

# Topographical Description of the Indus River and its Tributaries

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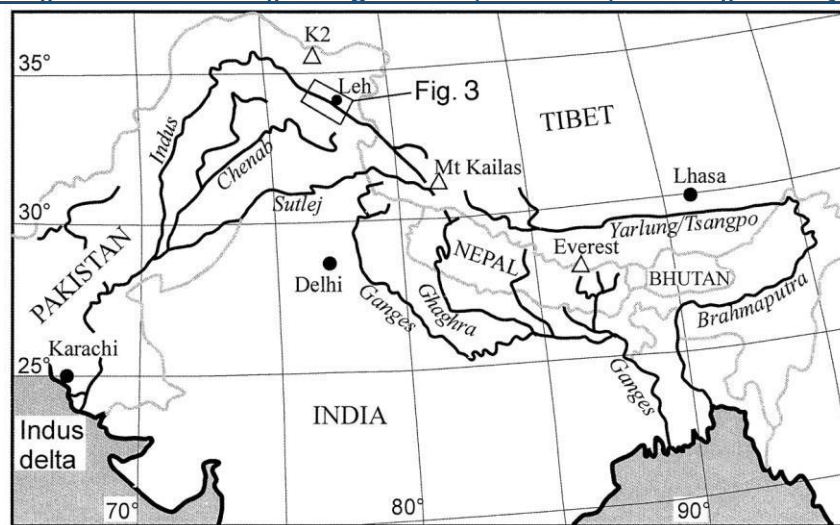
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**Abstract:** *The Indus River system is one of the largest rivers on the Asian continent, but unlike the Ganges-Brahmaputra system, the drainage of the Indus is dominated by the western Tibetan Plateau, Karakoram and tectonic units of the Indus Suture Zone, rather than the High Himalaya. The location of the river system relative to the Indus Suture Zone explains the deep exhumation north of that line in the Karakoram, compared with the modest erosion seen further east in Tibet. The modern Indus cuts Paleogene fluvial sedimentary rocks of the Indus Group located along the Indus Suture Zone in Ladakh, northern India. After the final marine incursion within the Indus Group in the early Eocene palaeo-current indicators changed from a north-south flow to an axial, westward pattern, synchronous with a marked change in sediment provenance involving erosion of South Tibet. The Indus probably was initiated by early Tibetan uplift following the India-Asia collision. The river has remained stationary in the suture since Early Eocene time, cutting down through its earlier deposits as they were deformed by northward folding and thrusting associated with the Zaskar backthrust at c. 20 Ma. The Indus appears to have been located close to its present position within the foreland basin since at least Mid-Miocene time, and to have migrated only c. 100 km east since Early Eocene time. In the Arabian Sea Paleogene fan sedimentation was significant since at least Mid-Eocene time (c. 45 Ma). Sediment flux to the mid fan and shelf increased during Mid-Miocene time (after 16 Ma) and can be correlated with uplift of the Murray Ridge preventing sediment flow into the Gulf of Oman, tectonic uplift and erosion in the Karakoram and western Lhasa Block, and an enhanced monsoon triggered by that same uplift. Sedimentation rates fell during Late Miocene to Recent time. The Indus represents 18% of the total Neogene sediment in the basins that surround Asia, much more than all the basins of Indochina and East Asia combined. Unlike the rivers of East Asia, which have strongly interacted as a result of eastward propagating deformation in that area, the Indus has remained uninterrupted and represents the oldest known river in the Himalayan region.*

**Key Words:** Civilization, trans-border rivers, perennial river, khyber pass, tributaries, Tibet, Pakistan, Vedas, Delta, Basin, Hydrology, Lake Mapam, Arabian sea, Mount Kailash, Drainage Area.

## **Objectives:**

- To document the Indus river and its tributaries
- To assess the topographical features of rivers
- To analyse the significance of rivers in relation to civilization
- To provide information for further research



Courtesy: Lyell Collection

**A. Introduction:** One of the world's largest river basins is the Indus River System, a Himalayan river system. Sindhu is another name for the Indus River. As a result, the Sindhu River System is a component of one of the world's and the Indian subcontinent's most fertile regions. There were several river systems on the Indian subcontinent long before there were any civilizations, the Indus River System is one such system of rivers. Paleolithic sites have been discovered in Potohar, with the stone tools of the Soan Culture. In ancient Gandhara, evidence of cave dwellers dated 15,000 years ago has been discovered at Mardan. The major cities of the Indus Valley Civilization (IVC), such as Harappa and Mohenjo Daro, date back to around 3300 BC, and represent some of the largest human habitations of the ancient world. The IVC was extended from Balochistan to Gujarat, with an upward reach to the Punjab from east of River Jhelum to Rupar on the upper Sutlej. The coastal settlements extended from Sutkagen Dor at the Iranian border to Lothal in Gujarat. There is an Indus site on the Oxus river at Shortughai in northern Afghanistan, and the Indus site Alamgirpur at the Hindon river is located only 28 km from Delhi (S.P. Gupta 1995:183). Till date, over 1,052 cities and settlements have been found, mainly in the general region of the Ghaggar-Hakra River and its tributaries. Among the settlements were the major urban centers of Harappa and Mohenjo-daro, as well as Lothal, Dholavira, Ganeriwala, and Rakhigarhi. Only 90 to 96 of the over 800 known Indus Valley sites have been discovered on the Indus and its tributaries. The Sutlej, a tributary of the Indus, in Harappan times flowed into the Ghaggar-Hakra River, in the watershed of which were more Harappan sites than along the Indus (S.P. Gupta 1995: 183). Settlements of Gandhara grave culture of the early Indo-Aryans flourished in Gandhara from 1700 to 600 BCE, when Mohenjo Daro and Harappa had already been abandoned. The name Indus is a Latinization of Hindu, in turn the Iranian variant of Sindhu, the name of the Indus in the Rigveda. Sanskrit sindhu generically means "river, stream", probably from a root 'sidh' "togo, move"; sindhu is attested 176 times in the Rigveda, 95 times in the plural, more often used in the generic meaning. Already in the Rigveda, notably in the later hymns, the meaning of the word is narrowed to refer to the Indus river in particular, for example in the list of rivers of the 'Nadistuti Sukta.' This resulted in the anomaly of a river with masculine gender: all other Rigvedic rivers are female, not just grammatically, being imagined as goddesses and compared to cows and mares yielding milk and butter.

**B. Book Review:** R.N.Dandekar's book entitled, "Harappan Bibliography" published in 1987 containing 513 pages offers insights into the books on the Indus valley. This Bibliography constitutes a fairly comprehensive, critical, and up-to-date record of the most significant writings relating to the Harappan (Indus valley) civilization. It contains nearly 3500 entries which have been conveniently arranged subject wise in 9 sections. Brief indication of the contents of a large number of books and books and articles recorded herein (and, in some cases, also of reviews) has been given. It may be recalled that in each of the first three volumes on Vedic Bibliography, the author has included a chapter on Indus Valley Civilization.



