

 *Chronicle* **ias**

CLASS

9TH



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PHYSICAL FEATURES OF INDIA

You have already learnt earlier that India is a vast country with varied land forms. What kind of terrain do you live in? If you live in the plains, you are familiar with the vast stretches of plain land. In contrast, if you live in hilly region, the rugged terrain with mountains and valleys are common features. In fact, **our country has practically all major physical features of the earth, i.e., mountains, plains, deserts, plateaus and islands.**

The land of India displays great physical variation. Geologically, the **Peninsular Plateau** constitutes one of the **ancient landmasses** on the earth's surface. It was supposed to be one of the **most stable land blocks.** The Himalayas and the Northern Plains are the most recent landforms. From the view point of geology, **Himalayan mountains form an unstable zone.** The **whole mountain** system of Himalaya represents a **very youthful topography** with high peaks, deep valleys and fast flowing rivers. The northern plains are formed of alluvial deposits. The **peninsular plateau is composed of igneous and metamorphic rocks** with gently rising hills and wide valleys.

MAJOR PHYSIOGRAPHIC DIVISIONS

The physical features of India can be grouped under the following physiographic divisions (Figure 2.2):

- (1) The Himalayan Mountains
- (2) The Northern Plains
- (3) The Peninsular Plateau
- (4) The Indian Desert
- (5) The Coastal Plains
- (6) The Islands

The Himalayan Mountains

The Himalayas, **geologically young** and structurally **fold mountains** stretch over the northern borders of India. These mountain ranges run in a **west-east direction** from the Indus to the Brahmaputra. The Himalayas represent the loftiest and one of the most rugged mountain barriers of the world. They **form an arc, which covers a distance of about 2,400 Km.** Their **width varies from 400 Km in Kashmir to 150 Km in Arunachal Pradesh.** The **altitudinal variations are greater in the eastern half than those in the western half.** The Himalaya consists of **three parallel ranges** in its **longitudinal extent.** A number of valleys lie between these ranges. The **northern-most range is known as the Great or Inner Himalayas or the Himadri.** It is the most **continuous range** consisting of the loftiest peaks with an **average height** of **6,000 metres.** It contains all prominent Himalayan peaks.

