

# **River Systems**

# Himalayan River Systems

- The Indus, the Ganga and the Brahmaputra comprise the Himalayan river systems.
- The Himalayan Rivers existed even before the formation of Himalayas i.e. before the **collision of Indian Plate with the Eurasian plate**.
- They were flowing into the **Tethys Sea**. These rivers had their source in the now **Tibetan region**.
- The **deep gorges** of the Indus, the Satluj, the Brahmaputra etc. clearly indicate that these rivers are **older than the Himalayas**.
- They continued to flow throughout the building phase of the Himalayas; their banks rising steeply while the beds went lower and lower due to vertical erosion (Vertical down cutting was significant and was occurring at a rate faster than the rising of Himalayas), thus cutting deep gorges.
- Thus, many of the Himalayan Rivers are typical examples of **antecedent drainage**.

# Indus River System

- india got her name from Indus.
- ‘The Indus Valley Civilization’ was born around this river.
- It flows in north-west direction from its source (**Glaciers of Kailas Range** – Kailash range in Tibet near Lake Manasarovar) till the **Nanga Parbhat** Range.
- It’s length is about 2,900 km. Its total drainage area is about 1,165,000 square km [more than half of it lies in semiarid plains of Pakistan]. It is joined by **Dhar River** near Indo-China border.
- After entering J&K it flows between the **Ladakh** and the **Zaskar Ranges**. It flows through the regions of Ladakh, Baltistan and Gilgit.

- it is joined by the **Zaskar River at Leh** .
- Near **Skardu**, it is joined by the **Shyok** at an elevation of about 2,700 m.
- The **Gilgit, Gartang, Dras, Shiger, Hunza** are the other Himalayan tributaries of the Indus.
- It crosses the Himalayas (ends its mountainous journey) through a 5181 m deep gorge near **Attock**, lying north of the **Nanga Parbat**. It takes a sharp southerly bend here (**syntaxial bend**).
- **Kabul river** from Afghanistan joins Indus near **Attock**.
- Thereafter it flows through the **Potwar plateau** and crosses the **Salt Range** (South Eastern edge of Potwar Plateau).

- Some of the important tributaries below Attock include the **Kurram, Toch** and the **Zhob-Gomal**.
- Just above **Mithankot**, the Indus receives from **Panjnad (Panchnad)**, the accumulated waters of the five eastern tributaries—the Jhelum, the Chenab, the Ravi, the Beas and the Satluj.
- The river empties into the Arabian Sea south of **Karachi** after forming a huge delta.



# Major Tributaries of Indus River

## Jhelum River

- The Jhelum has its source in a **spring at Verinag** in the south-eastern part of the **Kashmir Valley**.
- It flows northwards into **Wular Lake** (north-western part of Kashmir Valley).
- From Wular Lake, it changes its course southwards. At **Baramulla** the river enters a gorge in the hills.
- The river forms steep-sided narrow gorge through **Pir Panjal Range** below **Baramulla**.

- At **Muzaffarabad**, the river takes a sharp hairpin bend southward.
- Thereafter, it forms the India-Pakistan boundary for 170 km and emerges at the Potwar Plateau near Mirpur.
- it joins the Chenab at **Trimmu**.
- The river is **navigable for about 160 km** out of a total length of 724 km.

## Chenab River

- The Chenab originates from near the **Bara Lacha Pass** in the **Lahul-Spiti** part of the **Zaskar Range**.
- Two small streams on opposite sides of the pass, namely **Chandra** and **Bhaga**, form its headwaters at an altitude of 4,900 m.
- The united stream **Chandrabhaga** flows in the north-west direction through the **Pangi valley**, parallel to the Pir Panjal range.
- Near **Kistwar**, it cuts a deep gorge. It enters the plain area near **Akhnur** in Jammu and Kashmir.
- From here it flows through the plains of Pakistani Punjab to reach Panchnad where it joins the **Satluj** after receiving the waters of Jhelum and Ravi rivers.

## Ravi River

- The Ravi has its source in **Kullu hills** near the **Rohtang Pass** in Himachal Pradesh.
- It drains the area between the **Pir Panjal** and the **Dhaola Dhar ranges**.
- After crossing Chamba, it takes a south-westerly turn and cuts a deep gorge in the Dhaola Dhar range.
- It enters Punjab Plains near **Madhopur** and later enters Pakistan below Amritsar.
- It debouches into the Chenab a little above **Rangpur in Pakistani Punjab**.

