2

In the Expansive Plain

Various types of landforms, such as lofty mountains, expansive plains, plateaus, scorching deserts and valleys are found on the surface of the Earth. They were formed over millions of years. In the previous chapter, you learned in detail about the Northern Mountains, one of the physiographical divisions of our country. Observe the map (Fig 2.1) given below. Don't you find a vast physical division that lies to the south of the Northern Mountains and to the north of the Peninsular Plateau? It is an extensive alluvial plain known by the name Indo-Gangetic- Brahmaputra Plain.

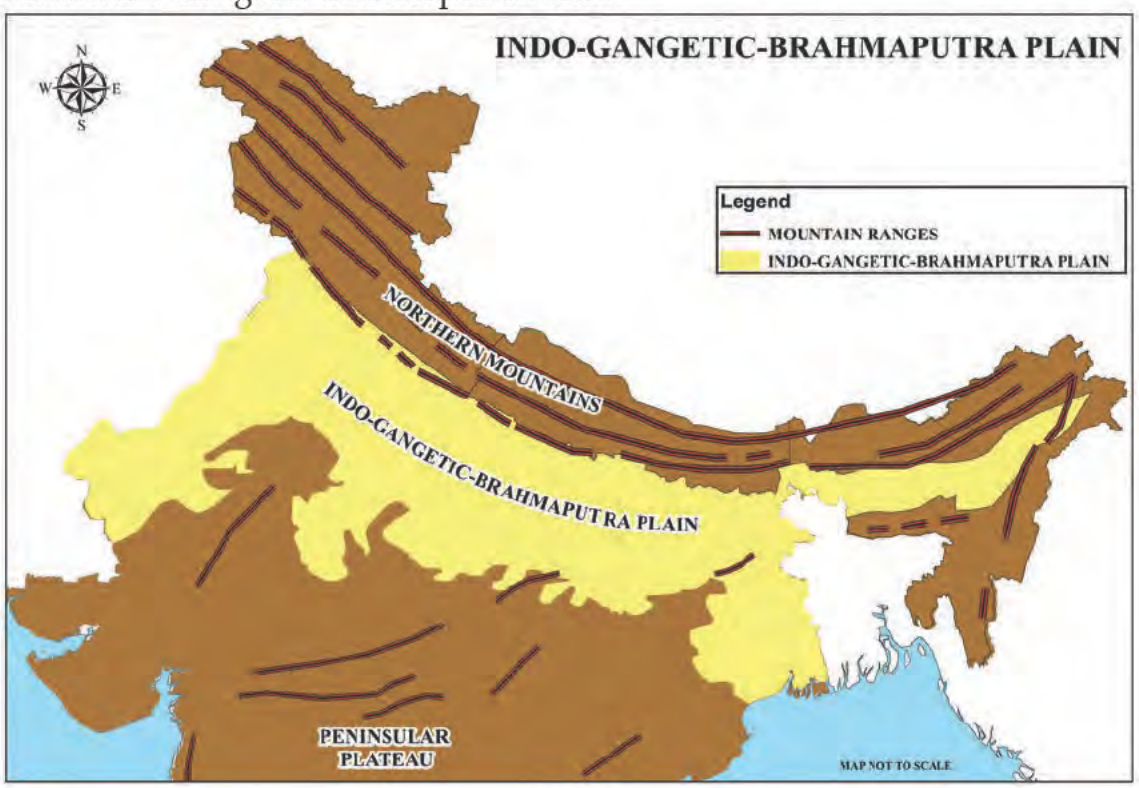


Fig 2.1

Let's have a glance at the formation of this physiographical division, which is also called the North Indian Plain.

Alluvium

Alluvium refers to debris, including silt, sand, gravel, etc., brought by rivers.

Diverse landforms are formed on the surface of the Earth through the continuous processes driven by external forces, such as running water, wind, glaciers, and waves that operate on the Earth's surface. Therefore, these external forces are called geomorphic agents, and the processes that lead in the formation of landforms are called geomorphic processes. The sediments or rock materials formed through the disintegration of rocks by various physical, chemical, and biological processes are transported by these external forces or geomorphic agents from one place to another. These materials are then deposited conveniently in low lying regions. This process is called deposition. Now look at Fig 2.2.

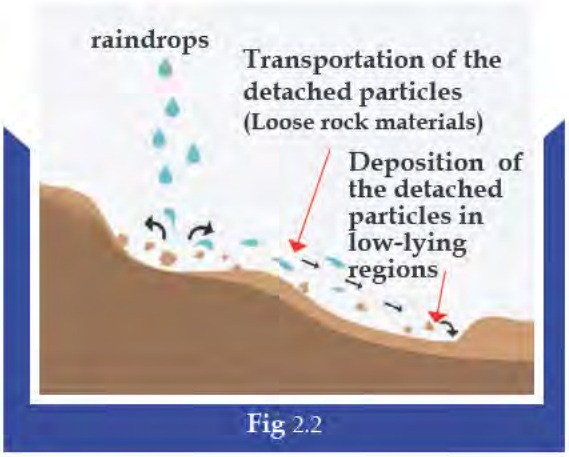
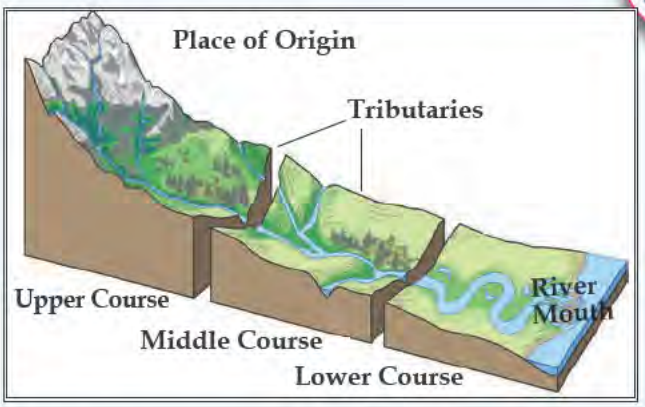


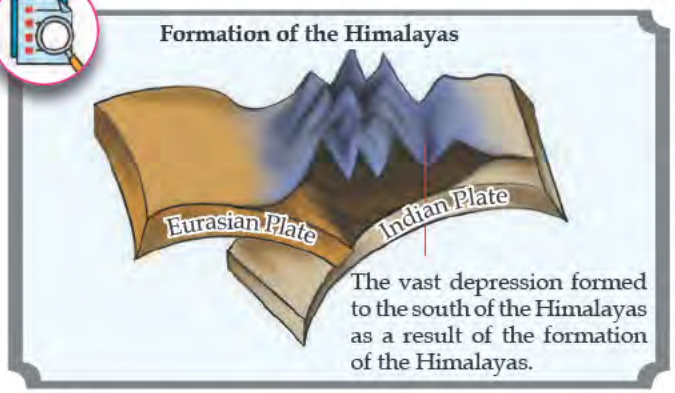
Fig 2.2

Haven't you seen how the rainwater carries away loose rock materials from a higher region and deposits them in a lower region?



