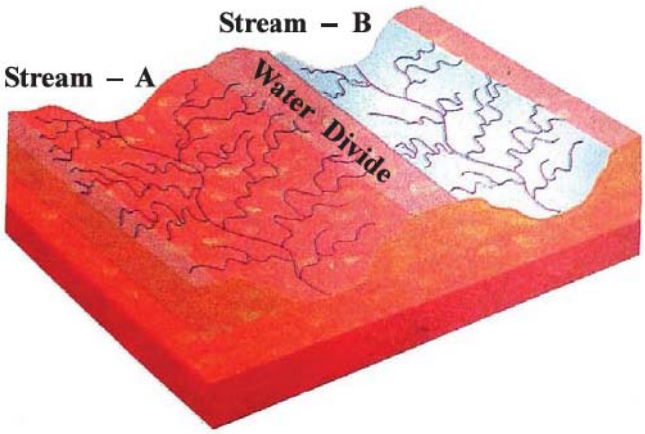
15 Drainage System

The word 'drainage system' is used for the systematic pattern of rivers. While observing the physiography of India, it is seen that a river and her many tributaries come from different directions and merge into a single river. The water of these rivers is emptied into a water reservoir, sea or a desert. Thus, when a river flows through its system in any area, it is called a 'river basin'. When a mountain or an upland separates the flow of water from one another, it is called Water-divider.



15.1 Water Divider

Like to know

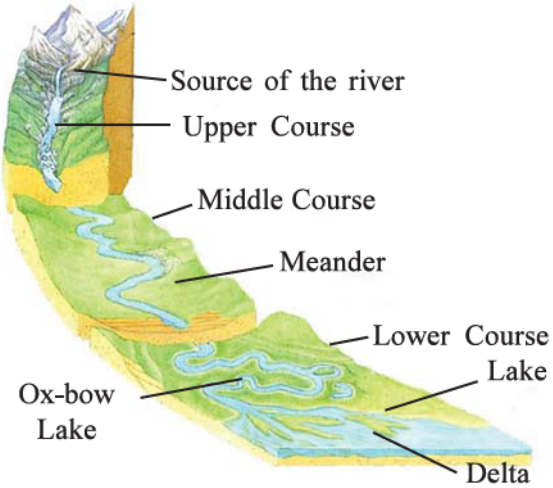
River Amazon has the largest river basin in the world. Ganga has the largest river basin in India.

Drainage system of India :

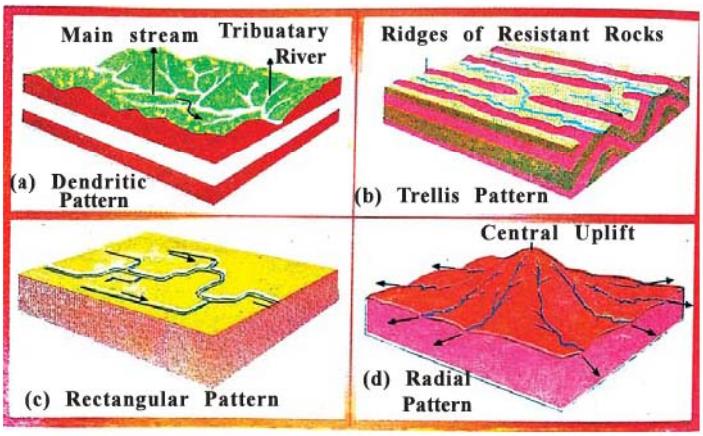
The drainage system of India follows its physiography. Accordingly, the drainage system of India is divided into two parts :

(1) Himalayan Rivers (2) Peninsular Rivers

Rivers of India are divided into two zones according to the physical features. Due to this a large difference is seen among the Himalayan and Peninsular rivers. Himalayan rivers contain water throughout the year. These rivers are perennial because of the increase in water volume due to heavy rain during monsoon and due to the melting of snow during summer. Two major rivers of Himalayas, Sindhu and Brahmaputra, originate in the northern part of this mountain system. These rivers have cut deep gorges by cutting the mountains. Himalayan rivers cross a long way from its origin to the sea.



15.2 Different Stages of River



15.3 River Systems

Three stages of a river system

(1) Upper Course (2) Middle Course (3) Lower Course

When a river starts from mountainous region, it causes intense erosion. It carries huge volume of sand and sediments along with it. Its flow decreases in its middle and lower courses. Meanders are seen here. Due to these meanderings and the impact of floods, a lake is formed in the shape of horse's hoof. Near its delta, a river is divided into many tributaries. This divided area turns into a very fertile plain in a triangle shape. This is called Delta.