**D. Course of the river:** The river rises in the southwestern Tibet autonomous Region of China near Lake Mapam at an elevation of about 18,000 feet (5,500 metres). For about 200 miles (320 km) it flows northwest, crossing the southeastern boundary of the disputed Kashmir region at about 15,000 feet (4,600 metres). A short way beyond Leh, in the Indian-administered union territory of Ladakh, it is joined on its left by its first major tributary, the Zaskar River. Continuing for 150 miles (240 km) in the same direction into the Pakistani-administered areas of the Kashmir region, the Indus is joined by its notable tributary the Shyok River on the right bank. Below its confluence with the Shyok, as far as the Kohistan region of Pakistan's Khyber Pakhtunkhwa province, it is fed by mighty glaciers on the slopes of the Karakoram Range, the Nanga Parbat massif, and the Kohistan highlands. The Shyok, Shigar, Gilgit, and other streams carry glacial meltwater into the Indus. The Shigar River joins the Indus on the right bank near Skardu in Baltistan. Farther downstream the Gilgit River is another right-bank tributary, joining it at Bunji. A short distance downstream the Astor River, running off the eastern slope of Nanga Parbat, joins as a left-bank tributary. The Indus then flows west and turns south and southwest to enter Khyber Pakhtunkhwa province, in the process skirting around the northern and western sides of the Nanga Parbat massif (26,660 feet [8,126 metres]) in gorges that reach depths of 15,000 to 17,000 feet (4,600 to 5,200 metres) and widths of 12 to 16 miles (19 to 26 km). Trails cling grimly to precipitous slopes overlooking the river from elevations of 4,000 to 5,000 feet (1,200 to 1,500 metres). After emerging from this highland region, the Indus flows as a rapid mountain stream between the Swat River and Hazara areas in Khyber Pakhtunkhwa province until it reaches the reservoir of Tarbela Dam. The Kābul River joins the Indus just above Attock, where the Indus flows at an elevation of 2,000 feet (600 metres) and is crossed by the first bridge carrying rail and road. Finally, it cuts across the Salt Range near Kalabagh to enter the Punjab Plain. The Indus receives its most-notable tributaries from the eastern Punjab Plain. These five rivers—the Jhelum, Chenab, Ravi, Beas, and Sutlej—give the name Punjab ("Five Rivers") to the region divided between Pakistan and India. (Britannica, 2023). The Indus flows in India only through the Leh district in Jammu and Kashmir. The Jhelum, an important tributary of the Indus, rises from a spring at Verinag situated at the foot of the

Pir Panjal in the south-eastern part of the valley of Kashmir. It flows through Srinagar and the Wular Lake before entering Pakistan through a deep narrow gorge. It joins the Chenab near Jhang in Pakistan. The Chenab is the largest tributary of the Indus. It is formed by two streams, the Chandra and the Bhaga, which join at Tandi near Keylong in Himachal Pradesh. Hence, it is also known as Chandrabhaga. The river flows for 1,180 km before entering into Pakistan. The Ravi is another important tributary of the Indus. It rises west of the Rohtang pass in the Kullu hills of Himachal Pradesh and flows through the Chamba valley of the state. Before entering Pakistan and joining the Chenab near Sarai Sidhu, it drains the area lying between the south-eastern part of the Pir Panjal and the Dhauladhar ranges. The Beas is another important tributary of the Indus, originating from the Beas Kund near the Rohtang Pass at an elevation of 4,000 m above the mean sea level. The river flows through the Kullu valley and forms gorges at Kati and Lari in the Dhauladhar range. It enters the Punjab plains where it meets the Satluj near Harike.

The Indus Valley is located on the fertile floodplains along the river. This region was home to the ancient Indus Valley Civilization, which was one of the oldest known civilizations. Archaeologists have uncovered evidence of religious practices starting in about 5500 BCE, and farming began by around 4000 BCE. Towns and cities grew up in the area by about 2500 BCE, and the civilization was at its peak between 2500 and 2000 BCE, coinciding with the civilizations of the Babylonians and Egyptians. When at its peak, the Indus Valley Civilization boasted houses with wells and bathrooms, underground drainage systems, a fully developed writing system, impressive architecture, and a well-planned urban center. Two major cities, Harappa and Mohenjo-Daro, have been excavated and explored. Remains include elegant jewelry, weights, and other items. Many items have writing on them, but to date, the writing has not been translated. The Indus Valley Civilization began to decline around 1800 BCE. Trade ceased, and some cities were abandoned. Reasons for this decline are unclear, but some theories include flood or drought. Around 1500 BCE, invasions by the Aryans began to erode what was left of the Indus Valley Civilization. The Aryan people settled in their place, and their language and culture have helped to shape the language and culture of today's India and Pakistan. Hindu religious practices may also have their roots in Aryan beliefs. Snow melt in Pakistan's northern mountains begins to add to the Indus River volume each June. As sunlight warms Central Asian land surfaces and melts the snow, it also forces warm air up into the atmosphere, drawing in cooler, moister air from the Indian Ocean. The Himalayas block the transport of air masses, pushing them upwards, boosting the convection process, and amplifying the monsoon rains.

The Kailash range glaciers at Mansarovar Lake are the source of the Indus, the principal river of this river system. The Indus River has a length of around 2880 km, of which only 710 km are in the Indian state of Jammu & Kashmir; the remaining distance is divided between Pakistan and Tibet. It comes from a glacier in Tibet's Bokhar Chu region, close to Mansarovar Lake. The Himalayan Mountains, Hindu Kush, and Karakoram Range make up the majority of the landscape; the rest is made up of Pakistan's semi arid plains. Indus, Jhelum, Chenab, and Ravi rivers pass through J&K. The Yamuna and the rivers Chenab, Ravi, Beas, and Satluj flow through Himachal Pradesh. Ghaggar flows across Punjab with the rivers Ravi, Beas, Satluj, and Chenab and Indus river. The other Himalayan tributaries of the Indus include Gilgit, Garstang, Dras, Shiger, and Hunza. After passing through Gilgit, the river makes a southerly bend before turning west and entering Khyber Pakhtunkhwa, Pakistan's northwest frontier province. The collected waters of the five eastern tributaries—the Jhelum, the Chenab, the Ravi, the Beas, and the Satluj—arrive at the Indus from Panjnad (Panchnad) just before Mithankot. Its principal left-bank tributaries include the Zaskar River, Suru River, Soan River, Jhelum River, Chenab River, Ravi River, Beas River, Satluj River, and Panjnad River. Its principal right-bank tributaries include the Shyok River, Gilgit River, Hunza River, Swat River, Kunhar River, Kurram River, Gomal River, and Kabul River.