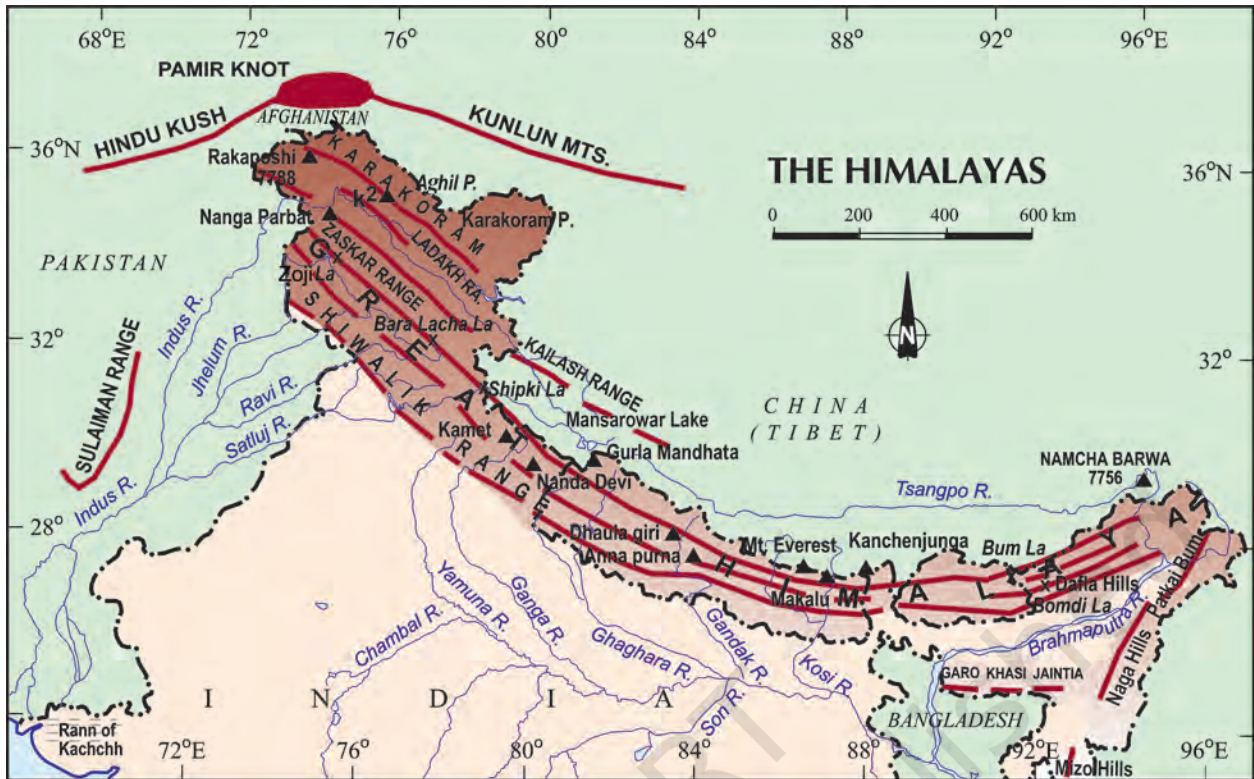


Figure 2.1 : Himalayas

Some Highest Peaks of the Himalayas

Peak	Country	Height in metres
Mt. Everest	Nepal	8848
Kanchenjunga	India	8598
Makalu	Nepal	8481
Dhaulagiri	Nepal	8172
Nanga Parbat	India	8126
Annapurna	Nepal	8078
Nanda Devi	India	7817
Kamet	India	7756
Namcha Barwa	India	7756
Gurla Mandhata	Nepal	7728

The folds of the Great Himalayas are **asymmetrical in nature**. The core of this part of Himalayas is **composed of granite**. It is **perennially snow bound**, and a number of glaciers descend from this range.

Find out

- The names of the glaciers and passes that lie in the Great Himalayas.
- The name of the states where the highest peaks are located.

The range lying to the **south of the Himadri forms** the most rugged mountain system and is known as **Himachal or lesser Himalaya**. The ranges are mainly composed of highly compressed and altered rocks. The **altitude varies** between **3,700 and 4,500 metres** and the **average width is of 50 Km**. While the **Pir Panjal range** forms the longest and the most important range, the **Dhauladhar** and the **Mahabharat ranges** are also prominent ones. This **range consists** of the famous **valley of Kashmir, the Kangra and Kullu Valley** in Himachal Pradesh. This region is **well-known for its hill stations**.

Find out

- Location of Mussoorie, Nainital, Ranikhet from your atlas and also name the state where they are located.

The **outer-most range** of the Himalayas is called the **Shivaliks**. They **extend over a width**

