Geography Optional - 2024

DRAINAGE SYSTEM OF INDIA

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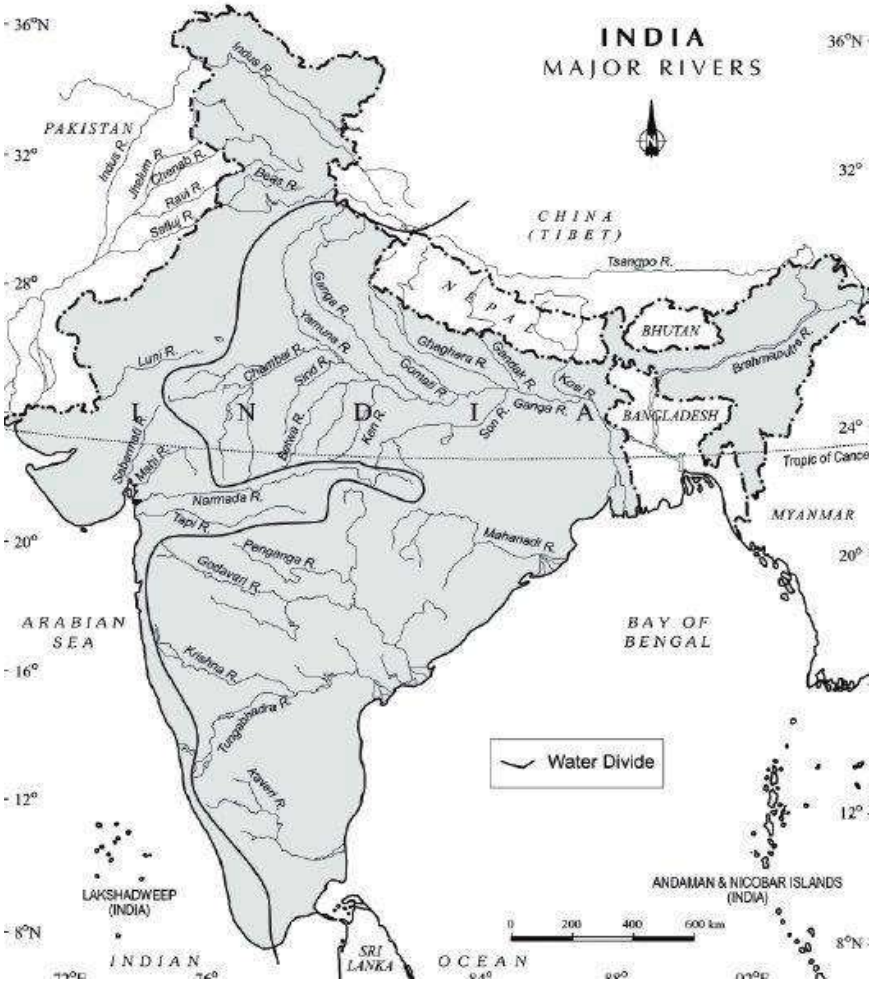
Tributaries and a trunk stream which collects and drains surface water into the sea, lake or some other body of water. The total area drained by a river and its tributaries is known as a drainage basin. The drainage pattern of an area is the result of the geological structure of the respective areas. The river system provides irrigation, drinking water, navigation, power as well as grant livelihoods for a large number of population. The drainage system of India is broadly divided into two major groups on the basis of their location. They are Himalayan rivers and the Peninsular rivers.

Himalayan Rivers

Drained by 19 major rivers, of which the Indus and the Brahmaputra are the largest, each having catchment basins in the mountains of about 260,000 square km in extent. Five of the 19 rivers, with a total catchment area of about 132,000 square km belong to the Indus system—the Jhelum, the Chenab, the Ravi, the Beas, and the Sutlej—and collectively define the vast region divided between Punjab state in India and Punjab province in Pakistan. Of



the remaining rivers, nine belong to the Ganges system—the Ganges, Yamuna, Ramganga, Kali (Kali Gandak), Karnali, Rapti, Gandak, Baghmati, and Kosi rivers—draining roughly 218,000 square km)in the mountains. three belong to the Brahmaputra system—the Tista, the Raidak, and the Manas—draining another 184,000 square km in the Himalayas. Mainly comprises the basin areas of the Indus, the Ganga and the Brahmaputra. The rivers are perennial in nature and are fed by rains during monsoon season as well as by the melting of the snow during summer season. Rivers are in their youthful stage thus carving out a number of erosional features like deep gorges, V-shaped valleys, rapids and water falls.

Himalayan Rivers, which now belong to the three principal systems (the Indus, the Ganga and the Brahmaputra), have evolved through a long period of geological history.

