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## 1 Defence Systems in News (Source: The Hindu)

### Astra Missile

- **Developed by** - Defence Research and Development Organization (DRDO)
- **Technology:** It works on the Beyond Visual Range Air-to-Air Missile (BVRAAM) technology that enables the fighter-pilots to shoot precisely at the enemy targets which are beyond their visual range.
- **Features**
  - **Speed:** 4.5 mach
  - **Range:** over 70 km
  - **Electronic Counter-Countermeasures or ECCM Feature:** Enables Astra missile to overcome defensive measures put forth for the target by the enemy.

### Pinaka Rocket System

- **What is it?:** It is a Multi-Barrel Rocket Launcher (MBRL) system.
- **Developed by:** DRDO
- **Naming:** Named after God Shiva's bow.
- **First Use:** In the Kargil War (1999).
- **Features**
  - **Firing Power:** It can fire 12 rockets over a period of 44 seconds
  - **Strike Range:** 60 - 75 km
  - **Guidance:** It is guided by Indian Regional Navigation Satellite System (IRNSS).



## 2 Role of Western Ghats in Monsoon (Source: The Indian Express)

### ROLE OF WESTERN GHATS IN MONSOON

The Western Ghats act as a natural barrier that shapes the monsoon pattern, rainfall distribution and climate of peninsular India.

#### 1. OROGRAPHIC ROLE – RAINFALL ENHANCER

Moist monsoon winds from Arabian Sea

Moist air rises, cools and condenses to give heavy rainfall on windward side (Konkan & Malabar coast)

Dry air descends, leading to rain shadow region in interior Deccan Plateau

WESTERN GHATS

ARABIAN SEA

RAIN SHADOW ZONE

#### KEY ROLES

- 1. Induces Heavy Rainfall**  
Blocks the moist south-west monsoon winds and forces them to rise, resulting in very heavy rainfall on the windward slopes.
- 2. Creates Rain Shadow**  
Moisture is released on the windward side; descending air on the leeward side is dry, causing low rainfall in the interior Deccan region.
- 3. Sustains Ecosystems**  
High rainfall supports rich biodiversity, evergreen forests, rivers and waterfalls in the Western Ghats.
- 4. Source of Major Rivers**  
Numerous west-flowing rivers originate in the Western Ghats, which are rain-fed during the monsoon.
- 5. Regulates Climate**  
Moderates temperature, maintains humidity, and influences local and regional climate patterns.
- 6. Recharge of Water Resources**  
Enhances groundwater recharge and sustains reservoirs, lakes and agriculture in surrounding areas.

#### 2. IMPACT ON RAINFALL DISTRIBUTION

Very Heavy Rainfall (2000–7000 mm)  
Konkan & Malabar Coast

Low Rainfall (400–800 mm)  
Interior Deccan Plateau (Rain Shadow Region)

WESTERN GHATS

Rainfall  
2000 mm & above  
1000 – 2000 mm  
500 – 1000 mm  
Below 500 mm

#### 3. EXAMPLES

- Mawsynram (Meghalaya) is one of the wettest places in India due to similar orographic effect.
- Heavy rainfall along the Western Ghats coast – Konkan, Goa, Malabar.
- Low rainfall in regions like Rain Shadow parts of Karnataka, Telangana and Marathwada.