**E. Tributaries:** In India, the Indus exclusively runs through the Leh area of Jammu & Kashmir. A spring at Verinag, which is located at the base of the Pir Panjal in the southern portion of the Kashmir valley, gives rise to the Jhelum, a significant Indus tributary. It passes past Srinagar and the Wular Lake before entering Pakistan in a small, deep valley. Near Pakistan's Jhang, it merges into the Chenab. The



Chenab is the Indus River's largest tributary. It is created by two streams, the Chandra and the Bhaga, which converge in Himachal Pradesh near Keylong at Tandi. This leads to another name for it: Chandrabhaga. The river travels 1,180 kilometers until it enters Pakistan. Another significant Indus tributary is the Ravi. It begins west of the Rohtang Pass in Himachal Pradesh's Kullu Hills and runs through the Chamba Valley. It drains the region located between the southern Pir Panjal range and the Dhauladhar ranges before entering Pakistan and meets the Chenab near Sarai Sidhu. Another significant Indus tributary, the Beas, rises from the Beas Kund, which is about 4,000 meters above mean sea level and is close to the Rohtang Pass. The river creates canyons at Kati and Largi in the Dhauladhar Mountain as it runs through the Kullu valley. When it reaches the Punjab plains, it merges with the Satluj close to Harike. The Indus River System is one of the longest river systems in the subcontinent, measuring a total of 2900 km. The Indus River System's overall drainage area is approximately 11 lakh 65 thousand square kilometers. However, Pakistan now includes the majority of this region. Below is an explanation of the rivers that make up the Indus river system, along with their points of origin- Wakha Shingo Sutlej Astor Gilgit Ghizer Hunza Gumal Zhob Zaskar Kunar Gar Shyok Shigar Chenab Jhelum moring Suru Chu Swaan stream

**1. Astor river:** A short distance downstream the Astor river, running off the eastern slope of Nanga Parbat, joins as a left-bank tributary. The Indus then flows west and turns south and southwest to enter Khyber Pakhtunkhwa province, in the process skirting around the northern and western sides of the Nanga Parbat. Astor River, in Pakistan's Gilgit-Baltistan administrative region, is a tributary of the Indus river and one of the rivers draining the Deosai Plateau, running through Astore Valley. The river originates from western slopes of Burzil Pass. Astor river joins Gilgit River:

**2. Beas River:** The Beas River (Sanskrit: Vipāśā) is a river in north India and the river rises in the Himalayas in central Himachal Pradesh, and flows for some 470 kilometers to the Sutlej river in the state of Punjab. Its total length is 470 kilometers and its drainage basin is 20,303 square kilometers large. An important river that contributes to the Indus river system is the Beas. The Beas Kund in the Rohtang La pass in the Indian state of Himachal Pradesh is where the Beas River begins to flow. The Beas travels about 470 kilometers from its source in Himachal Pradesh to Punjab, where it merges with the Satluj River. As a result, the Beas River flows through the Indian states of Punjab and Himachal Pradesh.

**3. Chenab River:** The river Chenab, also known as Asskini Chandrabhaga, is another crucial river in the Indus river system. In the West Himalayan region of the Himachal Pradesh state, the Chenab River joins the rivers Chandra and Bhaga. The Baralacha La Pass serves as the streams' primary water source. Before joining the Indus River, the Chenab River passes through Himachal Pradesh and Jammu and Kashmir. It is the Indus River System's biggest tributary. The Chenab River is a major river that flows in India and Pakistan, and is one of the 5 major rivers of the Punjab region. It is formed by the union of two headwaters, Chandra and Bhaga, which rise in the upper Himalayas in the Lahaul region of Himachal Pradesh, India. The Chenab flows through the Jammu region of Jammu and Kashmir, India into the plains of Punjab, Pakistan, before ultimately flowing into the Indus River.

**4. Gar river:** is a headwater of the Indus River in the Ngari Prefecture, Tibet, China. It merges with other headwater, Sênggê Zangbo, near the village of Tashigang to form the Indus river. The combined river flows in the same valley and in the same direction as Gar Tsangpo. Thus by physical geography, Gar Tsangpo is the "Indus River". The Tibetans however regard Sênggê Zangbo as the main Indus River, and treat Gar Tsangpo as a tributary. Gartok, the former administrative headquarters of Ngari is in the Gar Valley. The present headquarters, under PRC administration, is at Shiquanhe in the Sênggê Zangbo valley, close to the point of confluence of the two rivers. The sources of Gartang are on the southwestern slopes of the Kailas Range (Gangdise Shan). From there, the river flows northwest in the Gar Valley, the tectonic valley between the Kailas Range and the Ladakh Range. The slope of the valley is extremely gentle, only about 2 metres per kilometre. After a distance of 130 kilometres, the Gartang joins Sengge Zangbo (Shiquan He), which originates on the northern slopes of Mount Kailash and flows in a wide arc towards the Gar Valley. The point of confluence is near the town of Tashigang (Zhaxigang). After the confluence, the

combined river, regarded as the Indus River, flows in the same direction as Gartang. For this reason, western explorers have traditionally regarded Garstang as the main source of the Indus river. However, the Tibetans regard Sengge Zangbo as the main Indus River and the Gartang as its tributary.

**5. Gilgit River:** is the Gilgit-Baltistan area of the Pakistani-administered portion of the Kashmir region of the northwestern Indian subcontinent. The river rises from a high alpine glacier in the area where the Hindu Kush, Karakoram Range, and western (Punjab) Himalayas meet. Descending through a deep valley, it flows north and then east and southeast to the town of Gilgit. Just southeast of town the river is joined by the Hunza River, and the Gilgit then flows a short distance more before joining the Indus River just north of Bunji. The Gilgit's total course is some 240 km. The Gilgit river flows through the Gupis-Yasin, Ghizer and Gilgit districts of Gilgit-Baltistan. The Gilgit river starts from Shandur Lake and joins the Indus River at nearby towns of Juglot and Bunji, where also the three mountain ranges of Hindu Kush, Himalaya and Karakoram ranges are believed to meet. The upper sections of the Gilgit river are called Gupis and Ghizer river.