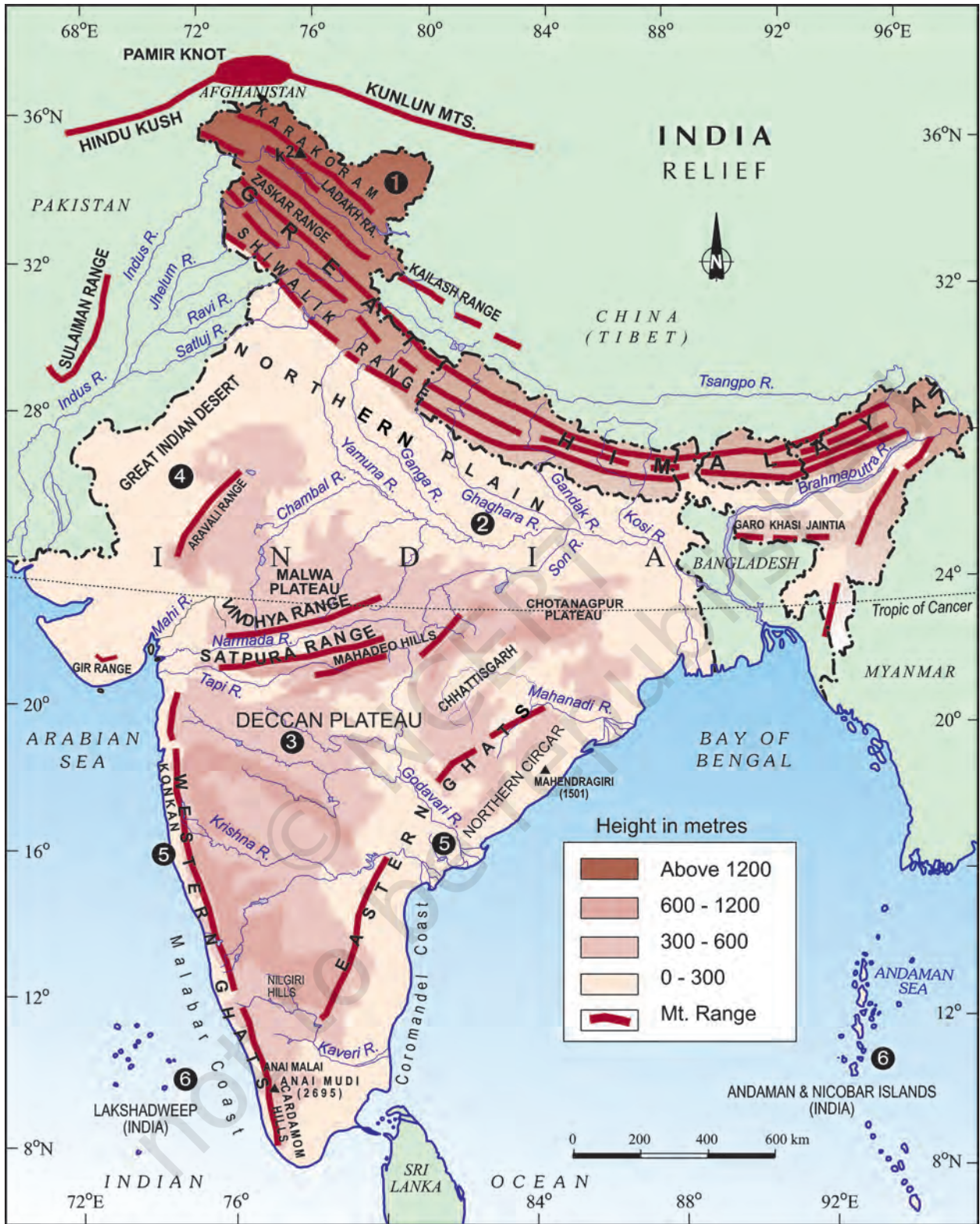


Figure 2.2 : Relief



Figure 2.3 : The Himalayas

of 10-50 Km and have an altitude varying between 900 and 1100 metres. These ranges are composed of unconsolidated sediments brought down by rivers from the main Himalayan ranges located farther north. These valleys are covered with thick gravel and alluvium. The longitudinal valley lying between lesser Himalaya and the Shiwaliks are known as Duns. Dehra Dun, Kotli Dun and Patli Dun are some of the well-known Duns.

Besides the longitudinal divisions, the Himalayas have been divided on the basis of regions from west to east. These divisions have been demarcated by river valleys. For example, the part of Himalayas lying between Indus and Satluj has been traditionally known as Punjab Himalaya but it is also known regionally as Kashmir and Himachal Himalaya from west to east respectively. The part of the Himalayas lying between Satluj and Kali rivers is known as Kumaon Himalayas. The Kali and Teesta rivers demarcate the Nepal Himalayas and the part lying between Teesta and Dihang rivers is known as Assam Himalayas. There are regional names also in these broad

categories. Find out some regional names of the Himalayas

The Brahmaputra marks the eastern-most boundary of the Himalayas. Beyond the Dihang gorge, the Himalayas bend sharply to the south and spread along the eastern boundary of India. They are known as the Purvachal or the Eastern hills and mountains. These hills running through the north-eastern states are mostly composed of strong sandstones, which are sedimentary rocks. Covered with dense forests, they mostly run as parallel ranges and valleys. The Purvachal comprises the Patkai hills, the Naga hills, the Manipur hills and the Mizo hills.