## Beas River

- The Beas originates near the **Rohtang Pass**, at a height of 4,062 m above sea level, on the **southern end of the Pir Panjal Range, close to the source of the Ravi.**
- It crosses the Dhaola Dhar range and it takes a south-westerly direction and meets the Satluj river at **Harike in Punjab.**
- It is a comparatively small river which is only 460 km long but **lies entirely within the Indian territory.**

## Satluj River

- The Satluj rises from the **Manasarovar-Rakas Lakes** in western Tibet at a height of 4,570 m within 80 km of the source of the Indus.
- Like the Indus, it takes a north-westerly course upto the Shipki La on the Tibet-Himachal Pradesh boundary.
- It cuts deep gorges where it pierces the Great Himalaya and the other Himalayan ranges.
- Before entering the Punjab plain, it cuts a gorge in Naina Devi Dhar, where the famous **Bhakra dam** has been constructed.

- After entering the plain at Rupnagar (Ropar), it turns westwards and is joined by the **Beas at Harike**.
- From near **Ferozpur to Fazilka** it forms the boundary between India and Pakistan for nearly 120 km.
- During its onward journey it receives the collective drainage of the Ravi, Chenab and Jhelum rivers. It joins the Indus a few kilometres above **Mithankot**.
- Out of its total length of 1,450 km, it flows for 1,050 km in Indian territory.

# Ganga River System

- The **Ganga** originates as **Bhagirathi** from the **Gangotri glacier** in Uttar Kashi District of Uttarakhand at an elevation of 7,010 m.
- **Alaknanda** River joins **Bhagirathi** at **Devaprayag**. From **Devaprayag** the river is called as **Ganga**.
- It is joined by the **Yamuna** at **Allahabad**.
- Near **Rajmahal Hills** it turns to the south-east.
- At **Farraka**, it bifurcates into **Bhagirathi-Hugli in West Bengal** and **Padma-Meghna in Bangladesh** (it ceases to be known as the Ganga after Farraka).
- **Brahmaputra** (or the **Jamuna** as it is known here) joins **Padma-Meghna** at
- The total length of the Ganga river from its source to its mouth (measured along the Hugli) is 2,525 km.

# Right Bank Tributaries of The Ganga

## Yamuna River

- Largest and the most important tributary.
- It originates from the **Yamnotri glacier** on the **Bandarpunch Peak** in the Garhwal region in Uttarakhand at an elevation of about 6,000 meters.
- It cuts across the **Nag Tibba**, the **Mussoorie** and the Shiwalik ranges.
- Its main affluent in the upper reaches is the **Tons** which also rises from the **Bandarpunch glacier**.

- It joins Yamuna below Kalsi before the latter leaves the hills.
- At this site, the water carried by the Tons is twice the water carried by the Yamuna.
- It unites with the Ganga near **Triveni Sangam, Allahabad.**
- The total length of the Yamuna from its origin till Allahabad is 1,376 km.
- It creates the highly fertile alluvial, **Yamuna-Ganges Doab** region between itself and the Ganges in the Indo-Gangetic plain.

# Chambal River

- The Chambal rises in the highlands of **Janapao Hills** (700 m) in the **Vindhyan Range**.
- It flows through the **Malwa Plateau**.
- It joins the Yamuna in **Etawah district** of Uttar Pradesh.
- The river flows much below its banks due to severe erosion because of poor rainfall and numerous deep ravines have been formed in the Chambal Valley, giving rise to **badland topography**.
- The total length of the river is 1,050 km.

# Dams on the Chambal

- **The Gandhi Sagar dam** is the first of the four dams built on the Chambal River, located on the Rajasthan-Madhya Pradesh border.
- **The Rana Pratap Sagar dam** is a dam located 52 km downstream of Gandhi Sagar dam on across the Chambal River in Chittorgarh district in Rajasthan.
- **The Jawahar Sagar Dam** is the third dam in the series of Chambal Valley Projects, located 29 km upstream of Kota city and 26 km downstream of Rana Pratap Sagar dam.
- **The Kota Barrage** is the fourth in the series of Chambal Valley Projects, located about 0.8 km upstream of Kota City in Rajasthan.
- Water released after power generation at Gandhi Sagar dam, Rana Pratap Sagar dam and Jawahar Sagar Dams, is diverted by Kota Barrage for irrigation in Rajasthan and in Madhya Pradesh through canals.