- They originate on the southern slopes of the Tibetan Highlands and first flow parallel to the main axis of the mountains in longitudinal troughs.
- They take a sudden bend towards the south carving out deep gorges across the mountain ranges to reach the northern plains of India. Such deep gorges by the Indus, Satluj, Alaknanda, Gandak, Kosi and Brahamaputra suggest that they are older than the mountains themselves and have antecedent characteristics.
- **Evolution of the Himalayan drainage**
- There are differences of opinion about the evolution of the Himalayan Rivers.
- However, geologists believe that a mighty river called Shiwalik or Indo-Brahma traversed the entire longitudinal extent of the Himalaya from Assam to Punjab and onwards to Sind, and finally discharged into the Gulf of Sind near lower Punjab during the Miocene period some 5-24 million years ago .
- The remarkable continuity of the Shiwalik and its lacustrine origin and alluvial deposits consisting of sands, silt, clay, boulders and conglomerates support this viewpoint.
- It is opined that in due course of time Indo Brahma River was dismembered into three main drainage systems:

(i) the Indus and its five tributaries in the western part;

(ii) the Ganga and its Himalayan tributaries in the central part

(iii) the stretch of the Brahmaputra in Assam and its Himalayan tributaries in the eastern part

- The dismemberment was probably due to the Pleistocene upheaval in the western Himalayas, including the uplift of the Potwar Plateau (Delhi Ridge), which acted as the water divide between the Indus and Ganga drainage systems.
- Likewise, the down-thrusting of the Malda gap area between the Rajmahal hills and the Meghalaya plateau during the mid-pleistocene period, diverted the Ganga and the Brahmaputra systems to flow towards the Bay of Bengal

These rivers are found in north India and originate from Himalayas. So, they are also called as Himalayan rivers. These are perennial rivers.

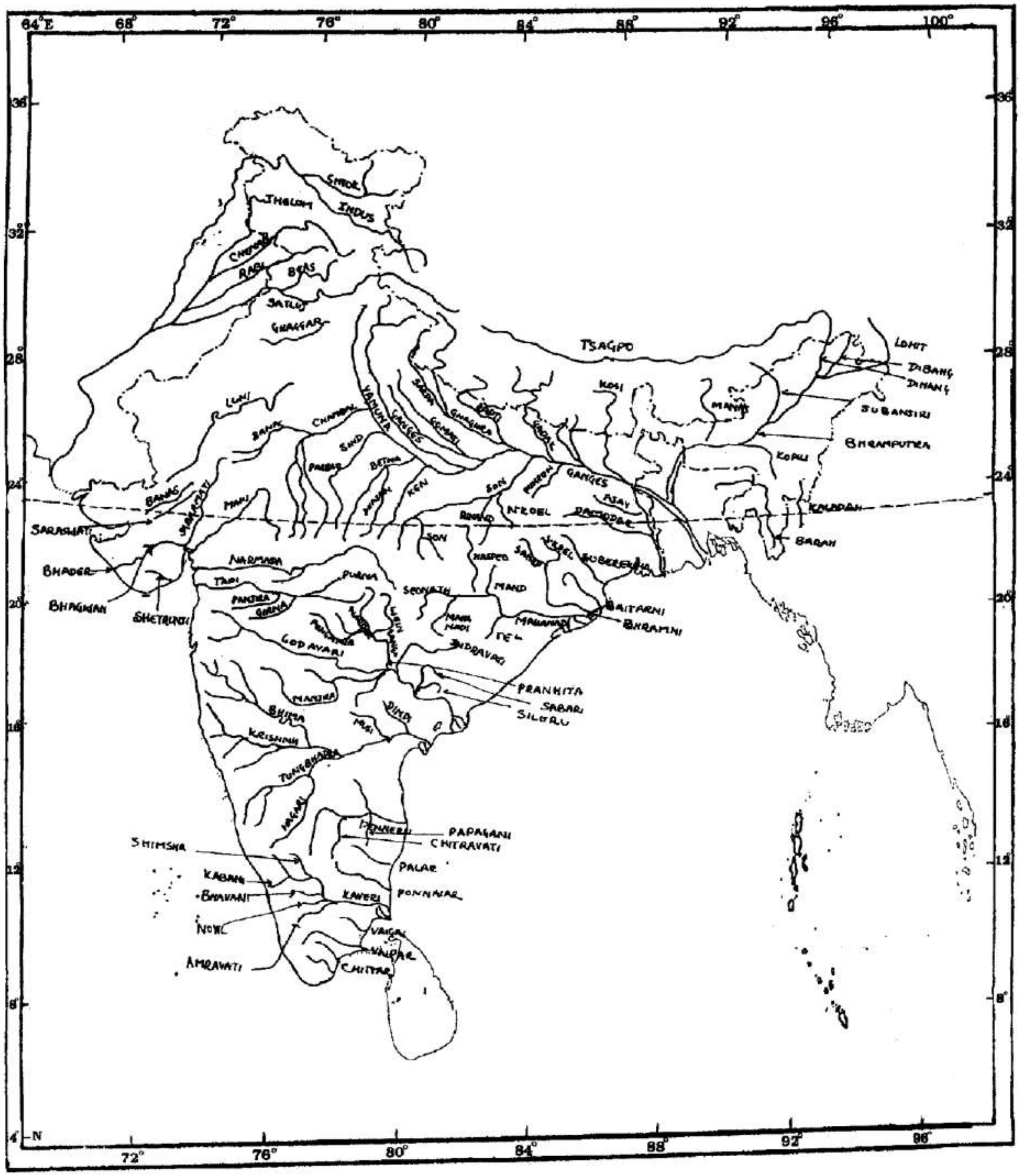
(a) The Indus River System: The Indus River is one of the largest rivers of the world. It originates from the northern slope of the Kailash range in Tibet near Manasarovar Lake at an elevation of about 5,150 m. Its length is about 2,880 km (Only 709 km is in India). The river has a total drainage area extending 11,65,500 sq km in which 321,289 sq km areas are drained in India. The river flows through the Ladakh and Zaskar ranges and creates deep gorges. The river runs through Jammu and Kashmir, turns south near Chillar and enters Pakistan. Its major tributaries are Jhelum, Chenab (Largest tributary of Indus), Ravi, Beas and Sutlej. It enters into with the Arabian Sea.