The place of origin of a river is called its source, and the place at which it discharges into the sea or another body of water is referred to as the river mouth.

Rivulets originating from high altitudes form rills. Rills join together to form streams. Rivers develop through the merging of numerous such streams. Rivers originating from high altitudes transport sediments down the stream and deposit them in low-lying areas. Over time, the deposition of sediments by rivers creates numerous depositional landforms, including expansive alluvial plains.



The fertile Indo-Gangetic-Brahmaputra plain was also formed in the same way by the deposition of sediments carried by rivers. The sediments are deposited in a vast depression at the south of the Himalayas which was formed as a result of the formation of the Himalayas. The sediments, transported by rivers originating from both the Himalayas and Peninsular India, were deposited in this expansive depression, which led to the formation of the plain. The continuous depositional processes over millions of years have contributed to the evolution of this fertile plain. The average depth of alluvial deposits in this plain ranges from 1000 metres to 2000 metres. Observe the graphical representation depicting the formation of the Indo-Gangetic-Brahmaputra Plain (Fig 2.3).

Fig 2.3

- Observe the map (Fig 2.4) and list out the rivers that flow through the Indo-Gangetic-Brahmaputra Plain.
  - Ganga
  - Yamuna
  - Betwa
  -
- Rivers originating from the Himalayas are known as Himalayan rivers, while those originating from the peninsular plateaus are referred to as peninsular rivers. Categorize the rivers flowing through the Indo-Gangetic-Brahmaputra plain based on their place of origin as Himalayan rivers or Peninsular rivers, and list them accordingly. Use Fig. 2.1 and 2.4 for this purpose.

Himalayan Rivers	Peninsular Rivers
•	•

The Indo-Gangetic-Brahmaputra Plain, extending approximately over 3200 km from the mouth of River Indus to the mouth of River Ganga, is one of the largest alluvial plain in the world. It spreads over around 2400 km in India. The plain widens from east to west, with the width varying between 150 km and 300 km. This plain is bordered by the Shiwalik ranges in the north and the irregular edges of the Peninsular Plateau in the south.

The plain covers an area of approximately 7 lakh sq.km.

List the eastern and western boundaries of the North Indian Plains with the help of a physiographic map of India.

Features such as fertile soil, adequate water supply, favourable climate and flat topography make this region suitable for agriculture.

Geographically, this plain can be considered as a single physiographic unit. However, based on the river system, direction of flow of rivers and topographical features, the plain can be divided into four regional divisions.

Now, let's examine the characteristic features of each division.

Observe the map provided (Fig 2.4) and list the four regional divisions of the North Indian Plain.

1. Rajasthan Plain
2. .....
3. .....
4. .....

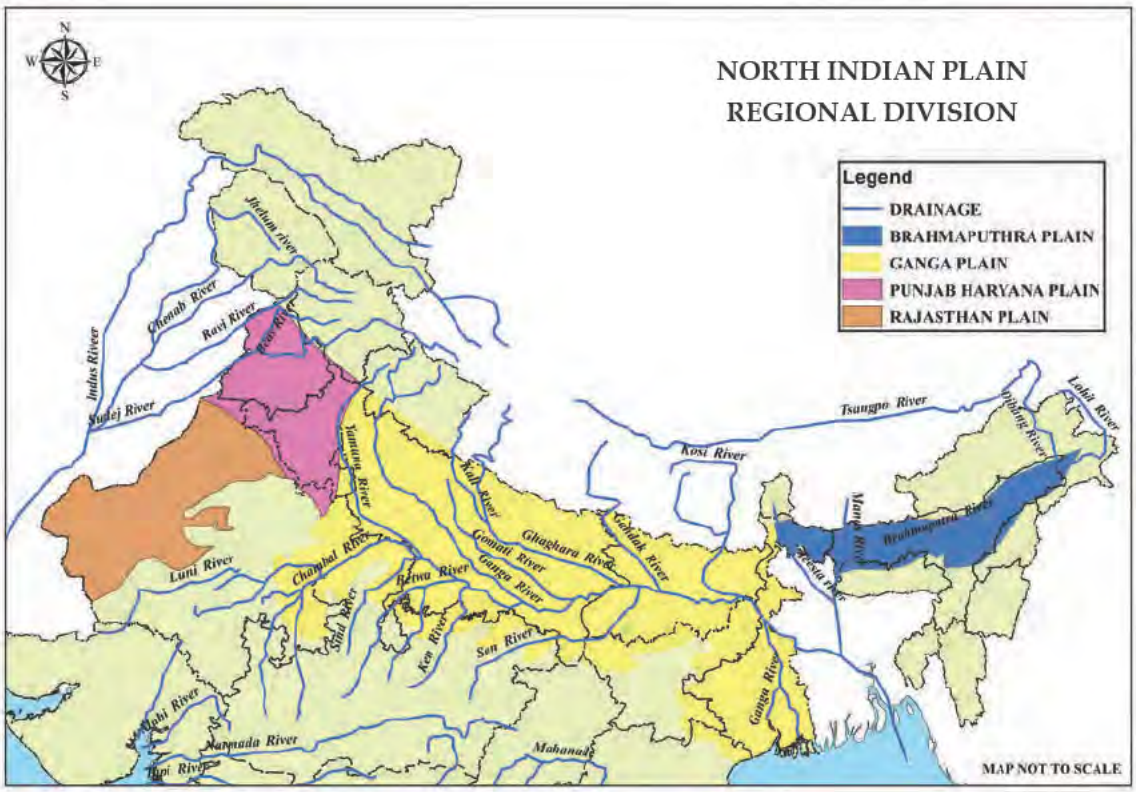


Fig 2.4

Rajasthan Plain

The Rajasthan Plain, which includes the Thar Desert, marks the westernmost end of the North Indian Plain. Two-thirds of the Thar Desert is situated in Rajasthan, while the remaining portion extends into the neighbouring states of Haryana, Punjab, and Gujarat. The Thar Desert is further divided into two significant regions: the actual desert area called Marusthali (the desert proper) and the semi-arid plain (semi desert region) known as Rajasthan Bagar.The geographical features of the Thar Desert are explained in detail in the following chapter.