## Banas River

- The Banas is a tributary of the Chambal.
- It originates in the southern part of the **Aravali Range**.
- It join the Chambal on **Rajasthan – Madhya Pradesh border** near **Sawai Madhopur**.

## **Sind River**

- The Sind originates in **Vidisha Plateau** of Madhya Pradesh.
- It flows for a distance of 415 km before it joins the Yamuna.

## **Betwa River**

- The Betwa rises in **Bhopal district (Vindhyan Range)** and joins the Yamuna near
- It has a total length of 590 km.
- **The Dhasan** is its important tributary.

# Son River

- The Son River rises in the **Amarkantak Plateau**.
- Its source is close to the origin of the Narmada.
- It passes along the **Kaimur Range**.
- It joins the Ganga near Danapur in Patna district of Bihar.
- It flows for a distance of 784 km from its source.
- The important tributaries of the Son are the Johilla, the Gopat, the Rihand, the Kanhar and the North Koel. Almost all the tributaries **join it on its right bank**.

# Damodar river

- The Damodar river rises in the hills of the **Chotanagpur plateau** and **flows through a rift valley**.
- Rich in mineral resources, the valley is home to large-scale mining and industrial activity.
- It has a number of tributaries and subtributaries, such as **Barakar, Konar, Bokaro, Haharo, etc.**
- The **Barakar** is the most important tributary of the Damodar.
- Several dams have been constructed in the valley, for the generation of hydroelectric power. The valley is called “**the Ruhr of India**”.

- It used to cause devastating floods as a result of which it earned the name 'Sorrow of Bengal'.
- Now the river is tamed by constructing numerous dams.
- It joins the **Hugli River** 48 km below Kolkata.
- The total length of the river is 541 km.

# Left Bank Tributaries of The Ganga

## Ramganga River

- The Ramganga river rises in the **Garhwal** district of Uttarakhand.
- It enters the Ganga Plain near Kalagarh.
- The Khoh, the Gangan, the Aril, the Kosi, and the Deoha (Gorra) are important tributaries of Ramganga.

# Ghaghra River

- its source is near **Gurla Mandhata peak, south of Manasarovar in Tibet (river of the trans-Himalayan origin).**
- It is known as the **Karnaili** in Western Nepal.
- Its important tributaries are the **Sarda, the Sarju (Ayodhya is located on its bank) and the Rapti.**
- The Ghaghara joins the Ganga a few kilometres downstream of Chhapra in Bihar.

# Kali River

- Rises in the high glaciers of **trans-Himalaya**.
- It forms the boundary between **Nepal and Kumaon**.
- It is known as the **Sarda** after it reaches the plains near Tanakpur.

# Gandak River

- Originates near the Tibet-Nepal border at a height of 7,620 m
- It receives a large number of tributaries in Nepal Himalaya.
- Its important tributaries are the **Kali Gandak, the Mayangadi, the Bari and the Trishuli.**
- It flows into Ganga at **Hajipur in Bihar.**

# Kosi River

- The Kosi river consists of seven streams namely **Sut Kosi, Tamba Kosi, Talkha, Doodh Kosi, Botia Kosi, Arun and Tamber** and is popularly known as **sapta kosi**
- These streams flow through **eastern Nepal** which is known as the **Sapt Kaushik region**.
- The sources of seven streams of the Kosi are located in snow covered areas which also receive heavy rainfall.
- Consequently, huge volume of water flows with tremendous speed.
- Seven streams mingle with each other to form three streams named the Tumar, Arun and Sun Kosi.
- They unite at **Triveni** north of the **Mahabharata Range** to form the Kosi.

# Brahmaputra River System

- The Brahmaputra (meaning the son of Brahma).
- It is 2,900 km in length.
- Source: **Chemayungdung glacier (Kailas Range)** at an elevation of about 5,150 m. It's source is very close to the sources of Indus and Satluj.
- **Mariam La** separates the source of the Brahmaputra from the Manasarovar Lake.
- Brahmaputra flows eastwards in Southern Tibet for about 1,800 km.