**6. Gomal/Gumal River:** river that rises in eastern Afghanistan near Sarwāndī on the Khumbur Khūlē Range and enters western Pakistan near Domandi, being joined there by the Kundar River. Gomal River's headwaters are located in the northern part of Paktika Province, southeast of the city of Ghazni. The springs which form the headwaters of the Gomal's main branch emerge above the fort at Babakarkol in Katawaz, a district in Paktika inhabited by Ghilji Pashtuns from the Kharoti and Sulaimankhel clans. The Gumal's other branch, the "Second Gomal", joins the main channel about 14 miles below its source. The Gomal flows southeast through the eastern Ghilji country before entering Khyber Pakhtunkhwa, Pakistan. Further joined by the Wāna Toi and Zhob rivers, it falls into the Indus River just south of Dera Ismāīl Khān after a course of 240 km. Dams under construction in the 1980s at Miān Nūr and Khajūri Kach, below the confluence of the Gumal and Zhob rivers, formed part of a multipurpose scheme to include flood control, irrigation of about 164,000 acres (66,400 hectares) of cropland in the locality of Dera Ismāīl Khān, and the production of hydroelectric power. Within Pakistan, the Gomal River forms the boundary between South Waziristan and Balochistan. After approximately 110 miles from its source, it merges with the Zhob River, its major tributary, near Khajuri Kach.

**7. Hunza river:** Hunza river is the principal river of Hunza in Gilgit–Baltistan, Pakistan. It is formed by the confluence of the Chapursan and Khunjerab nalas (gorges) which are fed by glaciers. It is joined by the Gilgit River and the Naltar River, before it flows into the Indus River. The river cuts through the Karakoram range, flowing from north to south. The Karakoram National Highway (NH-35) runs along the Hunza River valley, switching to the Khunjerab River valley at the point of confluence, eventually reaching the Khunjerab Pass at the border with China Xinjiang. The Attabad landslide disaster in January 2010 completely blocked the Hunza Valley. A new lake — now called the Attabad Lake or Gojal Lake — which extends 30 kilometers and rose to a depth of 400 feet, was formed as the Hunza River backed-up. The landslide completely covered sections of the Karakoram Highway. Buddhism, and to a lesser extent, Bön, were the main religions in the area. The region has several surviving Buddhist archaeological sites, such as the Sacred Rock of Hunza. Nearby are former sites of Buddhist shelters. Hunza valley was central as a trading route from Central Asia to the subcontinent. It also provided protection to Buddhist missionaries and monks visiting the subcontinent, and the region played a significant role in the transmission of Buddhism throughout Asia.

**8. Jhelum River:** also referred to as Vitusta in the Rigveda, Hydaspes in Greek, and Veth in Kashmir, is the next significant river in the Indus river system. Before it merges into the Chenab River in Pakistan, it travels a distance of about 720 km from its glacier of origin, the 'Chashma Verinag.' The Jhelum River reaches Pakistan after passing through the Indian state of Jammu & Kashmir. Jhelum River, river of northwestern India and northern and eastern Pakistan. It constitutes the westernmost of the five rivers of the Punjab region that merge with the Indus River in eastern Pakistan. The Jhelum rises from a deep spring at Vernag, in western Jammu and Kashmir union territory, in the Indian-administered portion of the Kashmir region. The river meanders northwestward from the northern slope of the Pir Panjal Range through the



Vale of Kashmir to Wular Lake at Srinagar, which controls its flow. Emerging from the lake, the Jhelum flows westward and crosses the Pir Panjal in a gorge some 7,000 feet (2,100 metres) deep with almost perpendicular sides. At Muzaffarabad, the administrative centre of Azad Kashmir in the Pakistani-administered sector of Kashmir, the Jhelum receives the Kishanganga River and then bends southward, forming part of the border between Azad Kashmir to the east and Khyber Pakhtunkhwa province, Pakistan, to the west. The river then flows southward into Punjab province. Near Mangla the Jhelum breaks through the Outer Himalayas into broad alluvial plains. At the city of Jhelum the river turns southwestward along the Salt Range to Khushab, where it again bends south to join the Chenab River near Trimmu. The total length of the Jhelum is about 450 miles (725 km).

**9. Kabul River:** The Kabul River is a 700-kilometre-long (430 mi) river that emerges in the Sanglakh Range of the Hindu Kush mountains in the northeastern part of Maidan Wardak Province, Afghanistan. It is separated from the watershed of the Helmand River by the Unai Pass. The Kabul River empties into the Indus River near Attock, Pakistan. It is the main river in eastern Afghanistan and the Khyber Pakhtunkhwa province of Pakistan. The Kabul River, which measures 700 kilometres or 430 miles long, passes through the cities of Kabul and Jalalabad in Afghanistan. Its large drainage basin covers the eastern provinces of Nangarhār, Kunar, Laḡmān, Lōgar, Kabul, Kāpīsā, Parvān, Panjshēr, and Bāmiān before it flows into Khyber Pakhtunkhwa in Pakistan some 25 kilometres (16 mi) north of the Durand Line border crossing at Torkham. In Khyber Pakhtunkhwa, the river passes through the cities of Peshawar, Charsadda, and Nowshera. A majority of the Kabul River's water originates from the snow and glaciers of Chitral District, out of which it flows into Afghanistan. In its upper reaches it is known as the Sarchashma. The major tributaries of the Kabul River are the Logar, Panjshir, Alingar, Surkhab, Kunar, Bara, and Swat rivers.

**10. Kunar river:** The Kūnar River also known in its upper reaches as the Mastuj/Chitral/Kama River is about 480 kilometres (300 mi) long, located in eastern Afghanistan (Nuristan, Kunar, Nangarhar) and northern Pakistan (Khyber Pakhtunkhwa). It emerges just south of the Broghil Pass, in the upper part of Chitral District of Khyber Pakhtunkhwa near the Afghan border. The river system is fed by melting glaciers and snow of the Hindu Kush mountains. The Kunar River is a tributary of the Kabul River, which is in turn a tributary of the Indus River. The river rises in the far north glaciated Hindu Kush mountains of Chitral, Khyber Pakhtunkhwa, Pakistan. Downstream as far as the town of Mastuj it is known as the "Mastuj River" from there to its confluence with the Lotkoh River just north of the important regional centre of Chitral. It is then called the "Chitral River", before flowing south into the upper Kunar Valley of Afghanistan. At the confluence in Asadabad, historically Chaga Sarai, it meets with Pech River and finally empties into the Kabul River just to the east of the city of Jalalabad in Afghanistan. The combined rivers then flow eastwards into Pakistan again, roughly following the Grand Trunk Road through the Khyber Pass, and joining the Indus River at the city of Attock.

**11. Ravi river:** The river Ravi, also referred to as Iravati or "The River of Lahore," is the next tributary of the Indus river system. The Ravi begins its journey near Rohtang Pass in the Himachal Pradesh district of Chamba, and after about 720 kilometres, it joins the Chenab River in Pakistan. Himachal Pradesh and Jammu and Kashmir are two Indian states that are traversed by the Ravi. It passes through Shahdara Bagh, which contains the tombs of Jahangir and Noor Jahan, between the Pir Panjal and Dhauladhar Ranges. The Ravi River, a transboundary river of India and Pakistan, is an integral part of the Indus River Basin and forms the headwaters of the Indus basin. The waters of the Ravi River drain into the Arabian Sea (Indian Ocean) through the Indus River in Pakistan. The river rises in the Bara Bhangal, Kangra District in Himachal Pradesh, India. The river drains a total catchment area of 14,442 square kilometres (5,576 sq mi) in India after flowing for a length of 720 kilometres (450 mi). Flowing westward, it is hemmed by the Pir Panjal and Dhauladhar ranges, forming a triangular zone.