The Rajasthan Plain is situated to the west of the Aravali Mountain range.

- Locate the Aravali Mountain range with the help of a physiographic map of India.
- Find out the influence of the Aravali Mountain range in the climate of the Rajasthan Plain.

A significant river in this plain is the Luni, which is non-perennial in nature. There are numerous salt lakes in Rajasthan Plain, and some of the major salt lakes are Sambhar, Didwana, and Sargol.

Punjab-Haryana Plain

You might have understood the main features of the Rajasthan Plain. Now, let's discuss the features of the Punjab-Haryana Plain. As you move from the Rajasthan Plain towards east and northeast, you can see the Northern Plains gradually transforming into a fertile plain. The Punjab-Haryana plain is situated to the east and northeast of the Rajasthan Plain. This plain is the western part of the North Indian Plain and extends upto the Yamuna River.

The eastern border of this plain is defined by River Yamuna.

Locate the significant landform to the west of the Punjab-Haryana Plain by referring to an atlas.

In India, this plain extends over the states of Punjab, Haryana, and Himachal Pradesh, covering an area of approximately 1.75 lakh sq.km. It gently slopes towards the west. The Punjab Plain, a significant part of this region, is primarily formed by the deposition of sediments carried by rivers such as Satluj, Jhelum, Chenab, Ravi and Beas. Punjab is etymologically known as the Land of Five Rivers. The Punjab-Haryana Plain is divided into five major doabs.

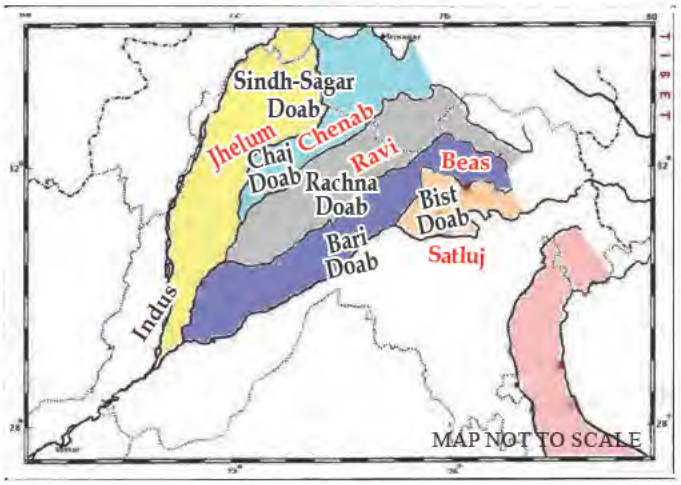


Fig 2.5

Do you know what a doab is? A doab is a land lying between two rivers that join together later. Observe Fig. 2.5 for reference.

Major Doabs

- Bist-Jalandhar Doab - between the rivers Beas and Satluj.
- Bari Doab - between the rivers Beas and Ravi.
- Rachna Doab - between the rivers Ravi and Chenab.
- Chaj Doab - between the rivers Chenab and Jhelum.
- Sindh-Sagar Doab - between the rivers Indus and Jhelum-Chenab.

The Ganga Plain

The division of the plain situated to the east of the Punjab - Haryana Plain is known as the Ganga plain. Observe the map (Fig 2.4). The Ganga Plain stretches from Bangladesh in the east to the Yamuna River in the west. This expansive plain covers the states of Uttarakhand, Uttar Pradesh, Haryana, Delhi, and parts of Jharkhand and West Bengal, spanning an area of approximately 3.75 lakh sq.km. This expansive plain was formed through the depositional processes by River Ganga and its tributaries. The average elevation of the Ganga Plain is around 200 metres above mean sea level, and it exhibits a general slope towards the east and the southeast.

Based on geographical features, the Ganga Plain has been further divided into three regions. Observe the given map (Fig 2.6) and identify them.