- It receives a large number of tributaries in Tibet.
- The first major tributary is the Raga Tsangpo meeting the Tsangpo near **Lhatse Dzong**.
- Towards the end of its journey in Tibet, its course abruptly takes a south ward turn around **Namcha Barwa (7,756 m)(Syntaxial Bend)**.
- Here it cuts across the eastern Himalaya through the **Dihang or Siang Gorge** and emerges from the mountains near **Sadiya** in the Assam Valley.
- Here it first flows under the name of Siong and then as the Dihang.

- In the north-eastern parts of Assam Valley, it is joined by two important tributaries viz, the **Dibang (or Sikang)** from the north and **Lohit from the south**.
- From Sadiya (Assam Valley) onwards, this mighty river is known as the brahmaputra.
- The main streams merging with the Brahmaputra from the north are, Subansiri, Kameng, Dhansiri (north), Raidak, Tista etc..
- The Tista was a tributary of the Ganga prior to the floods of 1787 after which it diverted its course eastwards to join the Brahmaputra.

- The river is nearly 16 km wide at Dibrugarh and forms many islands, the most important of which is **MAJULI**. It is 90 km long and measures 20 km at its widest.
- With rainfall concentrated during the monsoon months only the river has to carry enormous quantities of water and silt which results in disastrous floods. The Brahmaputra is thus truly a **River of Sorrow**.
- The river is navigable for a distance of 1,384 km upto Dibrugarh from its mouth and serves as an excellent inland water transport route.
- Brahmaputra bends southwards and enters Bangladesh near Dhubri.

# East Flowing Peninsular Rivers

- Mahanadi River
- Godavari River
- Krishna River
- Kaveri (Cauvery) River
- Pennar River
- Subarnarekha River
- Brahmani River
- Sarada River
- Ponnaiyar River
- Vaigai River