#### 4. ADDITIONAL BENEFITS

**Prevents Soil Erosion**  
Dense vegetation and heavy rainfall reduce soil erosion and landslides.

**Supports Agriculture**  
Provides water for irrigation and sustains agricultural activities in peninsular India.

**Biodiversity Hotspot**  
The monsoon nourishes one of the world's eight hottest biodiversity hotspots.

**Supports Livelihoods**  
Sustains millions of people dependent on forests, agriculture, fisheries and tourism.

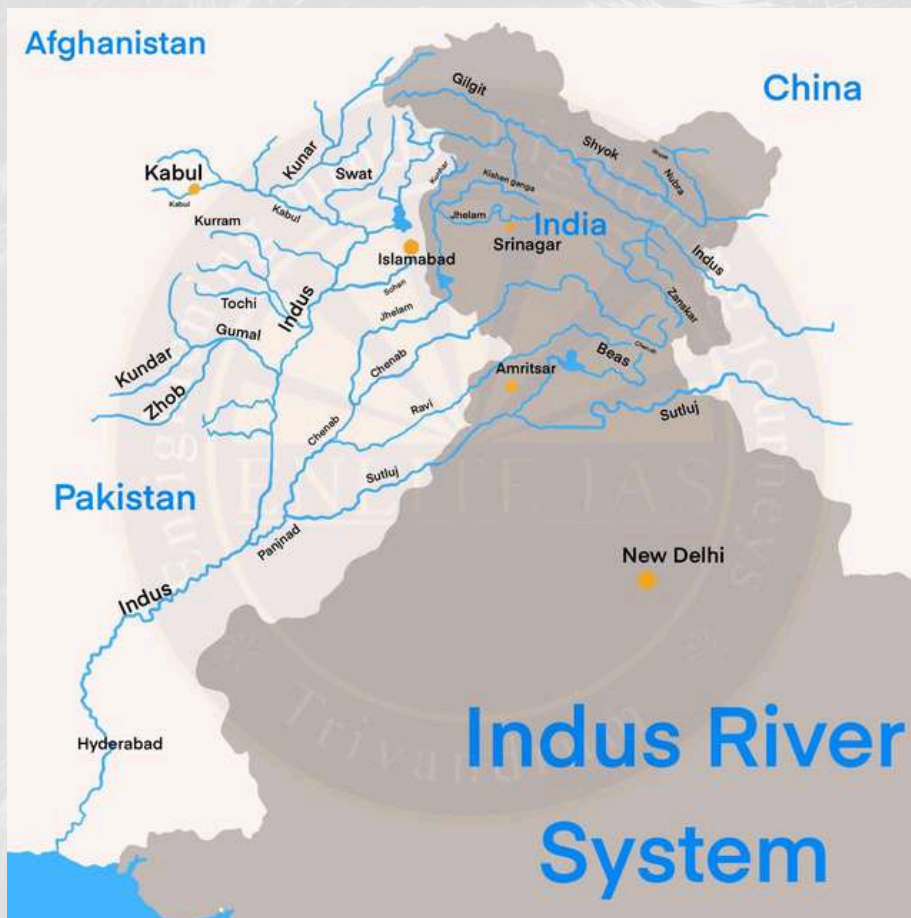
**KEY TAKEAWAY**

The Western Ghats are the 'Water Tower' of peninsular India – they capture monsoon moisture, bring abundant rainfall to the western coast, and are crucial for water security, ecology, agriculture and climate balance.

## 3 Himalayan River Systems (Source: The Indian Express)

### Indus River System (Sindhu River)

- One of the largest river basins spreads over **China(Tibet), India, and Pakistan.**
- *It originates from a glacier near Bokhar Chu in the Tibetan region in the Kailash Mountain range near the Mansarovar Lake.*
- River delta near Karachi , Pakistan.





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## Himalayan Tributaries of Indus River

1. Shyok River: Rising from the Karakoram Range at Rimo glacier. The river widens at the confluence with the Nubra River.
2. Nubra River: It is the main tributary of the Shyok River. It originates from the Nubra Glacier.
3. Shigar River: It rises from the Hispar Glacier. It joins Indus at Skardu.
4. Hunza River: It is an important left-bank tributary of the Gilgit River. It rises from a glacier north of the Karakoram Range in the northwestern part of Jammu and Kashmir.

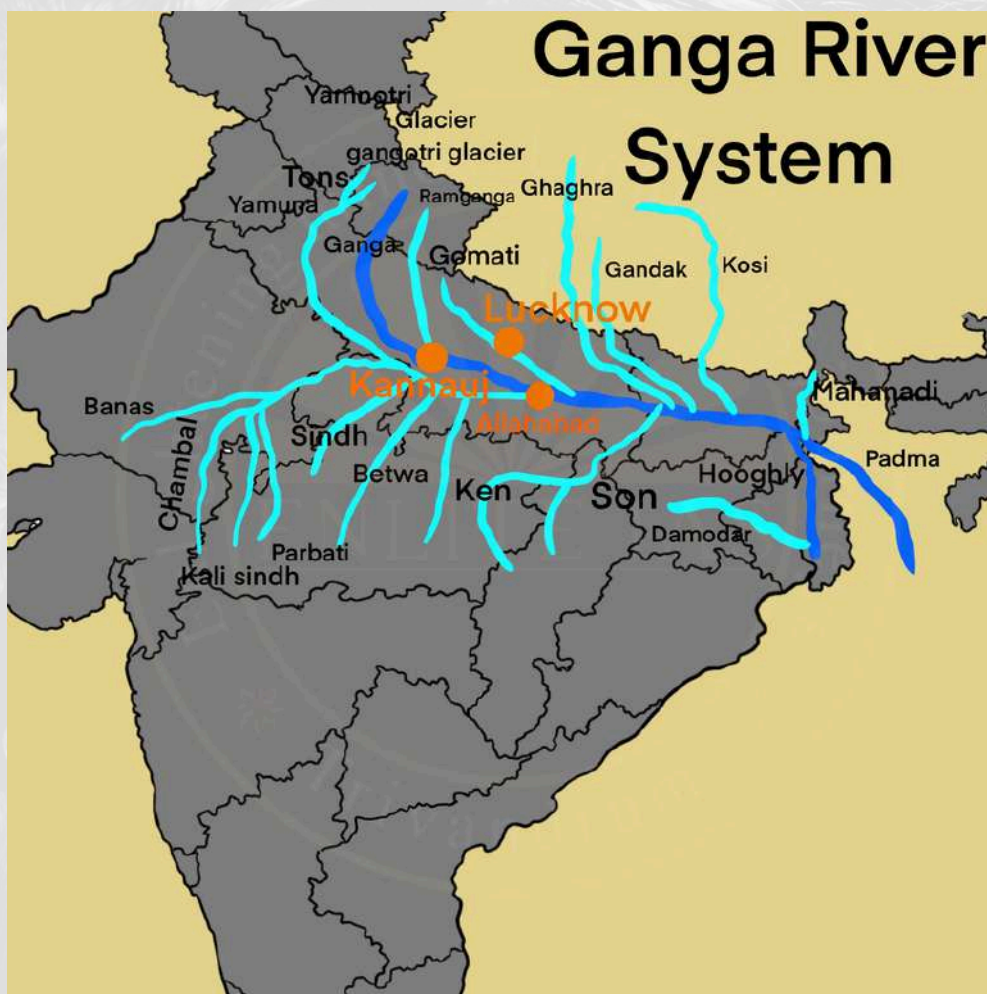
## Indus River Tributaries in the Plains