▶ Upper Ganga Plain ▶ Middle Ganga Plain ▶ Lower Ganga Plain

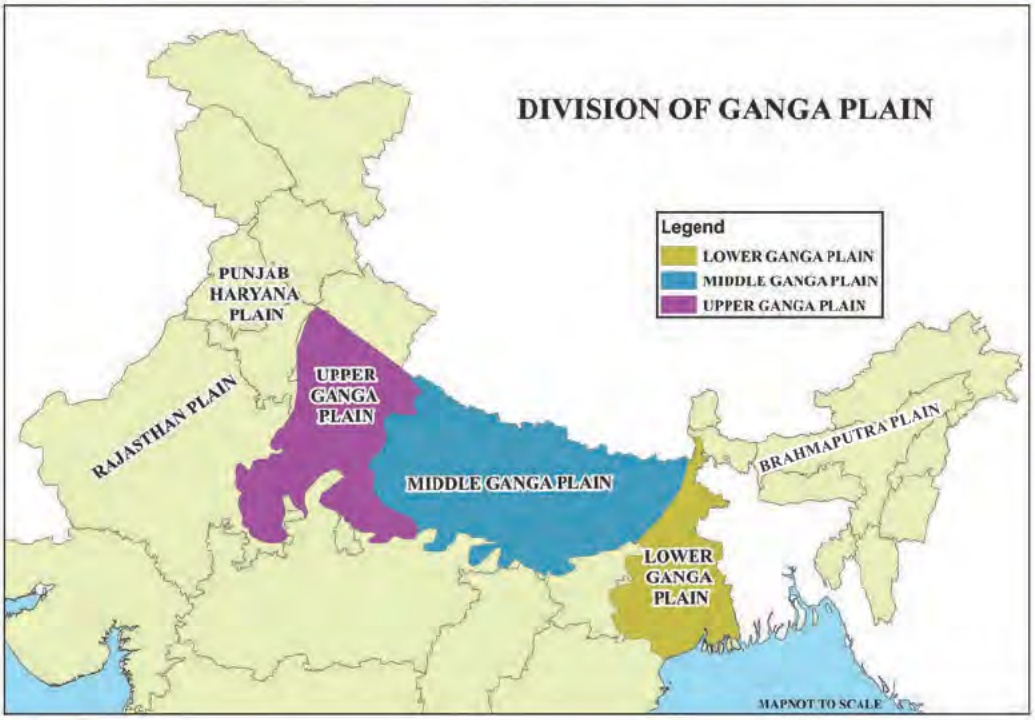


Fig 2.6

Brahmaputra Plain

The Brahmaputra Plain, known by various names such as Brahmaputra Valley, Assam Valley, and Assam Plain, constitutes the easternmost part of the North Indian Plain. Stretching from the easternmost edge of Assam to the west of Dubri, near the border of Bangladesh, it spans approximately 720 km in length, with the width ranging from 60 to 70 km. The major portion of the Brahmaputra Plain is located in the state of Assam. Though the Brahmaputra Plain is commonly considered as the eastward extension of the North Indian Plain, geographically this plain stands distinct and separate from the rest of the North Indian Plain.

The Eastern Himalaya in the north, the Patkai-Naga Hills in the east, and the Garo-Khasi-Jaintia Hills and Mikir Hills in the south serve as its natural boundaries, separating the plain from the surrounding areas. The Lower Ganga Plain lies to the west of the Brahmaputra plain.

With the help of an atlas, identify and locate the Brahmaputra Plain in an outline map of India, and include it in My Own Atlas

The Brahmaputra Plain, spanning an area of approximately 56,275 sq.km, is formed through the depositional processes carried out by the Brahmaputra River and its tributaries. Teesta, Manas, Lohit and Dibang are some of the major tributaries of the Brahmaputra River.

Observe the map (Fig 2.4) and locate the major tributaries of the River Brahmaputra in the outline map of India.Include it in 'My Own Atlas'.

This plain is rich in alluvial fans. Let's explore what alluvial fans are. Observe Fig 2.7. When rivers enter a plain from mountainous regions, their velocity decreases abruptly. The sediments (alluvium) carried by the rivers get deposited in the form of fans. Such depositional landform features are referred to as alluvial fans.

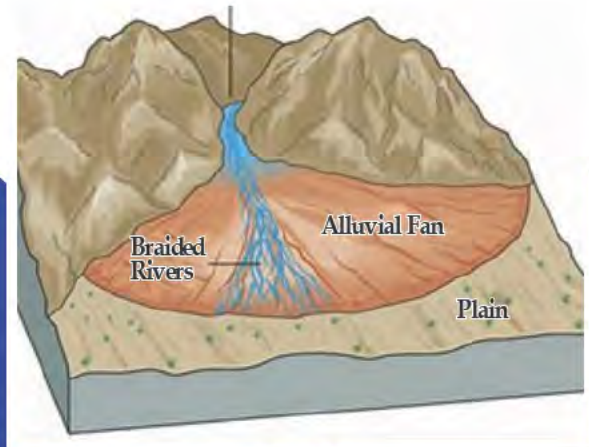


Fig 2.7
Alluvial Fan

Rivers that continue flowing through plains split into many channels. As the river's velocity decreases, it starts flowing creating curves in the river course or in a sinuous manner. This eventually leads to the formation of ox-bow lakes. Observe the given Fig 2.8 to understand the formation of ox-bow lakes.

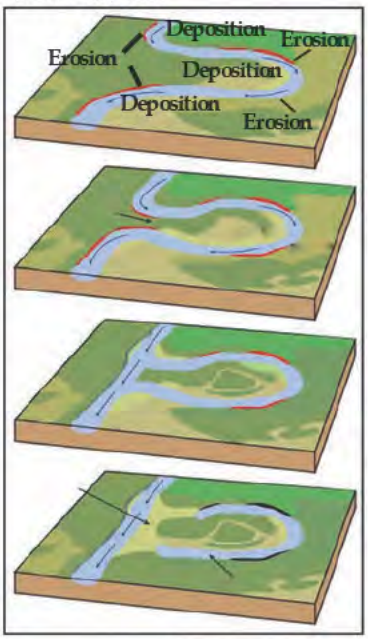


Fig 2.8
Formation of Ox-Bow Lakes

Meanders and Ox-Bow Lakes

A river, flowing through comparatively gentle slopes, deviates when alluvial deposits within the river course create obstructions to the flow. This deviation leads to the formation of sinuous curves along the river course, creating meanders. Over a period of time, continuous erosion and deposition cause meanders to curve further. Subsequently, when the river takes a straighter course, such curved sections get detached from the main river, forming isolated water bodies. Such isolated water bodies are called ox-bow lakes.

Fig 2.9
River Meandering

Fig 2.10
Ox-Bow lakes

A river thus flowing in a sinuous manner is called river meandering. Fig 2.9 illustrates a river meandering.

Prepare a digital album containing the pictures of river meandering and ox-bow lakes in different places of the world.

The North Indian Plain can be divided into three zones from north to south based on its geomorphic features.

- Bhabar
- Tarai
- Alluvial plains

Let's explore the characteristic features of each of these zones.

Bhabar is a narrow belt, approximately 8 to 10 km wide, running parallel to the Shiwalik mountain range at the break-up of the slope. It is situated to the south of the Shiwalik mountain range along its foothills. This zone of the plain is formed by the deposition of rocks and boulders brought by rivers flowing from the mountains. The rivers flowing through this region are not visible as they flow beneath the rocks and boulders. Look at Fig. 2.12.

Flood Plains

During floods, the alluvium brought by rivers gets deposited along the banks of a river, and plains are formed. The plains thus formed are flood plain. These areas are

ideal for agriculture and many well- known river valley civilizations in the world had flourished along such flood plains.