Figure 2.4 : Mizo Hills

The Northern Plain

The northern plain has been formed by the interplay of the three major river systems, namely — the Indus, the Ganga and the Brahmaputra along with their tributaries. This plain is formed of alluvial soil. The deposition of alluvium in a vast basin lying at the foothills of the Himalaya over millions of years, formed this fertile plain. It spreads over an area of 7 lakh sq. km. The plain being about 2400 km long and 240 to 320 km broad, is a densely populated physiographic division. With a rich soil cover combined with adequate water supply and favourable climate it is agriculturally a productive part of India.



Figure 2.5 : The Northern Plains

The rivers coming from northern mountains are involved in depositional work. In the lower course, due to gentle slope, the velocity of the river decreases, which results in the formation of riverine islands.

Do You Know?

Majuli, in the Brahmaputra river, is the largest inhabited riverine island in the world.

The rivers in their lower course split into numerous channels due to the deposition of silt. These channels are known as distributaries.

The Northern Plain is broadly divided into three sections. The Western part of the Northern Plain is referred to as the Punjab Plains. Formed by the Indus and its tributaries, the larger part of this plain lies in Pakistan. The Indus and its tributaries — the Jhelum, the Chenab, the Ravi, the Beas and the Satluj originate in the Himalaya. This section of the plain is dominated by the doabs.

Do You Know?

'Doab' is made up of two words — 'do' meaning two and 'ab' meaning water. Similarly 'Punjab', is also made up two words — 'Punj' meaning five and 'ab' meaning water.

The Ganga plain extends between Ghaggar and Teesta rivers. It is spread over North India in Haryana, Delhi, U.P., Bihar, partly Jharkhand and West Bengal. In the East, particularly in Assam lies the Brahmaputra plain.

The northern plains are generally described as flat land with no variations in its relief. It is not true. These vast plains also have diverse relief features. According to the variations in relief features, the Northern plains can be divided into four regions. The rivers, after descending from the mountains deposit pebbles in a narrow belt of about 8 to 16 km in width lying parallel to the slopes of the Shiwaliks. It is known as bhabar. All the streams disappear in this bhabar belt. South of this belt, the streams and rivers re-emerge and create a wet, swampy and marshy region known as terai. This was a thickly forested region full of wildlife. The forests have been cleared to create agricultural land and to settle migrants from Pakistan after partition. Locate Dudhwa National Park in this region.

The largest part of the northern plain is formed of older alluvium. It lies above the floodplains of the rivers and presents a terrace-like feature. This part is known as bhangar. The soil in this region contains calcareous deposits, locally known as kankar. The

newer, younger deposits of the floodplains are called *khadar*. They are renewed almost every year and so are fertile, thus, ideal for intensive agriculture.

The Peninsular Plateau

The Peninsular plateau is a tableland composed of the old crystalline, igneous and metamorphic rocks. It was formed due to the breaking and drifting of the Gondwana land and thus, making it a part of the oldest landmass. The plateau has broad and shallow valleys and rounded hills. This plateau consists of two broad divisions, namely, the Central Highlands and the Deccan Plateau. The part of the Peninsular plateau lying to the north of the Narmada river, covering a major area of the Malwa plateau, is known as the Central Highlands. The Vindhyan range is bounded by the Satpura range on the south and the Aravalis on the northwest. The further westward extension gradually merges with the sandy and rocky desert of Rajasthan. The flow of the rivers draining this region, namely the Chambal, the Sind, the Betwa and the Ken is from southwest to northeast, thus indicating the slope. The Central Highlands are wider in the west but narrower in the east. The eastward extensions of this plateau are locally known as the Bundelkhand and Baghelkhand.



Figure 2.6 : A Waterfall in Chotanagpur Plateau

The Chotanagpur plateau marks the further eastward extension, drained by the Damodar river.

The Deccan Plateau is a triangular landmass that lies to the south of the river Narmada. The Satpura range flanks its broad base in the north, while the Mahadev, the Kaimur hills and the Maikal range form its eastern extensions. Locate these hills and ranges in the Physical map of India. The Deccan Plateau is higher in the west and slopes gently eastwards. An extension of the Plateau is also visible in the northeast, locally known as the Meghalaya, Karbi-Anglong Plateau and North Cachar Hills. It is separated by a fault from the Chotanagpur Plateau. Three prominent hill ranges from the west to the east are the Garo, the Khasi and the Jaintia Hills.

