 69 | Nidasale Dam | Irrigation | Nagini | Tumkur | Karnataka |
| 70 | Nittur Dam | Irrigation | Shimsha Valley | Tumkur | Karnataka |
| 71 | Nonavinakere Lake Dam | | | Tumkur | Karnataka |
| 72 | Noyyal Athupalayam Dam | Irrigation | Noyyal | Karur | Tamil Nadu |
| 73 | Noyyal Orathupalayam Dam | Irrigation | Noyyal | Tiruppur | Tamil Nadu |
| 74 | Nugu Dam | Hydroelectric, Irrigation | Nugu | Mysore | Karnataka |
| 75 | Obichudanahally Dam | Irrigation | Arkavathy | Bangalore | Karnataka |

| | | | | | |
|---|---|---|---|---|---|
| 76 | Palar Porundalar Dam | Irrigation | PalarPorundalar | Dindigul | Tamil Nadu |
| 77 | Parappalar Dam | Irrigation | Parappalar | Dindigul | Tamil Nadu |
| 78 | Parson□S Valley Dam | Hydroelectric | Parson Valley Stream | The Nilgiris | Tamil Nadu |
| 79 | Pegumbahallah Forebay Dam | Hydroelectric | Pengumbahallh | The Nilgiris | Tamil Nadu |
| 80 | Perumpallam Dam | | Perumpalam | Erode | Tamil Nadu |
| 81 | Pillur Dam | Hydroelectric | Bhavani | Coimbatore | Tamil Nadu |
| 82 | Ponnaniar Dam | Irrigation | Ponnaniyar | Karur | Tamil Nadu |
| 83 | Porthimund Dam | Hydroelectric | Porthimund St | The Nilgiris | Tamil Nadu |
| 84 | Pykara Dam | | | The Nilgiris | Tamil Nadu |
| 85 | Sarigehally Dam | Irrigation | Shimsha | Tumkur | Karnataka |
| 86 | Siddhamalli Dam | Irrigation | | Ariyalur | Tamil Nadu |
| 87 | Siruvani (ID) Dam | Drinking/ Water Supply | Siruvani | Palakkad | Kerala |
| 88 | Suvarnavathy Dam | Irrigation | Suvarnavathy | Chamarajanagar | Karnataka |
| 89 | Taraka Dam | Irrigation | Taraka | Mysore | Karnataka |
| 90 | Thonnur Dam | Irrigation | Hebballa Valley | Mandya | Karnataka |
| 91 | Thoppaiyar Dam | Irrigation | Thoppaiyar | Dharmapuri | Tamil Nadu |
| 92 | Tippagondana Hally Dam | Drinking/ Water Supply | Arkavathy & Kumudavathy | Bangalore | Karnataka |
| 93 | Turuvekere Dam | Irrigation | Shimsha Valley | Tumkur | Karnataka |
| 94 | Uduthorehalla Dam | Irrigation | Uduthorehalla | Chamarajanagar | Karnataka |
| 95 | Uppar (Erode) Dam | | Uppar | Tiruppur | Tamil Nadu |
| 96 | Upper Bhavani Dam | Hydroelectric | Bhavani | The Nilgiris | Tamil Nadu |
| 97 | Varattupallam Dam | Irrigation | Varattupallam | Erode | Tamil Nadu |
| 98 | Vattamalaikarai Odai Dam | Irrigation | V.K. Odai | Tiruppur | Tamil Nadu |
| 99 | Votehole Dam | Irrigation | Votehole | Hassan | Karnataka |
| 100 | West Varahapallam Weir Dam | | W.V.Pallam | Nilgiri | Tamil Nadu |
| 101 | Yagachi Dam | Irrigation | Yagachi | Hassan | Karnataka |

**Source:** India-WRIS

### 3.3.3. Barrages/ Weirs

Barrages are low-head diversion structures that help regulate river discharge, control water levels, and facilitate irrigation and navigation. Unlike dams, barrages allow water to flow over gates, providing better sediment passage and reducing reservoir-induced ecological imbalances. However, they require efficient operation and maintenance to prevent sediment buildup and flow obstruction. A list of barrages/weirs in CRB is available in Table 3.