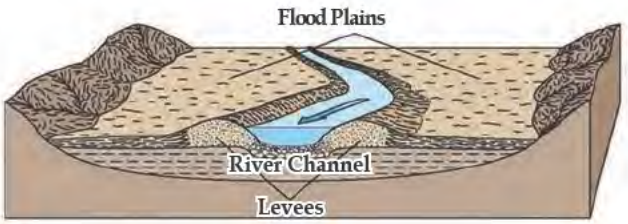


Fig 2.11

Fig 2.12
Bhabar Region

Fig 2.13
Tarai Region

Riverine Islands, Levees and Sandbars

When rivers flow through plains, their velocity and depth are comparatively low. Therefore, the sediments brought by rivers get deposited, forming islands in the river channels (Riverine Islands) and ridges along their sides (Levees). Linear landforms formed by sediments including sand, silt and gravel along river beds are called sandbars.

The Tarai is a marshy and swampy tract, approximately 10 to 20 km wide, running parallel to the Bhabar belt. The rivers that disappear in the Bhabar region re-emerge in this area. Observe Fig 2.13. The Tarai has a luxurious growth of natural vegetation and serves as a habitat for varied wildlife.

To the south of the Tarai, the belt consisting of older and newer alluvial deposits forms the Alluvial plain. The older alluvium deposits are called the Bhangar, and the newer ones are referred to as the Khadar. The major characteristic features of this region include depositional landforms such as riverine islands, sandbars, and deltas. Braided streams, meanders and ox-bow lakes are also prominent features of this area.

Observe the diagram (Fig 2.14) illustrating the side profile of the North Indian Plain.

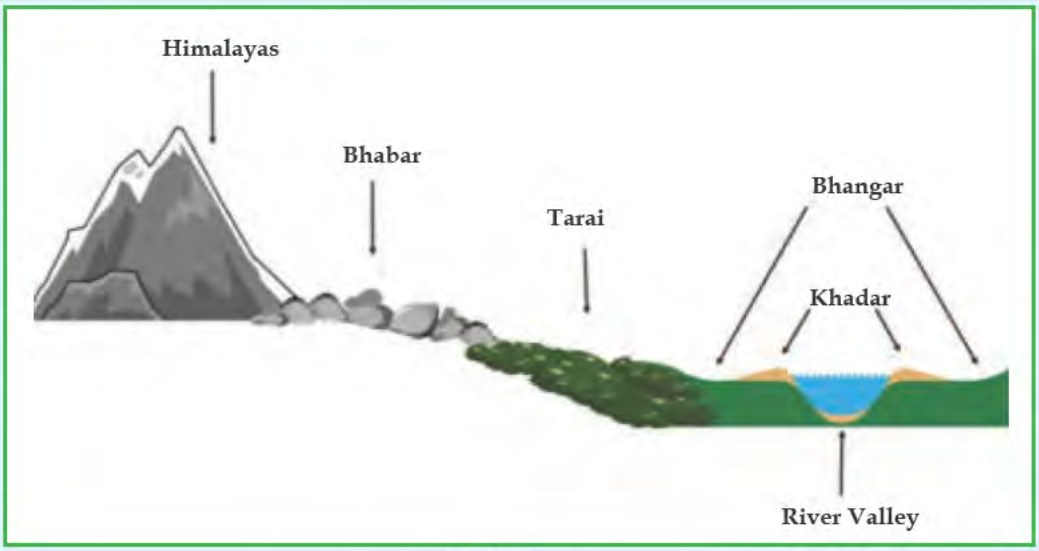


Fig 2.14
The side profile of the North Indian Plain

Graphical representation only for the purpose of conceptual clarity. Not according to the scale

Which one of the geographical divisions of the North Indian Plain is more suitable for agriculture?

Fig 2.15
A Deltaic Region

Deltas

When the river nears the river mouth through the plains, the velocity of the river decreases. Most rivers branch out into distributaries at this stage, where the volume of both water and sediments is high. The sediments brought by the river are deposited between these distributaries, forming almost triangular-shaped landforms called deltas. These features are named after the Greek alphabet Δ (Delta) due to their resemblance in shape.

Identify and list out the landforms which are formed due to the depositional process by rivers. Prepare a digital album containing the pictures of such depositional landform features.

You might have understood the physiographic features of the North Indian Plain by now. The climate experienced in a region is as significant as physiographic features in influencing characteristic features such as natural vegetation, wildlife, human life, soil and agricultural diversity in that particular region. Let's explore the main characteristic features of the climate experienced in the North Indian Plain.

Climate of the North Indian Plain

The Cold Weather Season

Usually, the cold weather season sets in by mid-November in North India. December and January are the coldest months in the North Indian Plain and excessive cold is experienced during this period. Do you know why there is excessive cold weather in the North Indian Plain?

- The major portion of the North Indian Plain is located far away from the moderating influence of the oceans, result ing in a continental climate.
- Snowfall in the nearby Himalayan ranges contributes to strong cold waves.
- Cold winds from West Asia cause frost, fog and cold waves in the western part of the North Indian Plain.
- The apparent movement of the sun from the northern hemisphere towards the southern hemisphere adds to the cold conditions.
-

During the cold weather season, the North Indian Plain receives slight rainfall.

The Hot Weather Season

The temperature increases in the North Indian Plain by March. The summer season in the North Indian Plain is experienced in the months of April, May, and June. Summer is extremely severe in North Indian Plain. By the month of May, the temperature rises up to 48 Degree Celsius in the western part of the North Indian Plain.

Hot, dry and oppressive wind blows from the desert region of Rajasthan to the Ganga Plain in the months of May and June. This wind, called 'Loo', increases the temperature considerably in the North Indian Plain.

Dust storms are very common in the evenings in Punjab, Haryana, Eastern Rajasthan, and Uttar Pradesh. As these storms bring light rain during summer, it provides some relief from the oppressive heat.

The North Indian Plain's distance from the ocean contributes to the excessive heat experienced during the summer in these regions. Why is it so?

The Southwest Monsoon Season

As a result of the rapid increase in temperature over the North Indian Plain by the month of March, a low-pressure area is developed over this region. This low-pressure area attracts the southwest monsoon winds to the Indian subcontinent. The southwest monsoon winds enter the Indian subcontinent as two branches.