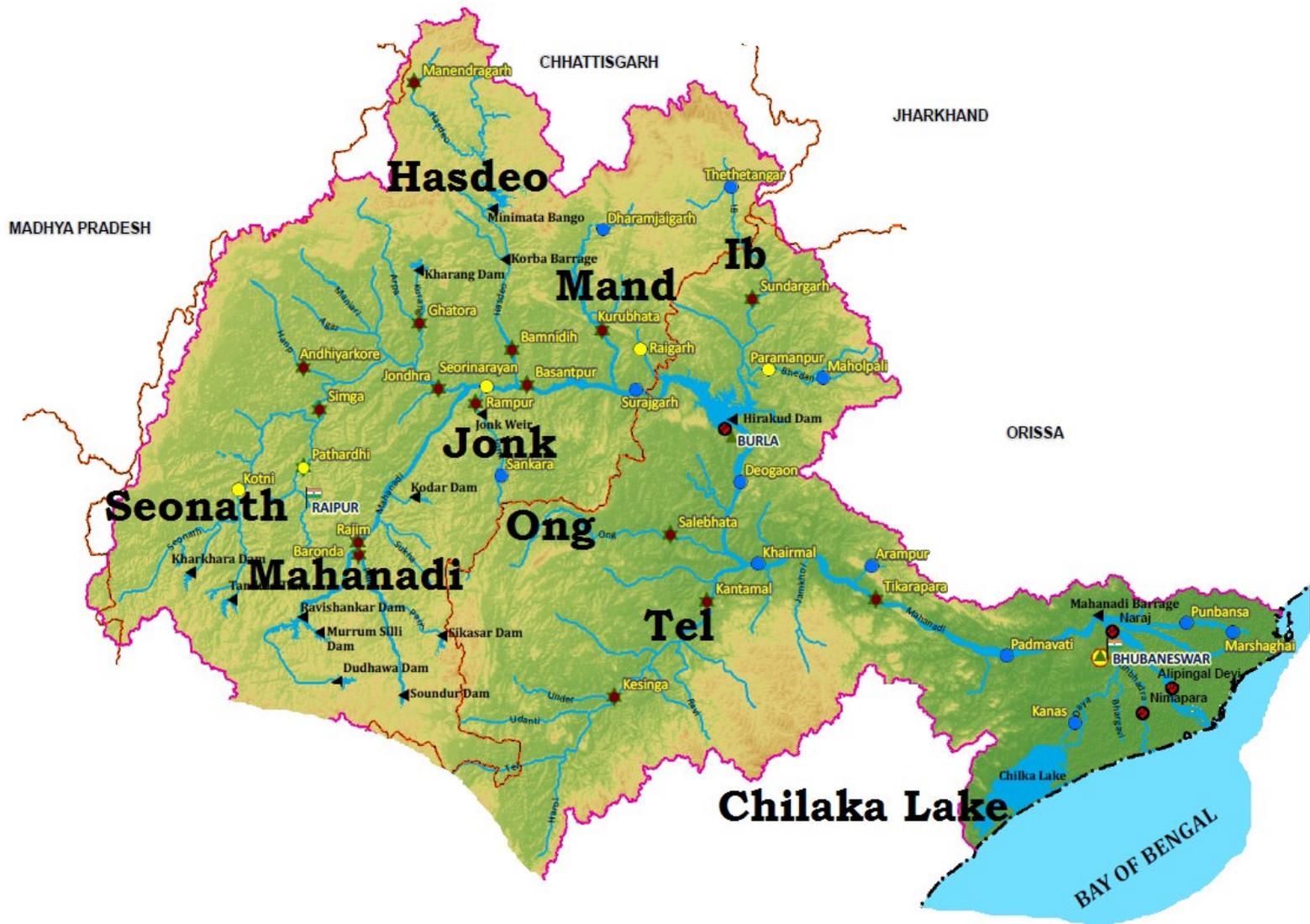
# Mahanadi River

- The Mahanadi basin extends over states of Chhattisgarh and Odisha and comparatively smaller portions of Jharkhand, Maharashtra and Madhya Pradesh, draining an area of 1.4 lakh Sq.km.
- The **Mahanadi (“Great River”)** follows a total course of 560 miles (900 km).
- It has its source in the northern foothills of **Dandakaranya in Raipur District** of Chhattisgarh at an elevation of 442 m.
- The Mahanadi is one of the major rivers of the peninsular rivers, in water potential and **flood producing capacity**, it ranks second to the Godavari.

- The major part of basin is covered with agricultural land accounting to 54.27% of the total area.
- It is one of the **most-active silt-depositing** streams in the Indian subcontinent.
- After receiving the **Seonath River**, it turns east and enters Odisha state.
- At Sambalpur the ***Hirakud Dam*** (one of the largest dams in India) on the river has formed a man-made lake 35 miles (55 km) long.
- It enters the Odisha plains near Cuttack and enters the Bay of Bengal at False Point by several channels.
- **Puri**, at one of its mouths, is a famous pilgrimage site.

# Tributaries of Mahanadi River

- Its upper course lies in the saucer-shaped basin called the '**Chhattisgarh Plain**'.
- This basin is surrounded by hills on the north, west and south as a result of which a large number of tributaries join the main river from these sides.
- Left bank Tributaries: The **Seonath**, the **Hasdeo**, the **Mand** and the **Ib**.
- Right bank Tributaries: The **Ong**, the **Tel** and the **Jonk**.



# Projects on Mahanadi River

- Two important projects completed during pre-plan period in the basin are the **Mahanadi main canal** and **Tandula reservoir in Chhattisgarh**.
- During the plan period, the **Hirakud dam, Mahanadi delta project, Hasdeo Bango, Mahanadi Reservoir Project** were completed.

# Industry in Mahanadi River Basin

- Three important urban centres in the basin are **Raipur, Durg and Cuttack**.
- Mahanadi basin, because of its **rich mineral resource** and **adequate power resource**, has a favorable industrial climate.
- The Important industries presently existing in the basin are the **Iron and Steel plant at Bhilai, aluminium factories at Hirakud and Korba, paper mill near Cuttack** and **cement factory at Sundargarh**.
- Other industries based primarily on agricultural produce are sugar and textile mills.
- Mining of coal, iron and manganese are other industrial activities.

# Godavari River

- The Godavari is the **largest river system of the Peninsular India** and is revered as **Dakshina Ganga**.
- The Godavari basin extends over states of Maharashtra, Andhra Pradesh, Chhattisgarh and Odisha in addition to smaller parts in Madhya Pradesh, Karnataka and Union territory of Puducherry (Yanam) having a total area of ~ 3 lakh Sq.km.
- The Godavari River rises from **Trimbakeshwar in the Nashik district** of Maharashtra about 80 km from the Arabian Sea at an elevation of 1,067 m.
- The total length of Godavari from its origin to outfall into the Bay of Bengal is 1,465 km.