The Western Ghats and the Eastern Ghats mark the western and the eastern edges of the Deccan Plateau respectively. Western Ghats lie parallel to the western coast. They are continuous and can be crossed through passes only. Locate the Thal, Bhore and Pal Ghats in the Physical map of India.

The Western Ghats are higher than the Eastern Ghats. Their average elevation is 900–1600 metres as against 600 metres of the Eastern Ghats. The Eastern Ghats stretch from the Mahanadi Valley to the Nigiris in the south. The Eastern Ghats are discontinuous and irregular and dissected by rivers draining into the Bay of Bengal. The Western Ghats cause orographic rain by facing the rain bearing moist winds to rise along the western slopes of the Ghats. The Western Ghats are known by different local names. The height of the Western Ghats progressively increases from north to south. The highest peaks include the Anai Mudi (2,695 metres) and the Doda Betta (2,637 metres). Mahendragiri (1,501 metres) is the highest peak in the Eastern Ghats. Shevroy Hills and the Javadi Hills are located to the southeast of the

Eastern Ghats. Locate the famous hill stations of Udagamandalam, popularly known as Ooty and the Kodaikanal.

One of the **distinct features** of the **Peninsular plateau** is the **black soil area known as Deccan Trap**. This is of volcanic origin, hence, the **rocks are igneous**. Actually, these **rocks have denuded over time** and are **responsible for the formation of black soil**. The **Aravali Hills** lie on the **western and northwestern margins** of the Peninsular plateau. These are **highly eroded hills** and are found as broken hills. They **extend** from **Gujarat to Delhi** in a **southwest-northeast** direction.

The Indian Desert

The Indian desert **lies towards the western margins of the Aravali Hills**. It is an undulating sandy plain covered with sand dunes. This region receives **very low rainfall below 150 mm per year**. It has **arid climate with low vegetation** cover. Streams appear during the rainy season. Soon after they disappear into the sand as they do not have enough water to reach the sea. **Luni is the only large river** in this region.



Figure 2.7 : The Indian Desert

Barchans (crescent-shaped dunes) **cover larger areas** but **longitudinal dunes** become

more prominent near the Indo-Pakistan boundary. If you visit Jaisalmer, you may go to see a group of barchans.

The Coastal Plains

The Peninsular plateau is flanked by stretch of narrow coastal strips, running along the **Arabian Sea** on the **west** and the **Bay of Bengal** on the **east**. The **western coast**, sandwiched between the Western Ghats and the Arabian Sea, is a **narrow plain**. It **consists of three** sections. The **northern part** of the coast is called the **Konkan (Mumbai – Goa)**, the central stretch is called the **Kannad Plain**, while the **southern stretch** is referred to as the **Malabar coast**.



Figure 2.8 : The Coastal Plains

The plains **along the Bay of Bengal** are **wide and level**. In the **northern part**, it is referred to as the **Northern Circar**, while the **southern part** is known as the **Coromandel Coast**. Large rivers, such as the Mahanadi, the Godavari, the Krishna and the Kaveri have formed extensive delta on this coast. Lake Chilika is an important feature along the eastern coast.

Do You Know?

The Chilika Lake is the largest salt water lake in India. It lies in the state of Odisha, to the south of the Mahanadi delta.

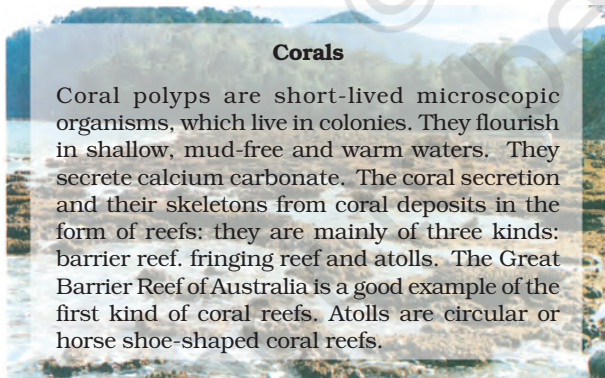
The Islands

You have already seen that India has a vast mainland. Besides this, the country has two groups of islands. Can you identify these island groups?