By observing the given map (Fig 2.17), identify and list the two branches of the southwest monsoon winds. Try to understand their paths over the subcontinent.

- The Arabian branch of the southwest monsoon winds
-

Fig 2.17

The Bay of Bengal branch, entering the land through the Sundarbans delta region, gets bifurcated into two sub-branches. One branch moves eastward and enters the Brahmaputra Plain, causing widespread rains. The other branch, moving westward along the Ganga Plain, causes rainfall in West Bengal, Bihar, Uttar Pradesh, Delhi, and proceeds further westward. Over the Punjab Plain this branch joins the Arabian branch which is moving parallel to the Aravali Mountains and then brings rain to the foothills of the Western Himalayas.

The rainfall received in Rajasthan from the southwest monsoon is very scanty. Why?

The southwest monsoon season, experienced from June to September, is the main rainy season in the North Indian Plain.

The Northeast Monsoon Season

The low-pressure area that prevails over the North Indian Plain starts moving southward in response to the apparent movement of the sun towards the southern hemisphere. This season is named the retreating monsoon season. During this period, a high-pressure area develops over the North Indian Plain and consequently, the wind starts blowing from here to the Indian Ocean. As these moisture-less winds blow from the northeast, this season is called the northeast monsoon season.

The North Indian Plain generally experiences a dry climate during this season. Owing to the conditions of high temperature and atmospheric humidity, the weather becomes rather oppressive. This phenomenon is commonly known as the 'October heat'.

With the help of the provided map (Fig 2.18), identify the movement of winds that blow in the months of October and November. Locate them in an outline map of India and include it in 'My Own Atlas'.

Fig 2.18

The Natural Vegetation of the North Indian Plain

Fig 2.19
The Tropical Moist Deciduous Forests

The natural vegetation found in the North Indian Plain also shows diversity. Topography, climate, and the nature of the soil are some of the major factors that cause this diversity in natural vegetation. The term 'natural vegetation' refers to a plant community that has been left undisturbed for a long period, enabling its individual species to fully adapt to the respective climate and soil conditions.

The prominent natural vegetation generally found in these plains are given below:

- The Tropical Deciduous Forests
- The Tropical Thorn Forests
- Swamp Forests

The tropical deciduous forests are further divided into two. They are the dry deciduous forests and the moist deciduous forests.

Dry deciduous forests are found in those regions where the annual rainfall ranges between 70 cm and 100 cm. In these forests, trees shed their leaves for approximately 6 to 8 weeks in the dry season when sufficient moisture is not available. The dry deciduous forests are found in the plains of Uttar Pradesh and Bihar.

The moist deciduous forests are found in areas with moderate rainfall, ranging from 100 cm to 200 cm per annum. They are mainly seen along the strip of Shiwalik range including Tarai and Bhabar and in certain parts of Odisha and West Bengal.

Teak, sal, shisham, mahua, amla and sandalwood are the main species of the tropical deciduous forests.

In the higher rainfall regions of the North Indian Plain, these forests exhibit a parkland landscape characterized by open stretches of teak and other trees interspersed with patches of grass. In the dry season, when the trees shed their leaves entirely, these forests are transformed into a vast grassland with bare trees.

Fig 2.20
The Tropical Dry Deciduous Forests

The natural vegetation in the western part of the North Indian Plain is sparse due to low rainfall and intensive cattle rearing. Tropical thorn forests are prevalent in the semi-arid areas of southwest Punjab, Haryana, Rajasthan, and Uttar Pradesh. These forests consist of various grasses and shrubs, with important species such as babool, ber, wild date palm, khair, neem, khejri and palas. In certain regions Tussocky grass grows as undergrowth, reaching up to a height of 2 metres.

Fig 2.21
The Tropical Thorn Forests

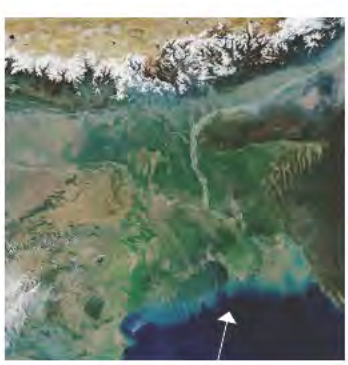
The swamp forests are the natural vegetation found in the vast saline expanses of Rajasthan, freshwater lakes, the freshwater marshes of the Ganga Plain, the flood plains of the Brahmaputra, and in the deltaic region of Sundarbans. The marshy and expansive deltaic region of Ganga Plain in West Bengal is Sundarbans. The natural vegetation found luxuriously in this region is mangroves. This region serves as a natural habitat for the Royal Bengal Tiger.

Fig 2.22
Swamp Forests

The roots of mangrove forests create a natural habitat for numerous aquatic species, including fishes.

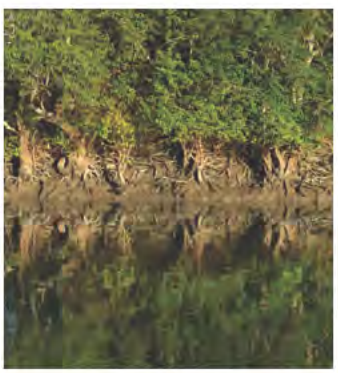
They are the abode of varied species of birds. Sundri, a type of mangrove, stands out as one of the distinctive features of the Sundarbans delta.

- Locate the Sundarbans delta by referring to an atlas
- With the help of information technology, prepare a note with pictures on the characteristic features of mangrove forests.



Sundarbans Deltaic Region

Satellite image of Sundarbans Delta



Sundri Mangrove

Fig 2.23

The provided map (Fig. 2.24) illustrates the distribution of natural vegetation in India. Identify and list the major natural vegetations in the North Indian Plain by analyzing the map.