# Tributaries of Godavari River

- The **Manjra** (724 km) is the only important right bank tributary. It joins the Godavari after passing through the **Nizam Sagar**.
- *Left Bank Tributaries:* **Dharna, Penganga, Wainganga, Wardha, Pranahita** [conveying the combined waters of Penganga, the Wardha and Wainganga], **Pench, Kanhan, Sabari, Indravati** etc.
- *Right Bank Tributaries:* **Pravara, Mula, Manjra, Peddavagu, Maner** etc.
- Below Rajahmundry, the river divides itself into two main streams, the **Gautami Godavari** on the east and the **Vashishta Godavari** on the west and forms a large delta before it pours into the Bay of Bengal.



# Projects on Godavari River

- important projects completed during the plan period are **Srirama Sagar, Godavari barrage, Upper Penganga, Jaikwadi, Upper Wainganga, Upper Indravati, Upper Wardha.**
- Among the on-going projects, the prominent ones are **Prnahita-Chevala and Polavaram.**

# Industry in Godavari Basin

- The major urban Centers in the basin are **Nagpur, Aurangabad, Nashik, Rajhmundry.**
- **Nashik and Aurangabad** have large number of industries especially **automobile.**
- Other than this, the industries in the basin are mostly based on agricultural produce such as rice milling, cotton spinning and weaving, sugar and oil extraction.
- Cement and some small engineering industries also exist in the basin.

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# Krishna River

- The Krishna is the second largest east flowing river of the Peninsula.
- The Krishna Basin extends over Andhra Pradesh, Maharashtra and Karnataka having a total area of ~2.6 lakh Sq.km.
- The Krishna River rises from the **Western Ghats** near **Jor village of Satara district of Maharashtra** at an altitude of 1,337 m just north of **Mahabaleshwar**.
- The total length of river from origin to its outfall into the Bay of Bengal is 1,400 km.
- The major part of basin is covered with agricultural land accounting to 75.86% of the total area.
- The Krishna forms a large delta with a shoreline of about 120 km. The Krishna delta appears to merge with that formed by the Godavari and extends about 35 km into the sea.

# Tributaries of Krishna River

- right bank: **the Ghatprabha, the Malprabha and the Tungabhadra.**
- Left Bank: **the Bhima, the Musi and the Munneru.**
- The **Koyna** is a small tributary but is known for **Koyna Dam**. This dam was perhaps the main cause of the devastating **earthquake** in 1967 that killed 150 people.
- The Bhima originates from the **Matheron Hills** and joins the Krishna near Raichur after for a distance of 861 km.
- The Tungabhadra is formed by the unification of the **Tunga** and the **Bhadra** originating from **Gangamula** in the **Central Sahyadri**. Its total length is 531 km.
- At Wazirabad, it receives its last important tributary, the **Musi**, on whose banks the city of Hyderabad is located

# Projects on Krishna River

- Important ones are the **Tungabhadra, Ghataprabha, Nagarjunasagar, Malaprabha, Bhima, Bhadra and Telugu Ganga.**
- The major Hydro Power stations in the basin are **Koyna, Tungabhadara, Sri Sailam, Nagarjuna Sagar, Almatti, Naryanpur, Bhadra.**
- Tunagabhadra is a major inter-States project in the basin. In order to operate the project and to regulate the flows among the beneficiary States of Karnataka and Andhara Pradesh.



# Cauvery River

- The Cauvery River rises at an elevation of 1,341 m at **Talakaveri** on the **Brahmagiri range** near Cherangala village of **Kodagu (Coorg) district of Karnataka**.
- The total length of the river from origin to outfall is 800 km.
- The Cauvery basin extends over states of Tamil Nadu, Karnataka, Kerala and Union Territory of Puducherry draining an area of 81 thousand Sq.km.
- The basin in Karnataka receives rainfall mainly from the S-W Monsoon and partially from N-E Monsoon. The basin in Tamil Nadu receives good flows from the North-East Monsoon.
- The river drains into the Bay of Bengal. The major part of basin is covered with agricultural land accounting to 66.21% of the total area.

# Tributaries of the Cauvery River

- Left Bank: the **Harangi**, the **Hemavati**, the **Shimsha** and the **Arkavati**.
- Right Bank: **Lakshmantirtha**, the **Kabbani**, the **Suvarnavati**, the **Bhavani**, the **Noyil** and the **Amaravati** joins from right.
- The river descends from the South Karnataka Plateau to the Tamil Nadu Plains through the ***Sivasamudram waterfalls (101 m high)***.
- At Shivanasamudram, the river branches off into two parts and falls through a height of 91 m. in a series of falls and rapids.
- The falls at this point is utilized for power generation by the power station at Shivanasamudram.