**Table 3.** Barrages/ Weirs in CRB

| Sr. No. | Name | Type | Purpose | River | District | State |
|---|---|---|---|---|---|---|
| 1 | Alangium Anicut | Anicut | Irrigation | Amaravathy | Tiruppur | Tamil Nadu |
| 2 | Aravakurichri Anicut | Anicut | Irrigation | Nanganji | Karur | Tamil Nadu |
| 3 | Bangaradoddy Anicut | Anicut | | Cauvery | Mandya | Karnataka |
| 4 | Bhavani Kattalai Barrage - I | Barrage | | Bhavani | Namakkal | Tamil Nadu |
| 5 | Bhavani Kattalai Barrage - II | Barrage | | Bhavani | Erode | Tamil Nadu |
| 6 | Bhavani Kattalai Barrage - III | Barrage | | | Namakkal | Tamil Nadu |
| 7 | Cauvery Anicut I | Anicut | Irrigation | Cauvery | Hassan | Karnataka |
| 8 | Cauvery Anicut II | Anicut | Irrigation | Cauvery | Mysore | Karnataka |
| 9 | Cauvery Anicut III | Anicut | Irrigation | Cauvery | Mysore | Karnataka |
| 10 | Chandranahalli Weir | Weir | Irrigation | Cauvery | Mandya | Karnataka |
| 11 | Chekkanur Barrage | Barrage | | Cauvery | Salem | Tamil Nadu |
| 12 | Chinna Dharapuram Anicut | Anicut | Irrigation | Amaravathy | Tiruppur | Tamil Nadu |

| | | | | | | |
|---|---|---|---|---|---|---|
| 13 | Danagere Anicut | Anicut | | Cauvery | Mandya | Karnataka |
| 14 | Devaraya Anicut | Anicut | | Cauvery | Mandya | Karnataka |
| 15 | Dhalavaipattinam Anicut | Anicut | Irrigation | Amaravathy | Tiruppur | Tamil Nadu |
| 16 | Dharapuram Anicut | Anicut | Irrigation | Amaravathy | Tiruppur | Tamil Nadu |
| 17 | Grand Anicut | Anicut | | | Thanjavur | Tamil Nadu |
| 18 | Gujjarahalli Small Anicut | Anicut | Irrigation | Chinnar | Dharmapuri | Tamil Nadu |
| 19 | Gujjaramalli Big Anicut | Anicut | Irrigation | Chinnar | Dharmapuri | Tamil Nadu |
| 20 | Halsur Anicut | Anicut | Irrigation | Nugu | Mysore | Karnataka |
| 21 | Haluvagilu Weir | Weir | Irrigation | Yagachi River | Hassan | Karnataka |
| 22 | Hemagiri Weir | Weir | Irrigation | Hemavati River | Mandya | Karnataka |
| 23 | Hullhalli Anicut | Anicut | Irrigation | Kabani | Mysore | Karnataka |
| 24 | Iggalur Barrage | Weir | Irrigation | Shimsha | Mandya | Karnataka |
| 25 | Jadarpalayam | Anicut | Irrigation | Cauvery | Namakkal | Tamil Nadu |
| 26 | Javvathupatti Anicut | Anicut | Irrigation | Parapalar | Dindigul | Tamil Nadu |
| 27 | Kadathur Anicut | Anicut | | | Tiruppur | Tamil Nadu |
| 28 | Kaldurai Anicut | Anicut | Irrigation | Shanmukha Nadi | Dindigul | Tamil Nadu |
| 29 | Kalingarayan Anicut | Anicut | | Bhavani | Erode | Tamil Nadu |
| 30 | Kallakattu Anicut | Anicut | Irrigation | Varattar | Dindigul | Tamil Nadu |
| 31 | Kaniyur Anicut | Anicut | Irrigation | Amaravathy | Tiruppur | Tamil Nadu |
| 32 | Karatholuvu anicut | Anicut | Irrigation | Amaravathy | Tiruppur | Tamil Nadu |
| 33 | Kattalai Bed Regulator | Weir | | Cauvery | Karur | Tamil Nadu |
| 34 | Kattemalalavadi | Weir | Irrigation | Lakshmanthirtha | Mysore | Karnataka |