**12. Satluj River:** The Satluj River is one of the Indus River's most significant tributaries. Of all the Indus river system's tributaries, it is the longest river. The Rakkas Lake, also known as Lake Rakshastal, is where Satluj first appeared. The Satluj River originates in Pakistan and flows through the states of Himachal Pradesh and Punjab before entering India via the Shipki La Pass and joining the Chenab River. The Satluj River has a total length of 1450 km, of which 1050 km are located in Indian Territory. The hydrology of the Sutlej is controlled by spring and summer snowmelt in the Himalayas and by the South Asian monsoon. The onset of the summer monsoon brings heavy rains that often produce extensive flooding downstream. The maximum recorded flood discharge occurred in 1955, when the river flowed at nearly 600,000 cubic feet (17,000 cubic metres) per second. The winter flow is substantially lower, since there is little precipitation or meltwater from the Himalayan glaciers. The 900-mile- (1,400-km-) long Sutlej is used extensively for irrigation. Its water was a source of dispute between India and Pakistan until 1960, when the countries concluded the Indus Waters Treaty, which allocated the water of the Sutlej to India in exchange for exclusive Pakistani rights to the Indus and its western tributaries. Major irrigation works include the Bhakra-Nangal Project, the Sirhind Canal, and the Sutlej Valley Project, the latter in both India and Pakistan.

**13. Shigar river:** is located in the mountainous Baltistan region of northern Pakistan. The Shigar River is formed from the melted water of the Baltoro Glacier and Biafo Glacier. It flows through the Shigar Valley. The river is tributary to the Indus River and meets the Indus in Skardu Valley. The Shigar River joins the Indus on the right bank near Skardu in Baltistan. Farther downstream the Gilgit River is another right-bank tributary, joining it at Bunji. A short distance downstream the Astor River, running off the eastern slope of Nanga Parbat, joins as a left-bank. It rises from the glacier at the base of the Nunkun peak on the north-facing slopes of the main Himalayan mountain range, which edges the Kashmir Valley. Subsequently this river drains northwards and combines with the Indus River at Marol, upstream of Skardu Valley, Pakistan.

**14. Shingo river:** The Shingo River is a tributary of the Indus River, and flows through Gilgit-Baltistan and Kargil regions. In Kashmiri terminology, the Shingo river joins the Dras River, which in turn joins the Suru River. In the Balti terminology, the Shingo River runs all the way to the Indus River, and the other rivers are its tributaries. The river originates in the Chhota Deosai plains in the Astore District, north of Minimarg, and flows east. The Shigar River, which originates in the Bara Deosai Plateau to the north, also flows east and joins the Shingo River before it enters the Indian-administered Kargil district near Dalunang. In the Kargil district, at the Kaksar village, Shingo is joined by the Dras River, which originates near Zojila Pass and flows northeast. The flow of Shingo is then doubled. The two combined rivers join the Suru River flowing north at Kharul, 7 km north of Kargil. The Suru river flows north into the Skardu District of Baltistan. (The Baltis continue to call the Suru River by the name Shingo.) The river joins the Indus from the left near Olding. The Shingo river is clearer than other rivers in Ladakh because it is formed from melting ice and flows through Chanigund.

**15. Shyok River,** is the river of the Kashmir region, in the northern part of the Indian subcontinent. It rises in the Karakoram Range in Indian-administered Jammu and Kashmir and is a notable tributary of the Indus River. The Shyok, which flows generally northwestward, is fed by meltwater from numerous glaciers on its journey through the range. At times the Chong Kumdan Glacier dams the river, causing serious floods in nearby areas. The river enters Pakistani-administered Gilgit-Baltistan, and near Khapaluit joins the Indus River. Its total length is 340 miles (550 km), and its main right-bank tributary is the Nubra. Along most of the Shyok River valley the climate is semiarid, with annual precipitation averaging less than 8 inches (200 mm) and maximum daily temperatures in summer often exceeding 86 °F (30 °C). River flow and sediment load are highest from June to September, when monsoon rains and glacial meltwater reach a maximum. Winters are cold, with minimum daily temperatures about 14 °F (−10 °C). Natural vegetation is sparse, comprising short grasses and scrub, but irrigation sustains fruit trees, wheat, barley, and potatoes along the Shyok valley.



**16. Suru river:** The Suru River is a tributary of the Indus River that flows largely through the Kargil district of Ladakh, India. The Suru Valley is coextensive with the Kargil tehsil, with the town of Kargil situated on its banks. The river enters the Kharmang District of Pakistani-administered Gilgit-Baltistan, coursing a brief length before joining the Indus near Marol. The Suru River is a 185 kilometres (115 mi) long river that originates from the Panzella glacier which lies at Pensi La pass near the Drang Drung Glacier. The Drang Drung Glacier also gives rise to the Stod River which flows down in the opposite direction from the Suru. The source of the Suru River lies 142 kilometres (88 mi) south of Kargil town, and 79 kilometres (49 mi) north from Zaskar. Srinagar, the capital of Jammu and Kashmir lies 331 kilometres (206 mi) to the west. The Suru River forms the western and northern boundary of the Zaskar Range. The river flows westwards, along with the Kargil-Zanaskar Road, from its source and forms the Suru valley, which is towered by the massif of Nun Kun mountain. It drains the Nun Kun mountain massif of the Zaskar Range in the Suru valley, and is joined by a tributary "Shafat Nala" at the pastures of Gulmatango. This stream originates from the Shafat Glacier. The Suru River then flows northwards through a deep, narrow gorge to Kargil town, where it is fed by the Botkul River which originates from the glacier of the same name. The Dras River, fed by the Shingo River, joins the Suru River at Hardas (also called Kharal), 7 kilometres (4.3 mi) north of Kargil town. The Suru River then enters the Pakistani Administered Kashmir 5 kilometres (3.1 mi) ahead from the point of merger of Dras and Suru rivers through Post 43 and Post 44 of India and Pakistan respectively and merges with the Indus River near Marol.