(b) The Ganga River System: The Ganga River system is the largest drainage system of India it extend over and area of 8,61,404 sq km in India. The Ganga plain is the most densely populated place in India and many towns are developed on the banks of this river. The river Ganga originates as Bhagirathi from the Gangotri Glacier in Uttar Khasi District of Uttrakhand state, at an elevation of 7,010 m. The length of the river Ganga is about 2,525 km. Its major tributaries from the north are Gomti, Gandak, Kosi and Ghaghra and from south, Yamuna (largest tributary of Ganga), Son, Chambal etc. The river Ganga is known as the River Padma in Bangladesh. The combined river of Ganga and Brahmaputra creates the World's largest delta known as Sunderbans in Bangladesh before joining the Bay of Bengal.

(c) The Brahmaputra River System: The River Brahmaputra originates from the Chemayungdung Glacier of the Kailash range to the east of Lake Mansarovar in Tibet at an elevation of about 5,150 m. The total area is about 5,80,000 sq km but the drainage area lying in India is 1,94,413 sq km This river is known as Tsangpo (Purifier) in Tibet. The length of this river is about 2,900 km (900 km in India). It enters into India through a gorge in Arunachal Pradesh namely Dihang. It has many tributaries. Tista, Manas, Barak, Subansiri are some of them. This river is called as Jamuna in Bangladesh. After it joins with the river Ganga in Bangladesh, the river is called as Meghna.

Characteristics of Himalayan Rivers

- Originate from Himalayas
- Long and wide
- Perennial in nature
- Unsuitable for hydro power generation
- Middle and lower courses are navigable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TUNGBHADRA
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BHAVANI
AMRAVATI
KAVERI
PONNAIYAR
PALAR
PAPAGANI
CHITRAVATI
VAIGAI
VAIPAR
CHITTAR

Peninsular Rivers

Evolution of the Peninsular Drainage

Theory 1

- Geologists believe that the Sahyadri-Aravali axis was the main water divide in the past.
- According to one hypothesis, the existing peninsula is the remaining half of bigger landmass.
- The Western Ghats were located in the middle of this landmass.
- So one drainage was towards east flowing into Bay of Bengal and the other towards west draining into Arabian Sea.
- The western part of the Peninsula cracked and submerged in the Arabian Sea during the early Tertiary period (coinciding with the formation of Himalayas).
- During the collision of the Indian plate, the Peninsular block was subjected to subsidence in few regions creating a series of rifts (trough, faults).
- The now west flowing rivers of the Peninsula, namely the Narmada and the Tapi flow through these rifts.
- Straight coastline, steep western slope of the Western Ghats, and the absence of delta formations on the western coast makes this theory a possibility.

Theory 2

- It is believed that the west flowing peninsular rivers do not flow in the valleys formed by the rivers themselves.
- Rather they have occupied two fault rifts in rocks running parallel to the Vindhyas.
- These faults are supposed to be caused by bend of the northern part of the Peninsula at the time of upheaval of the Himalayas.
- Peninsular block, south of the cracks, tilted slightly eastwards during the event thus giving the orientation to the entire drainage towards the Bay of Bengal.
- Criticism: Tilting should have increased the gradient of the river valleys and caused some rejuvenation of the rivers. This type of phenomenon is absent in the Peninsula, barring a few exceptions such as waterfalls.