- The tropical deciduous forests
- The tropical thorn forests
-

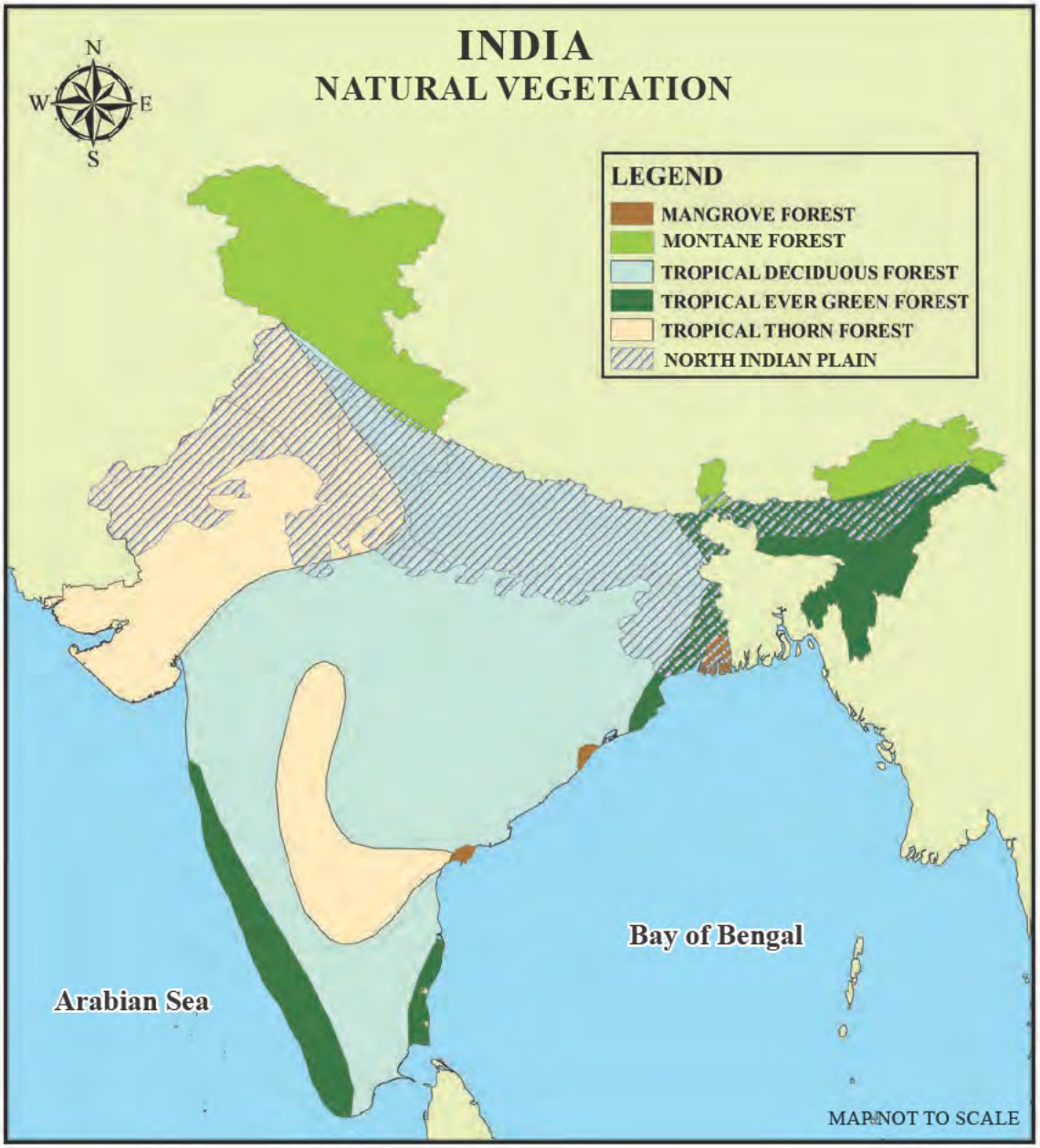

INDIA
NATURAL VEGETATION
N
W
E
S
LEGEND
MANGROVE FOREST
MONTANE FOREST
TROPICAL DECIDUOUS FOREST
TROPICAL EVER GREEN FOREST
TROPICAL THORN FOREST
NORTH INDIAN PLAIN
Bay of Bengal
Arabian Sea
MAP NOT TO SCALE

Fig 2.24

The Major Soil Types of the North Indian Plain

The soil which is widespread in the North Indian Plain is alluvial soil. The alluvial soils vary in nature from sandy loam to clay. Alluvial soil is found in limited areas of Rajasthan and extensively in the plains of Gujarat. There are two different types of alluvial soils developed in the Ganga Plain: Khadar and Bhangar. Write the characteristic features of these two types of soil by referring to the previous topics. The alluvial soil in the lower and middle Ganga plains and the Brahmaputra Valley are more loamy and clayey. Alluvial soil is well-suited for agriculture.

The red soil is found in the southern part of the Middle Ganga Plain. It is the presence of iron in the soil that gives a red colour to it. The soil found in the Sundarbans delta region is saline soil which is characterised by a higher presence of salt. Saline soil consists of sand and loam. Seawater intrusions into the deltas cause the formation of saline soils. In certain areas of the North Indian Plain, where there is intensive cultivation with excessive irrigation, the fertile alluvial soil has turned saline. Along the coastal regions of West Bengal, peat soil is also found.

Arid soil is the soil extensively found in the western parts of the North Indian Plain, including Rajasthan. It is generally sandy and saline in structure. As this soil lacks humus and moisture, irrigation support is required for the plants to grow.

Identify the distribution of different types of soils in the North Indian Plain by analyzing the provided map (Fig 2.25) and list them.