| | | | | | | |
|---|---|---|---|---|---|---|
| 35 | Keeranur Anicut | Anicut | Irrigation | Shanmukha Nadi | Dindigul | Tamil Nadu |
| 36 | Kiranguru Weir | Weir | Irrigation | Lakshmantirtha | Mysore | Karnataka |
| 37 | Kodiveri Anicut | Anicut | | | Erode | Tamil Nadu |
| 38 | Kolinjivadi Anicut | Anicut | Irrigation | Amaravathy | Tiruppur | Tamil Nadu |
| 39 | Koneripatti Barrage | Barrage | | Cauvery | Erode | Tamil Nadu |
| 40 | Koraiyulhu Anicut | Anicut | Irrigation | Nanganji | Dindigul | Tamil Nadu |
| 41 | Korikadavu Anicut | Anicut | Irrigation | Shanmukha Nadi | Dindigul | Tamil Nadu |
| 42 | Kothai Anicut | Anicut | Irrigation | Varattar | Dindigul | Tamil Nadu |
| 43 | Kumaralingam anicut | Anicut | Irrigation | Amaravathy | Tiruppur | Tamil Nadu |
| 44 | Lower Colleron Anicut | Anicut | | Colleron | Ariyalur | Tamil Nadu |
| 45 | Madhavamatri Anicut | Anicut | | Cauvery | Mysore | Karnataka |
| 46 | Mandagere Weir | Weir | Irrigation | Hemavati River | Mandya | Karnataka |
| 47 | Marandahalli Anicut | Anicut | Irrigation | Chinnar | Dharmapuri | Tamil Nadu |
| 48 | Muthukulam Anicut | Anicut | Irrigation | Kuthiraiyar | Dindigul | Tamil Nadu |
| 49 | Muthur Barrage | Barrage | | Noyal | Erode | Tamil Nadu |
| 50 | Nandhiyar Channel | Anicut | Irrigation | Nandiyar | Tiruchirappalli | Tamil Nadu |
| 51 | Nanjaithalayur Anicut | Anicut | Irrigation | Amaravathy | Tiruppur | Tamil Nadu |
| 52 | Nanjakkalakurichi Anicut | Anicut | Irrigation | Amaravathy | Tiruppur | Tamil Nadu |
| 53 | Nerunjipettai Barrage | Barrage | | Cauvery | Erode | Tamil Nadu |
| 54 | Netkal Balancing Reservoir | Barrage | | Cauvery | Mandya | Karnataka |
| 55 | Niralapallam Weir | Weir | | | The Nilgiris | Tamil Nadu |

| | | | | | | |
|---|---|---|---|---|---|---|
| 56 | Oddanai Anicut | Anicut | Irrigation | Nanganji | Karur | Tamil Nadu |
| 57 | Panchapalli Anicut | Anicut | Irrigation | Chinnar | Dharmapuri | Tamil Nadu |
| 58 | Panjanthangi Anicut | Anicut | Irrigation | Kuthiraiyar | Dindigul | Tamil Nadu |
| 59 | Periyakulam Anicut | Anicut | Irrigation | Parapalar | Dindigul | Tamil Nadu |
| 60 | Pullambadi Head Sluice | Anicut | Irrigation | Aiyar | Tiruchirappalli | Tamil Nadu |
| 61 | Rajaparameshwari Anicut | Anicut | | Cauvery | Mandya | Karnataka |
| 62 | Ramasmuthiram Anicut | Anicut | Irrigation | Parapalar | Dindigul | Tamil Nadu |
| 63 | Ramaswamy Anicut | Anicut | | Cauvery | Mandya | Karnataka |
| 64 | Sakkilian Anicut | Anicut | Irrigation | Varattar | Dindigul | Tamil Nadu |
| 65 | Sangaraino Nellore | Anicut | Irrigation | Kundiraiyar | Tiruppur | Tamil Nadu |
| 66 | Sarkar Kannadi Puthur Anicut | Anicut | Irrigation | Amaravathy | Tiruppur | Tamil Nadu |
| 67 | Sembakulam Anicut | Anicut | Irrigation | Kuthiraiyar | Dindigul | Tamil Nadu |
| 68 | Sholamdevi Anicut | Anicut | Irrigation | Amaravathy | Dindigul | Tamil Nadu |
| 69 | Siriyurunala | Anicut | Irrigation | Lakshmantirtha | Mysore | Karnataka |
| 70 | Siva balancing Reservoir | Barrage | | Cauvery | Mandya | Karnataka |
| 71 | Sri Ramadevra Anicut | Anicut | Irrigation | Hemavati River | Hassan | Karnataka |
| 72 | Sundakkampalayam Anicut | Anicut | Irrigation | Amaravathy | Tiruppur | Tamil Nadu |
| 73 | Thevadiakulam Anicut | Anicut | Irrigation | Kundiraiyar | Tiruppur | Tamil Nadu |
| 74 | Upla Ane Weir | Weir | Irrigation | Cauvery | Mandya | Karnataka |