The rivers in south India are called the Peninsular rivers. Most of these rivers originate from the Western Ghats. These are seasonal rivers (non–perennial). They have a large seasonal fluctuation in volume of water as they are solely fed by rain. These rivers flow in valleys with steep gradients. Based on the direction of flow, the peninsular rivers are divided into the West flowing and East flowing rivers.

East Flowing Rivers

(a) Mahanadi: The river Mahanadi originates near Sihawa in Raipur district of Chhattisgarh and flows through Odisha. Its length is 851 km. Seonath, Telen, Sandur and Ib are its major tributaries. The main stream of Mahanadi gets divided into several distributaries such as Paika, Birupa, Chitartala, Genguti and Nun. All these distributaries form the Delta of Mahanadi which is one of the largest deltas in India. The Mahanadi empties its water in Bay of Bengal.

(b) Godavari: Godavari is the longest river (1,465 km) with an area of 3.13 lakh km2 among the Peninsular Rivers. It is also called Vridha Ganga. It originates in Nasik district of Maharashtra, a portion of Western Ghats. It flows through the states of Telangana and Andhra Pradesh before joining Bay of Bengal. Purna, Penganga, Pranitha, Indravati, Tal and Salami are its major tributaries. The river near Rajahmundry gets divided into two Channels called Vasistha and Gautami and forms one of the largest deltas in India. Kolleru, a fresh water lake is located in the deltaic region of the Godavari.

(c) Krishna: The river Krishna originates from a spring at a place called Mahabaleshwar in the Western Ghats of Maharashtra. Its length is 1,400 km and an area of 2.58 lakh sq km. It is the second longest Peninsular river Bhima, Peddavagu, Musi, Koyna and Thungabhadra are the major tributaries of this river. It also flows through Andhra Pradesh and joins in Bay of Bengal, at Hamasaladeevi.

(d) Kaveri: The river Kaveri originates at Talakaveri, Kudagu hills of Karnataka. Its length is 800 km. The river kaveri is called Dhakshin Ganga or Ganga of south Harangi, Hemavati, Kabini, Bhavani, Arkavathy, Noyyal, Amaravathi etc are the main tributaries of the river Kaveri. In Karnataka the river bifurcates twice, forming the sacred islands of Srirangapatnam and Sivasamudram. While entering Tamil Nadu, the Kaveri continues through a series of twisted wild gorges until it reaches Hogenakkal Falls and flows through a straight, narrow gorge near Salem. The Kaveri breaks at Srirangam Island with two channels, river Coleroon and Kaveri. At last, it empties into the Bay of Bengal at Poompuhar.

West Flowing Rivers

(a) Narmada: This river rises in Amarkantak Plateau in Madhya Pradesh at an elevation of about 1057 m and flows for a distance of about 1,312 km it covers an area of 98,796 sq km and forms 27 km long estuary before outfalling into the Arabian Sea through the Gulf of Cambay. It is the largest among the west flowing rivers of Peninsular India. Its principal tributaries are Burhner, Halon, Heran, Banjar, Dudhi, Shakkar, Tawa, Barna and Kolar.

(b) Tapti: The Tapti is one of the major rivers of Peninsular India with the length of about 724 km. It covers an area of 65,145 sq km. Tapti river rises near Multai in the Betul district of Madhya Pradesh at an elevation of about 752 m. It is one of only the three rivers in Peninsular India that run from east to west - the others being the Narmada and the Mahi. Th e major

tributaries are Vaki, Gomai, Arunavati, Aner, Nesu, Buray, Panjhra and Bori. It outfalls into the Arabian Sea through the Gulf of Cambay.

Peninsular River System: Nature and characteristics

- much older than the Himalayan rivers .
- mainlyConcordant except for few rivers in the upper peninsular region.
- They are non-perennial rivers with a maximum discharge in the rainy season.
- The peninsular rivers have reached mature stage {Fluvial Landforms} and have almost reached their base level. [Vertical downcutting is negligible].
- The rivers are characterized by broad and shallow valleys.
- banks have gentle slopes except for a limited tract where faulting forms steep sides.
- The main water divide in peninsular rivers is formed by the Western Ghats, which run from north to south close to the western coast.
- The velocity of water in the rivers and the load carrying capacity of the streams is low due to low gradient.
- Most of the major rivers of the peninsula such as the Mahanadi, the Godavari, the Krishna and the Cauvery flow eastwards and drain into the Bay of Bengal. These rivers make deltas at their mouths.
- But the west flowing rivers of Narmada and Tapi as well as those originating from the Western Ghats and falling in the Arabian Sea form estuaries in place of deltas.
- There are few places where rivers form superimposed and rejuvenated drainage which are represented by
- Examples: The Jog on the Sharvati (289 m), Yenna of Mahabaleshwar (183 m), Sivasamundram on the Cauvery(101 m), Gokak on the Gokak (55 m), Kapildhara (23 m) and Dhuandar (15 m) on the Narmada are the major waterfalls in the Peninsular India

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