Peninsular rivers are seasonal because these are dependent on rain water. During dry season, their flow is either reduced or is totally stopped. Compared to the Himalayan rivers, their length is also less and are also shallow. Due to the physiography and the slopes of the mountains, most of the peninsular rivers originate in the Western Ghats, flow eastwards and meet the Bay of Bengal. Western Ghats serve as a major water divide for the peninsular rivers.

Like to know

Pattern of Drainage System :

The river system of main river and its tributaries is seen as follows :

(A) Dendritic Pattern :

When the arrangement of a river and its tributaries make a shape of the branches of a tree, it is called Dendritic Pattern, e.g. Ganga.

(B) Trellis Pattern :

Streams starting from mountainous region meet one-another due to the slopes, they make a net-like shape. It is called Trellis Pattern. e.g., many steams from Himalayan region.

(C) Rectangular Pattern :

When the main river and its tributaries meet at right angles, it develops Rectangular Pattern. Mostly, rivers flowing through rift valleys form such river system. e.g. Narmada.

(D) Radial Pattern :

When streams flow out in all directions from a mountain, this type of river system is formed. e.g. rivers of Saurashtra.

15.4 India : Major rivers and Lakes

(1) Himalayan Rivers :

Sindhu, Ganga and Brahmaputra are major rivers originating in the Himalayas. These rivers are long and many tributaries meet them. When a large river and her many tributaries meet, they form a pattern, which is called a System.

Sindhu (Indus) River System : River Sindhu emerges from near Mansarovar in Tibet. First it flows to west and then turns north - westwards. There it enters Leh district in Laddakh union territory. It has formed many inaccessible gorges. Rivers Zaskar, Nubra, Shyok and Hunza meet her. Satluj, Beas, Ravi and Jhelum are her main tributaries. These five rivers meet river Sindhu near Mithankot in Pakistan. The combined flow of all these rivers ultimately flows southwards and meets the Arabian Sea. These rivers flow at a slower speed in the plains. About one third of its basin falls in the mountainous region of Jammu- Kashmir.

Like to know...

- River **Sindhu** is 2900 km long.
- In 1960, a Treaty was signed with Pakistan regarding the distribution of the water of Sindhu river.
- Accordingly, India can use only 20 % of its water.
- Irrigation has been possible in Punjab, Haryana and south-western parts of Rajasthan by harnessing the waters of Satluj, Ravi and Beas rivers.

Ganga River System : Rivers **Bhagirathi** and Alaknanda emerging from the **Gangotri** area in Himalayas, merge with each other near **Devprayag** (Uttarakhand). Ganga leaves the mountainous terrain and enters plains near **Haridwar**.

Many Himalayan rivers meet Ganga. Among them **Ghaghra, Gandak** and **Kosi** are major rivers. **Yamuna** emerges from **Yamunotri** in Himalayas. Flowing to the right side of Ganga, it merges with Ganga near **Allahabad**. The source of Ghaghra, Gandak and Kosi rivers lies in Nepal. Hence the northern plain experiences flood disasters every year. There is a heavy loss of life and property in some areas, yet India has been able to attain prosperity in agriculture through the fertile plains formed by these rivers.

Few rivers like **Chambal**, **Betwa** originate in peninsular plateau and meet Yamuna. **Son** river meets Ganga. These rivers originate in semi - arid area, their a length of flow is shorter and have limited volume of water.

The combined flow of the rivers from north and south is divided down stream into two branches. One branch enters Bangladesh and is known there as **Padma**. Another branch is known as **Bhagirathi - Hugli** in west Bengal. Finally, these two branches meet the Bay of Bengal.

The flow of Ganga, which is known as **Padma** in Bangladesh, merges there with Brahmaputra river and their combined flow is called **Meghna**. The Ganga - Brahmaputra delta is the most fertile delta and is known as **Sundarvan**.

Like to know

- The delta region of Ganga is called **'Sundarvan'** because the trees known as 'sundari' grow in large number here.
- Sundarvan delta is more famous as mangrove forests.
- Total length of Ganga exceeds 2500 kilometres. Ambala City works as a water divide between Ganga and Sindhu rivers. Ambala to Sundarvan is about 1800 km, but the slope is very gentle. Ambala is at an altitude of 300 metres from sea level, while Sundarvan is at sea level. Considering this, the slope happens to be less than one metre for every 6 km so there are many meanders in this river.