**17. Wakhan River:** Wakhan River known locally as Ab-i-Wakhan or Abe Vâxân, Вахондарё and Vaxondaryo) is the name of the Sarhadd branch of the Panj River along its upper length in the Wakhan District of Badakhshan Province of Afghanistan. The river arises in the Hindu Kush. It is formed by the confluence of the Wakhjir River and the Bozai River near Kashch Goz and Bozai Gumbaz, some 40 km west of the Wakhjir Pass. Shortly thereafter, the Little Pamir comes to an end, and the conjoined river contracts into a narrow, deep, rapid river, delimited by cliffs and steep hills. From here the banks have grown birch and juniper trees. 40 km west at Sarhad-e Broghil the river flows in a dramatic basin 3 km wide. Little if any vegetation but dwarf willow grows in the area. At Sarhadd the river contracts into a wider valley, which is more populated. The river emerges near the village of Qila-e Panj, where it is joined by the Pamir River. From that point the river is always locally spoken of as the Panj River.

**18. Zaskar river:** The Zaskar River is the first major tributary of the Indus River, equal or greater in volume than the main river, which flows entirely within Ladakh, India. It originates northeast of the Great Himalayan range and drains both the Himalayas and the Zaskar Range within the region of Zaskar. It flows northeast to join the Indus River near Nimo. In its upper reaches, the Zaskar has two main branches. First of these, the Doda, has its source near the Pensi-la 4,400 m (14,400 ft) mountain-pass and flows south-eastwards along the main Zaskar valley leading towards Padum, the capital of Zaskar. The second branch is formed by two main tributaries known as Kargyag river, with its source near the Shingo La 5,091 m (16,703 ft), and Tsarap river, with its source near the Baralacha-La. These two rivers unite below the village of Purne to form the Lungnak river (also known as the Lingti or Tsarap). The Lungnak river then flows north-westwards along a narrow gorge towards Zaskar's central valley (known locally as gzhung khor), where it unites with the Doda river to form the main Zaskar river. This river then takes a north-eastern course through the dramatic Zaskar Gorge until it joins the Indus near "Nimmu" in Ladakh.

**19. Zhob river:** Zhob River is located in Balochistan and Khyber Pakhtunkhwa, Pakistan. The total length of the Zhob River is 410 km, and it flows on a generally northeasterly course. In the Pashto language, Zhob means "oozing water". Linguistically the name is Irano-Aryan in origin and compares etymologically to those of the Little Zab and Great Zab rivers in the Tigris Basin. The Zhob River originates in the Kan Mehtarzai range (Tsari Mehtarzai Pass) near Muslim Bagh. It passes about 4 km west of the city of Zhob. As a tributary of the Gomul River, which it joins near Khajuri Kach, it forms a part of the Indus River Basin. The Zhob River is used to irrigate the land in northern Balochistan along with the Gomul River, making the fertile soil available for agriculture. Although in the 1960s and 1970s degradation

of the channel of the Zhob decreased the irrigable acreage. Along the Zhob River there are located the ancient sites of Rana Ghundai, Periano Ghundai, Rehman Dheri, along with the nearby site of Gumla, which go before 3000 BC.

**F. The Indus Basin:** extends over an area of 11,65,500 sq. km and lies in Tibet, India, Pakistan and Afghanistan. The drainage area lying in India is 321289 sq. km. which is nearly 9.8% of the total geographical area of the country. It is bounded on the north by the Karakoram and Haramosh ranges, on the east by the Himalayas, on the west by the Sulaiman and Kirthar ranges and on the south by the Arabian sea. The basin lies in the States of Jammu and Kashmir, Himachal Pradesh, Punjab, Rajasthan, Haryana and the Union Territory of Chandigarh. The State-wise distribution of the drainage area is: The upper part of the basin lying in Jammu and Kashmir and Himachal Pradesh is mostly mountain ranges and narrow valleys. In Punjab, Haryana and Rajasthan the basin consists of vast plains which are the fertile granary of the country. The principal soil types found in the basin are submontane, brown hill and alluvial soils. The culturable area of the basin is about 9.6 M. ha which is 4.9% of the total culturable area of the country. The lower basin of the Indus forms a natural boundary between the Iranian Plateau and the Indian subcontinent; this region embraces all or parts of the Pakistani provinces Balochistan, Khyber Pakhtunkhwa, Punjab and Sindh and the countries Afghanistan and India. The first West Eurasian empire to annex the Indus Valley was the Persian Empire, during the reign of Darius the Great. During his reign, the Greek explorer Scylax of Caryanda was commissioned to explore the course of the Indus. It was crossed by the invading armies of Alexander, but after his Macedonians conquered the west bank—joining it to the Hellenic world, they elected to retreat along the southern course of the river, ending Alexander's Asian campaign. Alexander's admiral Nearchus set out from the Indus Delta to explore the Persian Gulf, until reaching the Tigris River. The Indus Valley was later dominated by the Mauryan and Kushan Empires, Indo-Greek Kingdoms, Indo-Scythians and Hephthalites. Over several centuries Muslim armies of Muhammad ibn al-Qasim, Mahmud of Ghazni, Muhammad of Ghor, Timur and Babur crossed the river to invade Sindh and Punjab, providing a gateway to the Indian subcontinent. The Indus is the 12th largest river in the world and has its source at Lake Ngangla Rinco on the Tibetan plateau. The river basin contains seven of the world's highest peaks in addition to Everest, including K2 (8,600 m) and Nanga Parbat (8,100 m). The basin stretches from the Himalayan mountains to the north to the dry, alluvial plains of Sindh province in Pakistan and flows out into the Arabian Sea. The upper Indus river basin lies in a high mountain region resting in the Hindu Kush, Karakoram and Himalayan ranges. The high mountains limit the intrusion of the monsoon. Precipitation patterns in the Hindu Kush and Karakoram ranges are characterized by westerly and south-westerly flows, and most of the precipitation falls in winter and spring from the west. Outside of the polar regions, this basin contains the greatest area of perennial (multi-year) glacial ice in the world (20,000 km<sup>2</sup>).

**G. The Indus Delta:** The Indus River Delta occurs where the Indus River flows into the Arabian Sea in Pakistan. The delta covers an area of about 16,000 square miles (41,440 km<sup>2</sup>), and is approximately 130 miles across where it meets the sea. Unlike many other deltas, the Indus River Delta consists of clay and other infertile soils, and is very swampy. The delta receives between 10 and 20 inches of rainfall in a normal year. Pakistan's fifth largest city, Hyderabad, lies about 130 miles north of the mouths of the Indus. Towns are found throughout the delta, but there are no large cities on the delta south of Hyderabad. Karachi, Pakistan's largest city, lies west of the delta on the coast of the Arabian Sea. Average temperatures for the delta region in July range from 70 - 85 °F, and 50 - 70 °F in January. The Indus River Delta is an important region for migrating water birds, and is an area rich in freshwater fauna. Fish found in the delta include the Hilsa, Indus baril, Indus garua (a catfish), and the giant snakehead. The end estimated coastline of the Indus delta with the Arabian Sea (the maximum length in the direction of the coast) is approximated at 210 km (130 mi). Because the Indus river has switched its location at various points in history, it has an "active" delta region, and total delta region (all area that was once a part of the delta). The total area is estimated at 29,524 km<sup>2</sup> (11,399 sq mi), [19] 30,000 km<sup>2</sup> (12,000 sq mi) and 41,440 km<sup>2</sup> (16,000 sq mi). The active area is estimated at 4,762 km<sup>2</sup> (1,839 sq mi), [19] and 6,000 km<sup>2</sup> (2,300 sq mi). The length of the total delta along