| | | | | | | |
|---|---|---|---|---|---|---|
| 75 | Upper Anicut | Anicut | | Cauvery | Tiruchirappalli | Tamil Nadu |
| 76 | Upper Bhavani Lower Diversion Weir | Weir | | | The Nilgiris | Tamil Nadu |
| 77 | Uppuchetti Anicut | Anicut | Irrigation | Varattar | Dindigul | Tamil Nadu |
| 78 | Urachikottar Barrage | Barrage | | Cauvery | Erode | Tamil Nadu |
| 79 | Viranam Eri | Weir | Irrigation | Coleroon | Cuddalore | Tamil Nadu |
| 80 | Virija Anicut | Anicut | | Cauvery | Mandya | Karnataka |

**Source:** India-WRIS

### 3.3.4. Intake wells

Intake wells are structures used to extract water from rivers for municipal and industrial use. Located within the riverbed, these wells are designed to ensure safe and consistent water withdrawal while minimizing sediment intake. Proper siting and maintenance are essential to prevent clogging, contamination, and reduced efficiency during low-flow conditions.

Major cities like Bengaluru, Mysuru, Tiruchirappalli, and Erode depend on the Cauvery River for drinking water supply. Intake wells are strategically placed along the river to withdraw water for municipal and industrial use. However, during dry seasons, reduced river flow and increased pollution levels create challenges in ensuring a steady and safe water supply.

### 3.3.5. Canals and off-takes

Canals and off-takes divert water from the main river channel for irrigation, drinking water supply, and industrial use. These structures ensure controlled water distribution but require regular dredging and sediment management to maintain capacity and prevent flow disruption. Unregulated off takes can lead to reduced downstream flows, affecting aquatic habitats and water availability.

CRB has an extensive network of irrigation canals that divert water for agriculture. Some of the most prominent canals include:

- The Vishveshwariah Canal System, which supplies water from KRS Dam.
- The Lower Bhavani Project Canal, an important irrigation system in Tamil Nadu.

- The Grand Anicut Canal System, which distributes Cauvery water across the delta.

These canals support agriculture in the Cauvery Delta, known as the "Rice Bowl of Tamil Nadu", but they require regular maintenance to prevent sediment deposition and water loss.

**Table 4.** Lift stations under CRB

| Sr. No. | Station name | Basin | Off-Take Point |
|---|---|---|---|
| 1 | Banahalli Hundi Lift Station | Cauvery | River |
| 2 | Huchanakoppalu Lift Station Stage - I | Cauvery | River |
| 3 | Huchanakoppalu Lift Station Stage - II | Cauvery | Canal |
| 4 | Iggalur LIS A | Cauvery | - |
| 5 | Iggalur LIS B | Cauvery | - |
| 6 | Iggalur LIS C II | Cauvery | - |
| 7 | Iggalur LIS CI | Cauvery | - |
| 8 | Iggalur LIS D | Cauvery | - |
| 9 | Kabini LIS | Cauvery | Reservoir |
| 10 | Kachnahalli Lift Station Stage - I | Cauvery | River |
| 11 | Kachnahalli Lift Station Stage - III | Cauvery | Canal |
| 12 | Kachnahalli Lift Station Stage - II | Cauvery | Canal |
| 13 | Kama Samundra Lift Station - I | Cauvery | River |
| 14 | Kama Samundra Lift Station - II | Cauvery | Canal |
| 15 | Nanjapura Lift Station | Cauvery | River |
| 16 | Periyapatna LIS | Cauvery | Canal |
| 17 | Somwarpet LIS | Cauvery | Canal |