- The two branches of the river join after the fall and flow through a wide gorge which is known as '**Mekedatu**' (**Goats leap**) and continues its journey to form the boundary between Karnataka and Tamil Nadu States for a distance of 64 km.
- At **Hogennekkal Falls**, it takes Southerly direction and enters the **Mettur Reservoir**.
- A tributary called Bhavani joins Cauvery on the Right bank about 45 Kms below **Mettur Reservoir**. Thereafter it enters the plains of Tamil Nadu.
- Two more tributaries Noyil and Amaravathi join on the right bank and here the river widens with sandy bed and flows as '**Akhanda Cauvery**'

# Projects on Cauvery River

- During the pre-plan period many projects were completed in this basin which included **Krishnarajasagar** in Karnataka, **Mettur dam** and **Cauvery delta system** in Tamil Nadu.
- Lower **Bhavani, Hemavati, Harangi, Kabini** are important projects completed during the plan period

# Pennar River

- The Pennar (also known as **Uttara Pinakini**) is one of the major rivers of the peninsula.
- The Pennar rises in the **Chenna Kasava hill** of the **Nandidurg range**, in **Chikkaballapura district** of **Karnataka** and flows towards east eventually draining into the Bay of Bengal.
- The total length of the river from origin to its outfall in the Bay of Bengal is 597 km.
- Located in peninsular India, the Pennar basin extends over states of Andhra Pradesh and Karnataka having an area of ~55 thousand Sq.km

## Tributaries of Pennar River

- Left Bank: the **Jayamangali**, the **Kunderu**
- Right bank: the **Chiravati**, the **Papagni** etc.

# Subarnarekha

- The Subarnarekha originates from the **Ranchi Plateau** in Jharkhand forming the boundary between West Bengal and Odisha in its lower course.
- It joins Bay of Bengal forming an estuary between the Ganga and Mahanadi deltas. Its total length is 395 km.

# Brahmani River

- The Brahmani river comes into existence by the confluence of the **Koel** and the **Sankh rivers** near **Rourkela**. It has a total length of 800 km.
- The basin is bounded in the North by Chhotanagpur plateau, in the West and South by the Mahanadi basin and in the East by the Bay of Bengal.
- The basin flows through Jharkhand, Chhattisgarh and Orissa States and drains into Bay of Bengal.

# Ponnaiyar River

- The Ponnaiyar is a small stream which is confined to the coastal area only.
- It covers a small area in the state of Tamil Nadu, Karnataka and Andhra Pradesh.

# Vaigai River

- South of the Cauvery delta, there are several streams, of which the Vaigai is the longest.
- The Vaigai basin is an important basin among the 12 basins lying between the Cauvery and Kanyakumari.
- The Vaigai drains an area of 7,741 Sq.Km, which entirely lies in the state of Tamil Nadu.

# West Flowing Rivers of The Peninsular India

- The west flowing rivers of the Peninsular India are fewer and smaller as compared to their east flowing counterparts.
- The two major west flowing rivers are the **Narmada** and the **Tapi**.
- The **Sabarmati**, **Mahi** and **Luni** are other rivers of the Peninsular India which flow westwards.
- Hundreds of small streams originating in the **Western Ghats** flow swiftly westwards and join the Arabian Sea.

- It is interesting to note that the Peninsular rivers which fall into the Arabian Sea **do not form deltas, but only estuaries.**
- This is due to the fact that the west flowing rivers, especially the Narmada and the Tapi flow through **hard rocks** and hence do not carry any good amount of silt.
- Moreover, the tributaries of these rivers are very small and hence they don't contribute any silt.
- Hence these rivers are not able to form distributaries or a delta before they enter the sea.

# Narmada River

- Narmada is the largest west flowing river of the peninsular India.
- Narmada flows westwards through a **rift valley** between the Vindhyan Range on the north and the Satpura Range on the south.
- It rises from **Maikala range near Amarkantak** in **Madhya Pradesh**, at an elevation of about 1057 m.
- Narmada basin extends over states of Madhya Pradesh, Gujarat, Maharashtra and Chhattisgarh having an area ~1 Lakh Sq.km.