the axis of Indus is estimated at 240 km (150 mi), whereas the current delta stretches from the Arabian Sea to just south of Thatta (~100 km or 62 mi). There are currently 17 major creeks (Including Sir Creek, Bhitario Creek and Kori Creek) and numerous minor creeks. The delta receives almost all of its water from the Indus river, which has an annual flow of approximately 180 billion cubic metres (240 billion cubic yards), and is accompanied by 400 million tonnes of silt. Since the 1940s, dams, barrages and irrigation works have been constructed on the river Indus. (In fact, the World Bank has characterized the works as the "world's largest" and the Indus Basin Irrigation System as the "largest contiguous irrigation system developed over the past 140 years" anywhere in the world. This has served to reduce the flow of water and by 1994, the annual flow of water into the delta was  $43 \times 10^9 \text{ m}^3$  ( $1.5 \times 10^{12} \text{ cu ft}$ ), and annual amount of silt discharged was estimated to be 100 million tonnes (98 million long tons). Since 1994, the water flow has decreased as Punjab has been allocated a higher share of the water. The climate of the delta is described as arid. It receives only 250–500 mm (9.8–19.7 in) of rain in a normal year. Average temperatures for the delta region range from 21 to 30 °C (70–85 °F) in July, and 10–21 °C (50–70 °F) in January.[21] During the summer, the delta experiences intense monsoonal winds from the southwest, causing parts of the delta to be covered by sea-water. When this water retreats, it leaves behind salts in the delta's soil. During the winter the winds in the delta come from the northeast.

**H. Indus Water Treaty:** In order to optimize water efficiency, a treaty was signed with Pakistan in the year 1960 - Indus Water Treaty. Under this treaty, the waters of the three eastern rivers (the Ravi, the Beas and the Satluj) would be for the exclusive use of India and waters of the three western rivers (the Indus, the Jhelum and the Chenab) for the exclusive use of Pakistan.

Salient features

1. The basin is recognized as the ideal and practical unit of water resources management as it allows the holistic understanding of upstream-downstream hydrological interactions and solution for management for all competing sectors of water demand. It is one of the largest basins of Asia.
2. In India, the Indus basin spreads over the states of Jammu & Kashmir, Himachal Pradesh, Punjab and a part of Rajasthan, Haryana, and Union Territory of Chandigarh, having an area of 3,21,289 sq. km, which is nearly 9.8% of the total geographical area of the country.
3. The Indus basin is bounded by the Himalayan on the east, the Karakoram and Haramosh ranges on the north, the Sulaiman and Kirthar ranges on the west, and the Arabian Sea on the south. The culturable area of the basin is 9.6 Mha (Million Hectare Area), which is about 4.9 percent of the total culturable area of the country.
4. Upper part of the basin lying in Jammu and Kashmir and Himachal Pradesh mostly consists of mountain ranges and narrow valleys. In Punjab, Haryana and Rajasthan the basin consists of vast plains, which are the fertile granary of the country.
5. The major part of the basin received an average annual rainfall of over 620.96 mm. The major part of the basin is covered with agricultural land accounting to 35.8 percent of the total area. 1.85 percent of the basin is covered by water bodies. The snowmelt makes a significant contribution to this huge water flow.
6. The hydroelectric potential of the Indus basin has been assessed at 33832 MW.
7. The water availability from the Indus basin has transformed the deserts into fertile agricultural fields, which has facilitated the influx of human settlers into the uninhabited land. Thus, the Indus river is very useful for our nation, and that is why it was the cradle of the great Indus Valley civilization of the ancient world.

Irrigation from Indus waters has provided the basis for successful agriculture since time immemorial. Modern irrigation engineering work commenced about 1850, and, during the period of British administration, large canal systems were constructed. In many cases, old canals and inundation channels in the Sindh and Punjab regions were revived and modernized. Thus, the greatest system of canal irrigation in the world was created. At the partition of British India in 1947, the international boundary between India and what was then West Pakistan cut the irrigation system of the Bari Doab and the Sutlej Valley

Project—originally designed as one scheme—into two parts. The headwork fell to India while the canals ran through Pakistan. That led to a disruption in the water supply in some parts of Pakistan. The dispute that thus arose and continued for some years was resolved through the mediation of the World Bank by a treaty between Pakistan and India (1960) known as the Indus Waters Treaty. According to that agreement, the flow of the three western rivers of the Indus basin—the Indus, Jhelum, and Chenab (except a small quantity used in Jammu and Kashmir union territory)—is assigned to Pakistan, whereas the flow of the three eastern rivers—the Ravi, Beas, and Sutlej—is reserved exclusively for India. In India a number of dams, barrages, and link canals have been built to distribute water from the eastern Indus tributaries to the Punjab and neighbouring states. The Harike Barrage, at the confluence of the Beas and Sutlej, channels water into the Indira Gandhi Canal, which runs for about 400 miles (640 km) to the southwest to irrigate some 1.5 million acres (607,000 hectares) of desert in western Rajasthan. The main canal was completed in 1987.

On the Indus itself there are several important headworks, or barrages, after the river reaches the plain. In the mountainous region the principal waterways west of the Indus are the Swat Canals, which flow from the Swat River, a tributary of the Kābul River. Those canals provide irrigation for the two chief crops of the area, sugarcane and wheat. The Warsak multipurpose project on the Kābul River, about 12 miles (19 km) northwest of Peshawar, provides irrigation for food crops and fruit orchards in the Peshawar valley and is designed to produce 240,000 kilowatts of electricity. In the plains region the Kalabagh, or Jinnah, Barrage controls the system of canals in the Thal Project, organized in 1949. The project, which irrigates a former desert area, is aimed at expanding agriculture, developing rural industry, and promoting the settlement of population in villages and towns. Farther downstream is the Chashma Barrage. Still farther the Taunsa Barrage, designed for the irrigation of land in the Dera Ghazi Khan and Muzaffargarh districts, also produces about 100,000 kilowatts of electricity. Within Sindh there are three major barrages on the Indus—Guddu, Sukkur, and Kotri, or Ghulam Muhammad. The Guddu Barrage is just inside the Sindh border and is some 4,450 feet (1,356 metres) long; it irrigates cultivated land in the region of Sukkur, Jacobabad, and parts of Larkana and Kalat districts. The project has greatly increased the cultivation of rice, but cotton also has become a major crop on the left bank of the river and has replaced rice as a cash crop. The Sukkur Barrage was built in 1932 and is about 1 mile (1.6 km) long. The canals originating from it serve a cultivable area of about 5 million acres (2 million hectares) of land producing both food and cash crops. The Kotri Barrage, also known as the Ghulam Muhammad Barrage, was opened in 1955. It is near Hyderabad and is nearly 3,000 feet (900 metres) long. The right-bank canal provides additional water to the city of Karachi. Sugarcane cultivation has been expanded, and yields of rice and wheat have increased.