**Source:** India-WRIS

### 3.3.6. Sewer outfalls

Sewer outfalls discharge treated or untreated wastewater into rivers, significantly impacting water quality and aquatic life. Properly designed outfalls with efficient treatment facilities help minimize pollution, while uncontrolled discharges lead to contamination, eutrophication, and habitat degradation. Sustainable river management requires strict wastewater treatment and pollution control regulations.

Urbanization along the Cauvery River has led to increased pollution from untreated sewage and industrial discharge. Cities like Mysuru, Erode, and Tiruchirappalli have several sewer outfalls that release wastewater into the river, impacting water quality and aquatic life. The presence of industrial effluents, domestic sewage, and agricultural runoff has led to concerns over river pollution, eutrophication, and declining fish populations. Proper wastewater treatment plants and pollution control measures are essential to mitigate these issues.

### 3.3.7. Ghats

Ghats are riverfront steps or platforms used for religious rituals, bathing, and cultural activities. They are prominent in many parts of the world, particularly in India, where they serve as social and spiritual hubs. However, pollution from human activities, wastewater discharge, and sediment accumulation pose significant challenges, necessitating regular maintenance and environmental safeguards.

The Cauvery River is also of great religious and cultural significance, with many ghats used for rituals, bathing, and religious festivals. Important ghats include:

- Srirangapatna and Talakadu Ghats in Karnataka, where devotees perform religious ceremonies.
- Mayiladuthurai and Thiruvaiyaru Ghats in Tamil Nadu, which host cultural and religious events.

While these ghats are important for spiritual and social activities, improper waste disposal and unregulated human activity contribute to river pollution and ecological degradation. Sustainable management practices are needed to preserve the cultural and environmental significance of these sites.

# 4. Challenges and Limitations

Hydraulic modelling of CRB faces several significant challenges, particularly due to the limited availability and quality of observational data. A key limitation is the short duration of data availability at many monitoring stations across the basin. This hampers the ability to conduct robust long-term analyses and hinders model calibration and validation. Moreover, data accessibility remains a critical issue. Often, essential hydraulic data are either not publicly available or are restricted due to administrative and policy-related constraints. In addition, longitudinal section data of the river, which are crucial for accurate hydraulic modelling, are also unavailable. Significant information on intake wells, sewer outfalls, and ghats is likewise lacking, further complicating the representation of anthropogenic influences and boundary conditions in the model. These limitations collectively reduce the reliability and precision of hydraulic models in CRB, emphasizing the need for improved data collection infrastructure, enhanced accessibility, and longer-term data records to support more effective water resource management.

# 5. Summary and Recommendations

Hydraulic data plays a vital role in understanding the river system by providing insights into flow characteristics, sediment transport, and infrastructure interactions. The present study focuses on key hydraulic parameters such as cross-sections of the mainstream and major tributaries, which help determine bed slope, water surface slope, surface roughness, and channel velocity. Additionally, longitudinal sections of the river and its tributaries provide a comprehensive view of flow patterns and gradient variations. The study also includes an assessment of infrastructure in and around the river, such as bridges, dams, barrages, intake wells, canals, sewer outfalls, and ghats, which influence hydraulic behaviour and water quality. This data is essential for river management, flood control planning, sediment transport studies, and infrastructure development.

To ensure effective river basin management, it is essential to conduct regular monitoring and data collection of cross-sections, longitudinal profiles, and hydraulic parameters to track changes in river morphology and flow conditions. Flood risk assessment and mitigation should be prioritized by utilizing hydraulic data for flood forecasting and designing protection measures that enhance infrastructure resilience. Additionally, evaluating the impact of infrastructure such as dams, barrages, and bridges on river flow and sediment transport is crucial for optimizing operations and minimizing environmental disruptions. Implementing sediment and erosion management strategies, including dredging and bank stabilization, will help maintain channel stability and prevent excessive deposition. Furthermore, assessing the effects of sewer outfalls and industrial discharges on water quality is necessary for enforcing pollution control measures and protecting aquatic ecosystems. Considering climate change adaptation, hydraulic data should be integrated into climate models to develop strategies for managing extreme weather events, shifting precipitation patterns, and long-term water availability. Lastly, promoting sustainable river basin management through integrated water resource management (IWRM) will help balance agricultural, industrial, and domestic water demands while preserving the ecological integrity of the river system.