1. Chenab River
  - The Chenab originates from near the Bara Lacha Pass in the Lahul-Spiti part of the Zaskar Range.
  - Chenab river is formed by the confluence of the Chandra and Bhaga rivers.
  - It flows through the Jammu region of Jammu and Kashmir into the plains of Punjab in Pakistan
  - The waters of the Chenab are allocated to Pakistan under the terms of the Indus Water Treaty
2. Jhelum River
  - It is a tributary of the Chenab River
  - The river Jhelum rises from a spring at Verinag situated at the foot of the Pir Panjal range.
  - The waters of the Jhelum are allocated to Pakistan under the terms of the Indus Water Treaty.
  - It flows through the Wular Lake.
  - The Kishenganga River is the largest tributary of the Jhelum.
3. Ravi River
  - It rises west of Rohtang pass in the Kullu hills of Himachal Pradesh.
  - The waters of the Ravi River are allocated to India under the Indus Waters Treaty.
  - The major multipurpose project built on the river is the Ranjit Sagar Dam.
4. Sutlej River
  - It rises from beyond the Indian borders on the southern slopes of the Kailash Mountain from the Rakas lake which is situated close to the Mansarovar Lake.
  - It enters Himachal Pradesh through Shipki La and flows in the South-westerly direction.
  - The world's highest gravity dam- Bhakra Nangal Dam is built on this river.
  - The waters of the Sutlej are allocated to India under the Indus Water Treaty.
5. Beas River
  - Beas River emerges from Rohtang Pass in Himachal Pradesh.
  - The tourist resorts of Manali are situated on the right banks of the River Beas.

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### Ganga River System

- The Ganga river system is spread over **India, Tibet, Nepal and Bangladesh.**
- It is the largest river basin in India and accounts for one-fourth of the total area of the country.
- *Its basin covers the states of Uttar Pradesh, Madhya Pradesh, Rajasthan, Bihar, West Bengal, Uttarakhand, Haryana, Chhattisgarh, Himachal Pradesh and the UT of Delhi. The*
- Ganga River flows through the states of Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, and West Bengal.
- *The Bhagirathi, considered to be the source stream of Ganga rises at the foot of the Gangotri Glacier, at Gaumukh.*





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## Himalayan Tributaries of the Ganga River

### 1. Alaknanda River

- It rises at the confluence and feet of the Satopanth and Bhagirath glaciers in Uttarakhand.
- It meets the Bhagirathi River at Devprayag after which it is called the Ganga.
- Its main tributaries are the Mandakini, Nandakini, and Pindar rivers.
- The Hindu pilgrimage centre of Badrinath and the natural spring Tapt Kund lie along the banks of the Alaknanda River.

### 2. Bhagirathi River

- It rises at the foot of Gangotri Glacier, at Gaumukh, at an elevation of 3892m at Uttarakhand.