Brahmaputra River System : River Brahmaputra originates near Mansarovar in Tibet. Its source is the near the place of origin of rivers Sindhu and Satluj. Most of its flow is out side India. This river flows in the the east parallel to the Himalayan Mountain System. Near Namcha Barva, it takes 'u' turn and enters Arunachal Pradesh. IIere it is known as Dihang. This river, with Lohit and Kenula tributaries, is collectively known as Brahmaputra in Assam.

Like to know

- Brahmaputra is the only river having a masculine pronoun, and is about 2900 kilometres long.
- Brahmaputra is known as Tsang Po in Tibet and as Jamuna in Bangladesh.
- 'Mazuli', an island in Brahmaputra, is the largest riverine island in the world.

There is less of sedimentation in this river in Tibet. In India, the river passes through regions of heavy rainfall. So further down there is more of water mass as well as sediments. Many tributaries meet this river in Assam. Thus river Brahmaputra flows in a braided form.

Every year, there is a huge increase in its water as it overflows during rainy season. As a result, devastating floods often occur in Assam and Bangladesh. There is a contrast in this river compared to other rivers of North India. Due to heavy rains in Assam during monsoon, there is a huge deposition. The increasing level of sand in this river raises its bed higher. So there are frequent changes in the course of the river.

(2) Peninsular Rivers :

Western Ghats is considered to be the main water divide for peninsular rivers. Major rivers of the peninsula are Mahanadi, Godavari, Krishna, Kaveri etc. All these rivers flow eastwards and meet the Bay of Bengal. Many rivers flow to the west of Western Ghats. Large rivers like Narmada and Tapi flow from east to west and meet the Arabian Sea in the west.

Narmada Basin : Narmada originates near Amarkantak plateau in Madhya Pradesh. It flows westward in a rift valley. It flows through a rocky terrain of marbles near Jabalpur, and flows faster due to slope. The Dhuandhar Falls are located here.

Tributaries of this river do not have longer flow. Most of the rivers meet at right angles. Its basin area is spread over Madhya Pradesh and Gujarat. Narmada is about 1312 km long.

Tapi Basin : Satpuda ranges are located in Madhya Pradesh. Tapi river originates in Betul District. It flows in a rift valley, parallel to Narmada, and meets Arabian Sea. It has an extensive basin in Madhya Pradesh and Maharashtra. Tapi is almost 724 km long.

Coastal plain between Arabian Sea and Western Ghats is very narrow. So the rivers have a shorter flow. Major rivers flowing westward have shorter course. Major rivers flowing westward are Sabarmati and Mahi (Mahisagar).

Godavari Basin: This is the largest of the peninsular rivers. It starts from the slopes of Western Ghats near Nasik in Maharashtra. It is about 1465 km long. It flows to the east and meets Bay of Bengal. It has the largest basin among the peninsular rivers. About 50 % of its basin lies in Maharashtra, and the rest is in Madhya Pradesh and Andhra Pradesh.

Many tributaries meet Godavari. Among them, Purna, Vardha, Pranhita, Manjara, Vainganga and Penganga are major rivers. Godavari has a longer flow and a large basin, so it is also known as ' Ganga of South ' .

Mahanadi Basin : Mahanadi originates in the mountainous area of Chhattisgarh. It flows through Odisha and meets Bay of Bengal. It is about 860 km long and has a basin spread in Chhattisgarh, Jharkhand and Odisha.

Krishna Basin : It originates near Mahabaleshwar in Maharashtra. It is about 1400 km long. Tungabhadra, Koyna, Ghatprabha, Musi and Bhima are her major tributaries. Its basin extends in Maharashtra, Karnataka and Andhra Pradesh.

Kaveri Basin : It has its origin in the Brahmagiri Range in Western Ghats and is about 760 km long. Amaravati, Bhavani, Hemvati and Kalini are her major tributaries. Its basin extends in Kerala, Karnataka and Tamil Nadu. It meets the Bay of Bengal to the south of Cuddalore in Tamil Nadu.

There are other smaller rivers which flow eastwards and meet Bay of Bengal. These rivers include Damodar, Brahmani, Vaitarni and Suvarnarekha.