- Alluvial soil
- Red soil
-

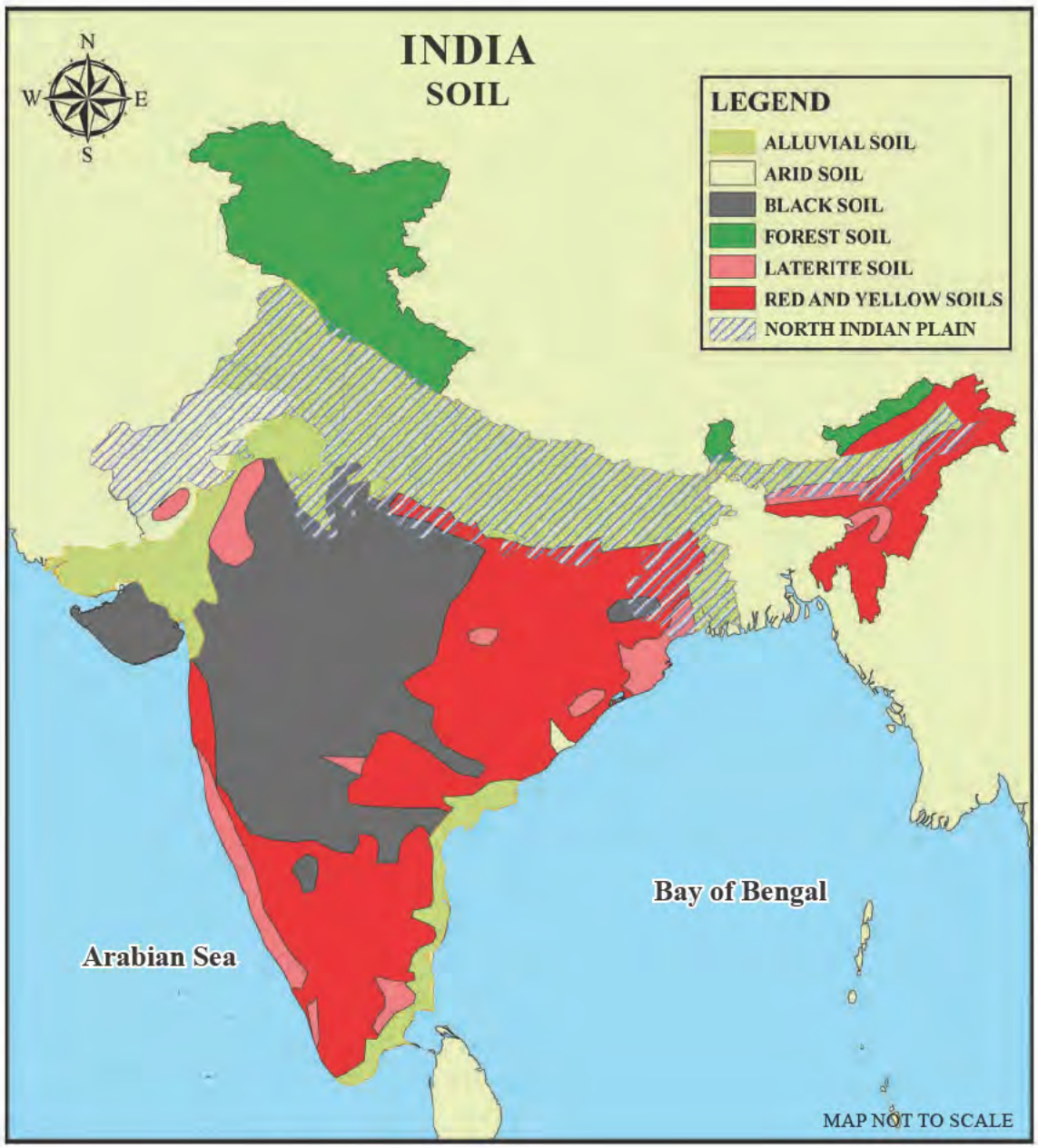

INDIA
SOIL
N
W
E
S
LEGEND
ALLUVIAL SOIL
ARID SOIL
BLACK SOIL
FOREST SOIL
LATERITE SOIL
RED AND YELLOW SOILS
NORTH INDIAN PLAIN
Bay of Bengal
Arabian Sea
MAP NOT TO SCALE

Fig 2.25

The Human Life

Fertile alluvial soil, flat topography, presence of perennial rivers and favourable climate are significant characteristic features of the North Indian Plain. Although this extensive plain accounts for less than one-fourth of the total area of our country, it is home to more than half of India's total population. The North Indian Plain plays a very significant role in building India's economic system based on the agricultural sector. Wheat, rice, jute, and sugarcane are widely cultivated here. Extensive cultivation, supported by irrigation, has made this plain the granary of India. The entire plain, except the Thar Desert, has a well-developed network of roads and railways. This infrastructural development has facilitated large-scale industrialisation and urbanisation of the region.

Fig 2.26
An Urban Area in the North Indian Plain

Kharif, Rabi, and Zaid are the three

Fig 2.27
A Fertile Part of the North Indian Plain

Fig 2.28
Crop Cultivation in the North Indian Plain

different cropping seasons in the North Indian Plain during which varied crops are cultivated. Kharif is associated with the southwest monsoon season. Rabi begins with the onset of the cold season. Zaid, a short duration cropping season, starts after the cultivation of Rabi crops.

Observe the table given below. In the table, the major crops cultivated in three different cropping seasons in the North Indian Plain are listed. Try to understand the duration of each cropping season and the crops cultivated in each season. Prepare a note on it by adding additional informations with the help of information technology.

Cropping Seasons	Major Crops
Kharif (From June to September)	Tropical Crops- Rice, Cotton, Jute, Bajra, Tur etc.
Rabi (From October to March)	Temperate - Subtropical Crops – Wheat, Gram, Mustard, Barley etc.
Zaid (From April to June)	Vegetables, Fruits, Fodder etc.

We have discussed the major crops cultivated in the North Indian Plain. The crops mentioned above are not uniformly cultivated across the entire plain. There are regional diversities in the distribution of crops and their cropping patterns.

You might have acquired a general awareness about the location and the extension of the North Indian Plain, as well as the processes by which this extensive plain was formed. This physiographic division, characterised by its rich output and abundance of perennial rivers, plays a significant role in shaping the cultural diversity of India. Serving as the backbone of India's agriculture-based economy, this plain bears a decisive responsibility for our nation's food security. The facilities such as transportation and communication provided by the plain have been facilitating the spread and cultural diffusion of people for decades. The plural and mixed society that developed through this is the beauty and strength of our India.

Extended Activities

1. Project – 'The significant role played by The North Indian Plain in shaping human life in India'.
2. Conduct a seminar on the topic 'Climate and Crops '
3. How is the formation of the North Indian Plains associated with the formation of the Himalayas? Elucidate.
4. Draw the outline map of India and locate the divisions of the North Indian Plain. Exhibit it in your classroom.
5. Draw the outline map of India and locate the major physiographic divisions using different colours to distinguish them. Also, draw the rivers flowing through the North Indian Plain and display the map in your classroom.