### 3. Dhauliganga River

- It originates from Vasundhara Tal, perhaps the largest glacial lake in Uttarakhand.
- Dhauliganga is joined by the Rishiganga river at Raini.
- It merges with the Alaknanda at Vishnuprayag
- The Tapovan Vishnugad Hydro Power Project is being constructed on the Dhauliganga River.

### 4. Rishiganga River

- It springs from the Uttari Nanda Devi Glacier on the Nanda Devi Mountain.
- It is also fed by the Dakshini Nanda Devi Glacier.
- It flows through the Nanda Devi National Park and merges into the Dhauliganga River



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## **Tributaries of Ganga River in Plans**

### **1. Ramganga River**

- Ramganga River originates in the southern slopes of Dudhatoli Hill in Uttarakhand.
- It also flows through the dun valley of Corbett National Park.
- It meets the Ganga near Kannauj.

### **2. Gomati River**

- It originates from Gomat Taal, Pilibhit in Uttar Pradesh.
- Meets the Ganges River in Ghazipur.
- At the Sangam of Gomti and Ganga, the famous Markandey Mahadeo temple is situated.

### **3. Ghaghariya River**

- The Ghagra originates in the glaciers of Mapchachungo.
- It is a transboundary perennial river originating from the Tibetan plateau near Lake Mansarovar.
- It is a major left-bank tributary of the Ganga and joins it at Chhapra in Bihar.
- Rapti, Chhoti Gandak, Sharda, and Sarju are the major tributaries of this river.

### **4. Gandak River**

- It is formed by the union of the Kali and Trisuli rivers, which rise in the Great Himalayan Range in Nepal.
- It enters the Ganga river opposite to Patna in a place called Sonapur.

### **5. Burhi Gandak River**

- Originates from Chautarva Chaur near Bisambharpur in the district of West Champaran district of Bihar.
- It flows parallel to and east of the Gandak River in an old channel.

### **6. Kosi River**

- Also called Saptakoshi for its 7 Himalayan tributaries.
- It is an antecedent transboundary river flowing through Nepal and India.
- The highest peak in the world, Mt. Everest, and the Kanchenjunga are situated in the Kosi catchment.
- It is also termed "The Sorrow of Bihar".

### **7. Yamuna River System**

- It originates from the Yamunotri Glacier on the southwestern slopes of Bandarpooch Peak in the Mussoorie range of the lower Himalayas.
- Flows through the states of Uttarakhand, Himachal Pradesh, and Haryana. It then enters Delhi and merges with the Ganga near Prayagraj.
- It is the largest tributary of the Ganga in the northern plains.
- It creates the highly fertile alluvial Yamuna-Ganges Doab region between itself and the Ganges in the Indo-Gangetic plain.
- Major Tributaries are Chambal, Banas, Kali Singh, Ken, Betwa and Sindh rivers.

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## Brahmaputra River System

- Originating from the Chemyungdung glacier in Tibet, China.
- It flows as the Yarlung Tsangpo River across southern Tibet to break through the Himalayas in great gorges and into Arunachal Pradesh, where it is known as Dihang.
- The first major tributary is the Raga Tsangpo, meeting the Tsangpo near Lhatse Dzong.
- West of the town of Sadiya, the Dihang turns to the southwest and is joined by two mountain streams, the Lohit and the Dibang, and below the confluence, the river is known as the Brahmaputra.
- It flows through Bangladesh as the Jamuna, where it merges with the Ganga (Padma) to form a vast delta, the Sunderbans.
- The biggest and the smallest riverine islands in the world, Majuli and Umananda, respectively, are situated in the river in the state of Assam.



# Brahmaputra River System



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## **Left Bank Tributaries**

### **1. Dhansiri River**

- It originates from the Naga Hills in Nagaland.

### **2. Lohit River**

- The River Lohit originates in eastern Tibet.
- The river flows through the Mishmi hills to meet the Siang at the head of the Brahmaputra valley.
- The Lohit Valley is densely forested and features a mix of alpine and subtropical vegetation.

### **3. Dibang River**

- Originates close to the Tibetan border at an altitude of more than 5000 m.
- The Mishmi hills are found along the upper course of the Dibang River.

## **Right Bank Tributaries**

### **1. Subansiri River**

- Also called the Gold River, as it is famous for its gold dust.
- Flows through Arunachal Pradesh and is ideal for kayaking.

### **2. Kameng River**

- Kameng River in the eastern Himalayan mountains originates in the Tawang district of Arunachal Pradesh.
- The Pakhui Wildlife Sanctuary and the Kaziranga National Park are located near the Kameng River.

### **3. Manas River**

- Manas River is a transboundary river in the Himalayan foothills between southern Bhutan and India.
- It flows through the Royal Manas National Park in Bhutan and its