Like to know

- Hydrosphere exists over about 71 % on the earth's surface.
- About 97 % of it is saline water.
- Only 3 % water is available as fresh water. One-fourth of its portion is in the form of ice.

Lakes

There are many lakes in India. Fresh water lakes are found more in the Himalayan region. Most of the lakes contain water during rainy season. In Himalayan region lakes are formed from glaciers. A few lakes are formed due to wind, rivers and human actions. In rivers having many meanders, ox-bow lakes are formed. Sea tides have created 'lagoon' lakes. Chilka, Kolleru and Pulicat are examples of this type of lakes. Sambhar lake in Rajasthan is a saline lake and salt is produced from it.

Himalaya has many fresh water lakes which are formed due to glacial action. Water was filled in the depressions which led to the formation of lakes. Beautiful lakes are formed here due to melting of snow. Wular Lake in Kashmir has a tectonic origin. Other fresh water lakes of this area are Dal, Bhimtal, Loktal and Badapani.

Importance of lakes : Lakes are useful to man in many ways. Some rivers have originated from lakes. In the regions which have more rain, more water can be accumulated in the lakes. The accumulated water can be utilised for irrigation and other purposes. The stored water can also be used during drought. Reservoirs and lakes formed due to dam are useful for generating hydel power. Few lakes enhance the natural beauty, hence such lakes have been developed as tourist spots. Lakes are also important for fishery and as tourist resorts.

Economic importance of rivers

Rivers have remained most important during human history. Rivers are the natural resource of water. These are very much important for many human activities. It has satisfied basic need of man. Agriculture and industries have developed due to rivers. Ancient civilizations also flourished along rivers. Major cities have developed along the river banks, e.g. Delhi, Kolkata, Ahmedabad, Bharuch, Surat etc.

River is considered to be the base for an agrarian country like India. In recent times, river water is utilised for drinking, irrigation, hydel power and for navigation.

River – pollution

River water is used more in domestic activities, agriculture and in industrial production. We know the rivers as 'Lokmata', consider it to be very holy and yet we release industrial effluents in the rivers. The sewage water is dumped into the river near the city. Besides, we also throw solid waste in the river. As a result, the river water is polluted. Thus, water pollution increases due to industrialization and urbanization. Pollution of river water has become our national problem. Government is putting in special efforts to prevent river pollution. At this stage, public participation is equally expected along with the government's efforts.

Measures to prevent water pollution

Rules to prevent water pollution should be implemented very strictly. Water purification projects must be implemented through National River Conservation Project. Strict rules should be formed to prevent industrial units from releasing industrial effluents in the rivers. Industrial units should filter harmful contents from the chemical effluents before releasing them in the river. In order to keep the river water clean, every citizen should take care not to mix up the domestic waste into the river.

Like to know

- National River Conservation Project (NRCP)
- National River Conservation Project was introduced at the second stage of Ganga River Purification.

Self study

1. Write short answers for the following questions :

(1) Give difference : Himalayan rivers – Peninsular rivers

(2) Explain : Drainage Pattern and Water Divide

(3) Explain the utility of lakes

(4) State the remedies to prevent water pollution.

(5) 'Godavari is named as Ganga of South' – Give reasons.

2. Answer the following :

(1) Explain the Ganga River System.

(2) Discuss the Narmada basin.

(3) Describe in detail the Krishna and Kaveri basins.

3. Find out the correct option from the given options :

(1) Which lakes are formed due to meandering of rivers ?

(A) Lagoon (B) Ox-bow (C) Oval-shape (D) Square

(2) What is it called when a mountain or an upland separates the water flow of rivers from one another ?

(A) Water formation (B) Water divide (C) River system (D) Basin

(3) Which of the following is not a peninsular river ?

(A) Godavari (B) Krishna (C) Kosi (D) Kaveri

(4) Which of the following lakes is used for producing salt ?

(A) Dhebar (B) Sambhar (C) Wular (D) Nal

(5) Which are the main tributaries of Ganga ?

(A) Yamuna,Ghaghra,Gandak and Kosi (B) Yamuna, Chambal, Ghaghra and Kosi

(C) Yamuna, Ghaghra, Sharavati and Kosi (D) Narmada, Ghaghra, Gandak and Kosi

Activities

- Prepare charts about the rivers and the multi-purpose projects.