**I. Documentary Film:** Wajahat Malik's documentary Expedition Indus 2022 covered an estimated 2,300 kilometres of the entire 3,180 km length of the Indus in Pakistan over 45 days. He filmed the river—the lifeline of Pakistan—on a raft and explained that the project was quite a challenge because no one had rafted the entire length of the river in Pakistan to date, he said speaking to ThePrint. As an adventure filmmaker himself, Malik was excited about the prospect of rafting down the river, but his passion for the subject of the environment and the impact of climate change drove him towards a larger purpose. His film documents how the river changes and how each time the crew neared a town or a city, they were greeted by a crowd of garbage and plastic blocking their path. "I wanted to see how the river is doing in terms of environment, climate change and form. We didn't want to bob up and down for the sake of rafting. I am very concerned about water and climate change in this region", explained Malik. The Indus is one of Asia's mightiest rivers. From its source in the northwestern foothills of the Himalayas, it flows through the Indian state of Jammu & Kashmir and along the length of Pakistan to the Arabian Sea. The river and its five tributaries together make up the Indus Basin, which spans four countries and supports 215m people. Yet fast-growing populations and increasing demand for hydropower and irrigation in each country means the Indus is coming under intense pressure. The Sindhu River, also commonly referred to as the Indus River, is a major waterway in South Asia. One of the longest rivers in the world, the Sindhu has



a total length of over 2,000 miles and runs south from the Kailash Mountain in Tibet all the way to the Arabian Sea in Karachi, Pakistan. It is the longest river in Pakistan, also passing through northwestern India, in addition to the Tibetan region of China and Pakistan. The Sindhu is a large part of the river system of the Punjab, which means "land of five rivers." Those five rivers—the Jhelum, Chenab, Ravi, Beas, and Sutlej—eventually flow into the Indus.

**J. Conclusion:** The Sindhu River follows a complex path from its origin at 18,000 feet in the Himalayas near Lake Mapam. It flows northwest for roughly 200 miles before crossing into the disputed territory of Kashmir in India and then into Pakistan. It eventually exits the mountainous region and flows into the sandy plains of the Punjab, where its most significant tributaries feed the river. The Indus has formed a natural boundary between the Indian hinterland and its frontier with Afghanistan and Iran. It has been crossed by the armies of Alexander the Great - Greek forces retreated along the southern course of the river at the end of the Indian campaign. The Indus plains have also been under the domination of the Persian empire and the Kushan empire. The Muslim armies of Muhammad bin Qasim, Mahmud of Ghazni and Babur also crossed the river to strike into the inner regions of Gujarat, Punjab and Rajputana. The Indus River System, which consists of the Indus, Jhelum, Chenab, Ravi, Beas, and Satluj, is made up of the principal tributaries of the Indus River. The Indus Water Treaty was signed in 1960 for the purpose of water sharing because the Indus River flows through both India and Pakistan. Today, the Sindhu River serves as a key water supply to Pakistan and is central to the country's economy. In addition to drinking water, the river enables and sustains the country's agriculture. Flowing through Tibet, northern India and Pakistan, the Indus is the western-most major river of the Indus-Ganga-Brahmaputra basin. This basin extends over most of South Asia from the Himalayas to the Vindhya, excluding Peninsular India, and carries the rain that falls in this region to the Indian Ocean. From its source to the sea, the Indus travels 3,180 kilometers, and drains 1,165,000 square kilometers. From Tibet, the river flows through Ladakh, where it meets its first major tributary- the Zaskar river. The villages here are entirely dependent on the river for sustaining their lives. The Indus provides water for irrigation and livestock, brings silt to base the fields upon, and feeds the springs that provide drinking water. There is speculation that climate change could cause the glaciers that feed the river to dry up and greatly diminish river flows. What will this mean to the people and the land of Ladakh? The Indus Water Treaty (1960) regulates the sharing of water between India and Pakistan. Among other provisions, it limits the construction of dams on the tributaries to the Indus as well as the river itself. Due in part to the Indus Water Treaty and in part to the 'inhospitable' terrain, the Indus has not been subject to the same misguided 'development' as some of the other Himalayan rivers. Is this about to change? Do the people of Ladakh, and maybe the other beings dependent on this river, have a say in its future? Water flow along the river begins to decline around early September, but the surrounding fields turn lush green as Kharif crops mature. Indus water levels continue dropping, and fields slowly brown through January and February. The irrigation infrastructure that stores water throughout the year becomes especially useful in the winter months, as farmers irrigate Rabi crops. Fields green again in late February. By April 2010 the region looked dry, and by June 2010 it appeared parched. In fact, water levels on the Indus and in the holding structure east of the barrage are lower in June 2010—shortly before the historic 2010 monsoon floods—than in June 2009. Strong monsoons have likely occurred in southwest Asia for millions of years. Likewise, runoff down the Indus River has supported irrigation agriculture in Pakistan for 4,000 years. Even now, the majority of Pakistan's population lives in rural areas, with direct links to farming. Although the Indus River can cause catastrophic damage when flooded, the river and the irrigation infrastructure surrounding it sustain a population of millions where water is generally scarce. The transboundary Indus river basin has a total area of 1.12 million km<sup>2</sup> distributed between Pakistan (47 percent), India (39 percent), China (8 percent) and Afghanistan (6 percent).

The well-watered northern Indus plains are settled by agricultural groups who speak Punjabi, Lahnda, and related dialects and who form the most numerous of the Indus valley peoples. Language, ethnicity, and tribal organization play a less-important role in differentiating groups there. The major distinguishing feature among Punjabi peoples is caste, although without the religious and ritual connotations of the Hindu system. Muslim Jats and Rajputs are important Punjabi communities. The lower Indus valley is inhabited by agricultural peoples who speak Sindhi and related dialects. Many cultural traits in the region appear to be of considerable antiquity, and the Sindhi pride themselves on their regional distinctiveness. Karachi, though in Sindh, is predominantly an Urdu-speaking city settled by Punjabis and muhājir, immigrants from India who arrived in Pakistan after partition of the subcontinent in 1947.

### **Findings:**

- Vast number of books are available on the Indus river but only few are available as online resource
- Documentation of tributaries in detail needs to be updated
- Different aspects of rivers assists us in gaining more knowledge
- Exclusive website containing all the links to sources is the need of the hour

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