## 6. Significance of the hydraulic data

Hydraulic data is essential for effective basin management and planning, providing critical insights into water flow, flood risks, sediment transport, and overall river dynamics (Fig. 16). It plays a key role in flood risk assessment and mitigation, helping identify vulnerable areas and design flood protection measures such as levees, dams, and diversion channels. Additionally, hydraulic data aids in water resource allocation, ensuring sustainable distribution for agriculture, industry, and domestic use, particularly in drought-prone regions. Understanding sediment transport is crucial for maintaining river morphology, preventing erosion, and managing sediment deposition in reservoirs. Engineers rely on hydraulic data for designing bridges, dams, irrigation systems, and urban drainage infrastructure, ensuring they can withstand extreme hydrological events. Furthermore, hydraulic data is vital for environmental conservation, helping protect aquatic habitats, regulate water quality, and maintain ecological balance. With increasing climate variability, this data is also essential for long-term planning, enabling authorities to develop climate adaptation strategies such as reservoir capacity adjustments, floodplain zoning, and efficient irrigation techniques. By integrating hydraulic data into policymaking and engineering solutions, authorities can ensure sustainable water management, balancing economic development, human needs, and environmental protection.

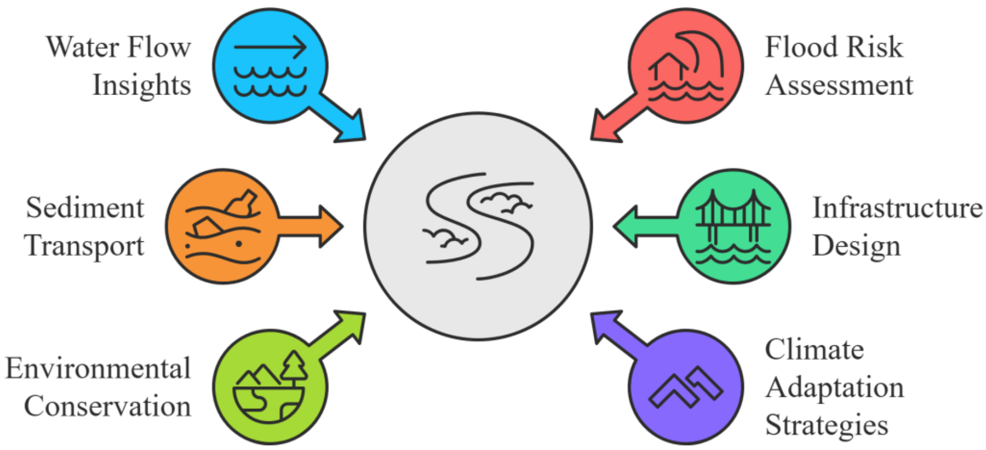



**Fig. 16.** Significance of the hydraulic data

# References


1. Ahakwa, I., Xu, Y., Tackie, E.A., Odai, L.A., Sarpong, F.A., Korankye, B. and Ofori, E.K., 2023. Do natural resources and green technological innovation matter in addressing environmental degradation? Evidence from panel models robust to cross-sectional dependence and slope heterogeneity. Resources Policy, 85, p.103943.
2. Ahmadi, S.M., Balahang, S. and Abolfathi, S., 2024. Predicting the hydraulic response of critical transport infrastructures during extreme flood events. Engineering Applications of Artificial Intelligence, 133, p.108573.
3. Akter, F., 2022. Flood inundation mapping and flood mitigation of Ghaghat river floodplain using HEC-RAS 1D/2D coupled model.
4. Bakhtiari, V., Piadeh, F., Chen, A.S. and Behzadian, K., 2024. Stakeholder analysis in the application of cutting-edge digital visualisation technologies for urban flood risk management: A critical review. Expert Systems with Applications, 236, p.121426.
5. Chatrabhuj, Meshram, K., Mishra, U. and Omar, P.J., 2024. Integration of remote sensing data and GIS technologies in river management system. Discover Geoscience, 2(1), p.67.
6. Gaikwad, V., Salunke, V., Jadhav, A. and Kudnar, N., 2024. Morphometric and longitudinal profile analysis in the Cauvery River basin: a geospatial approach. Arabian Journal of Geosciences, 17(10), p.279.
7. Gehring, J., Duvvuri, B. and Beighley, E., 2022. Deriving river discharge using remotely sensed water surface characteristics and satellite altimetry in the Mississippi River Basin. Remote Sensing, 14(15), p.3541.