- Its total length from its source in **Amarkantak** to its estuary in the **Gulf of Khambhat** is 1,310 km.
- The hilly regions are in the upper part of the basin, and lower middle reaches are broad and fertile areas well suited for cultivation.
- **Jabalpur** is the only important urban centre in the basin.
- The river slopes down near Jabalpur where it cascades (a small waterfall, especially one in a series) 15 m into a gorge to form the ***Dhuan Dhar (Cloud of Mist) Falls***.
- Since the gorge is composed of marble, it is popularly known as the Marble Rocks.

- It makes two waterfalls of 12 m each at Mandhar and Dardi. Near Maheshwar the river again descends from another small fall of 8 m, known as the **Sahasradhara Falls**.
- There are several islands in the estuary of the Narmada of which **Aliabet** is the largest.
- The Narmada is navigable upto 112 km from its mouth.

# Tributaries of Narmada River

- The absence of tributaries is especially noted on the right bank of the river where the **Hiran** is the only exception.
- The other right bank tributaries are the **Orsang, the Barna and the Kolar.**
- A few left bank tributaries drain the northern slopes of the Satpura Range and join the Narmada at different places.
- The major Hydro Power Project in the basin are **Indira Sagar, Sardar Sarovar, Omkareshwar, Bargi & Maheshwar.**

# Tapti River

- It originates near **Multai reserve forest in Madhya Pradesh** at an elevation of 752 m.
- Flows for about 724 km before outfalling into the Arabian Sea through the **Gulf of Cambay [Gulf of Khambhat]**.
- The Tapti River along with its tributaries flows over the plains of **Vidharbha, Khandesh** and Gujarat and over large areas in the state of Maharashtra and a small area in Madhya Pradesh and Gujarat.
- The basin extends over states of Madhya Pradesh, Maharashtra and Gujarat having an area of ~ 65,000 Sq.km

## Tributaries of Tapti River

- ***Right Bank:*** the **Suki**, the **Gomai**, the **Arunavati** and the **Aner**.
- ***Left Bank:*** the **Vaghur**, the **Amravati**, the **Buray**, the **Panjhra**, the **Bori**, the **Girna**, the **Purna**, the **Mona** and the **Sipna**.

## Projects on Tapti River

- Hathnur Dam of Upper Tapi Project (Maharashtra)
- Kakrapar weir and Ukai Dam of Ukai Project (Gujarat)
- Girna Dam and Dahigam Weir of Girna Project (Maharashtra)

# Sabarmati River

- The Sabarmati is the name given to the combined streams the **Sabar** and **Hathmati**.
- The Sabarmati basin extends over states of Rajasthan and Gujarat having an area of 21,674 Sq km.
- The total length of river from origin to outfall into the Arabian Sea is 371 km.
- The major part of basin is covered with agriculture accounting to 74.68% of the total area.
- Left bank tributaries: the Wakal, the Hathmati and the Vatrak.
- Right bank tributaries: the Sei.
- Projects: Sabarmati reservoir (Dharoi), Hathmati reservoir and Meshwo reservoir project are major projects completed during the plan period.

# Mahi River

- The Mahi basin extends over states of Madhya Pradesh, Rajasthan and Gujarat having total area of 34,842 Sq km.
- It originates from the northern slopes of Vindhyas at an altitude of 500 m in **Dhar district of Madhya Pradesh.**
- The total length of Mahi is 583 km.
- It drains into the Arabian Sea through the Gulf of Khambhat.
- The major part of basin is covered with agricultural land accounting to 63.63% of the total area
- Hydro Power stations are located in Mahi Bajaj Sagar dam and at Kadana Dam.

# Luni River

- The Luni or the **Salt River** (Lonari or Lavanavari in Sanskrit) is named so because its water is brackish below Balotra.
- Luni is the only river basin of any significance in Western Rajasthan, which form the bulk of arid zone.
- Luni originates from western slopes of the **Aravalli ranges** at an elevation of 772 m near **Ajmer** flowing in South West direction and traversing a course of 511 km in Rajasthan, it finally flow into the **Rann of Kachchh** (it gets lost in the marsh).
- The peculiarity of this river is that it **tends to increase its width** rather than deepening the bed because the banks are of soils, which are easily erodible whereas beds are of sand. The floods develop and disappear so rapidly that they have no time to scour the bed.