8. Ghosh, A., Roy, M.B., Roy, P.K. and Mukherjee, S., 2021. Assessing the nature of sediment transport with bridge scour by 1D sediment transport model in the sub-catchment basin of Bhagirathi–Hooghly river. Modeling Earth Systems and Environment, 7(4), pp.2823-2845.
9. Jesna, I., Bhallamudi, S.M. and Sudheer, K.P., 2023. Impact of cross-sectional orientation in one-dimensional hydrodynamic modeling on flood inundation mapping. Journal of Flood Risk Management, 16(3), p.e12893.
10. Li, L., Sabokruhie, P., Lindenschmidt, K.E. and Gutwin, C., 2024. Assessing the possible influence of human activities on sediment transport in the Saskatchewan River and its delta. Journal of Environmental Management, 368, p.122240.

11. Liao, J., Liu, X., Zhou, X. and Tursunova, N.R., 2023. Analyzing the role of renewable energy transition and industrialization on ecological sustainability: can green innovation matter in OECD countries. Renewable Energy, 204, pp.141-151.
12. Perosa, F., Seitz, L.F., Zingraff-Hamed, A. and Disse, M., 2022. Flood risk management along German rivers–A review of multi-criteria analysis methods and decision-support systems. Environmental Science & Policy, 135, pp.191-206.
13. Qiao, J., Shen, K., Xiao, W., Tang, J., Chen, Y. and Xu, J., 2024. Integrating Graph Data Models in Advanced Water Resource Management: A New Paradigm for Complex Hydraulic Systems. Water, 17(1), p.3.
14. Rather, S.A., Mir, A.A., Kapoor, K. and Patel, M., 2023, December. Assessment of Technological Developments in River Morphology Analysis: A Comprehensive Review. In International Conference on Hydraulics, Water Resources and Coastal Engineering (pp. 101-116). Singapore: Springer Nature Singapore.
15. Sarkar, A., Roy, L., Das, S. and Sengupta, S., 2021. Fluvial response to active tectonics: analysis of DEM-derived longitudinal profiles in the Rangit River Basin, Eastern Himalayas, India. Environmental Earth Sciences, 80(7), p.258.
16. Sarker, S., 2021. A short review on computational hydraulics in the context of water resources engineering. Open Journal of Modelling and Simulation, 10(1), pp.1-31.
17. Tang, H., Yuan, S. and Cao, H., 2023. Theory and practice of hydrodynamic reconstruction in plain river networks. Engineering, 24, pp.202-211.
18. Trinh, M.X. and Molkenthin, F., 2021. Flood hazard mapping for data-scarce and ungauged coastal river basins using advanced hydrodynamic models, high temporal-spatial resolution remote sensing precipitation data, and satellite imageries. Natural Hazards, 109(1), pp.441-469.
19. Xing, Y., Chen, H., Liang, Q. and Ma, X., 2022. Improving the performance of city-scale hydrodynamic flood modelling through a GIS-based DEM correction method. Natural Hazards, 112(3), pp.2313-2335.
20. Zhang, Y., Hu, X., Wang, W. and Pan, B., 2024. Evolution of the alluvial fan channel longitudinal profile and aggradation/degradation processes in the piedmont. Quaternary Science Reviews, 331, p.108654.
21. CWC. https://cwc.gov.in/
22. Google Earth. https://earth.google.com/
23. India-WRIS. https://indiawris.gov.in/

# Back cover page

© cCauvery, cGanga and NRCD, 2024