Figure 2.9 : An Island

Locate the Lakshadweep Islands group lying close to the Malabar coast of Kerala. This group of islands is composed of small coral islands. Earlier they were known as Laccadive, Minicoy and Amindive. In 1973, these were named as Lakshadweep. It covers small area of 32 sq km. Kavaratti island is the administrative headquarters of Lakshadweep. This island group has great diversity of flora and fauna. The Pitti island, which is uninhabited, has a bird sanctuary.



Corals

Coral polyps are short-lived microscopic organisms, which live in colonies. They flourish in shallow, mud-free and warm waters. They secrete calcium carbonate. The coral secretion and their skeletons from coral deposits in the form of reefs; they are mainly of three kinds: barrier reef, fringing reef and atolls. The Great Barrier Reef of Australia is a good example of the first kind of coral reefs. Atolls are circular or horse shoe-shaped coral reefs.

Now you see the elongated chain of islands located in the Bay of Bengal extending from north to south. These are Andaman and Nicobar islands. They are bigger in size and are more numerous and scattered. The entire group of islands is divided into two broad categories – The Andaman in the north and the Nicobar in the south. It is believed that these islands are an elevated portion of submarine mountains. These island groups are of great strategic importance for the country. There is great diversity of flora and fauna in this group of islands too. These islands lie close to equator and experience equatorial climate and has thick forest cover.

Do You Know?

India's only active volcano is found on Barren island in Andaman and Nicobar group of Islands.

A detailed account of the different physiographic units highlights the unique features of each region. It would, however, be clear that each region complements the other and makes the country richer in its natural resources. The mountains are the major sources of water and forest wealth. The northern plains are the granaries of the country. They provide the base for early civilisations. The plateau is a storehouse of minerals, which has played a crucial role in the industrialisation of the country. The coastal region and island groups provide sites for fishing and port activities. Thus, the diverse physical features of the land have immense future possibilities of development.

EXERCISE

1. Choose the right answer from the four alternatives given below.
 - (i) A landmass bounded by sea on three sides is referred to as
 - (a) Coast
 - (b) Island
 - (c) Peninsula
 - (d) None of the above
 - (ii) Mountain ranges in the eastern part of India forming its boundary with Myanmar are collectively called
 - (a) Himachal
 - (b) Uttarakhand
 - (c) Purvachal
 - (d) None of the above
 - (iii) The western coastal strip, south of Goa is referred to as
 - (a) Coromandel
 - (b) Konkan
 - (c) Kannad
 - (d) Northern Circar
 - (iv) The highest peak in the Eastern Ghats is
 - (a) Anai Mudi
 - (b) Kanchenjunga
 - (c) Mahendragiri
 - (d) Khasi
2. Answer the following questions briefly.
 - (i) What is the *bhabar*?
 - (ii) Name the three major divisions of the Himalayas from north to south.
 - (iii) Which plateau lies between the Aravali and the Vindhyan ranges?
 - (iv) Name the island group of India having coral origin.
3. Distinguish between
 - (i) *Bhangar* and *Khadar*
 - (ii) Western Ghats and Eastern Ghats
4. Which are the major physiographic divisions of India? Contrast the relief of the Himalayan region with that of the Peninsular plateau.
5. Give an account of the Northern Plains of India.
6. Write short notes on the following.
 - (i) The Indian Desert
 - (ii) The Central Highlands
 - (iii) The Island groups of India

MAP SKILLS

On an outline map of India show the following.

- (i) Mountain and hill ranges – the Karakoram, the Zaskar, the Patkai Bum, the Jaintia, the Vindhya range, the Aravali, and the Cardamom hills.
- (ii) Peaks – K2, Kanchenjunga, Nanga Parbat and the Anai Mudi.
- (iii) Plateaus, Chotanagpur and Malwa
- (iv) The Indian Desert, Western Ghats, Lakshadweep Islands

PROJECT/ACTIVITY

Locate the peaks, passes, ranges, plateaus, hills, and duns hidden in the puzzle. Try to find where these features are located. You may start your search horizontally, vertically or diagonally.

E	M	K	U	N	L	N	A	T	H	U	L	A	R	I	A	H	I	A	T
M	H	A	S	J	M	A	N	J	K	M	A	J	L	B	H	O	R	P	J
J	N	V	F	A	E	T	D	C	A	R	D	E	M	O	M	L	O	M	K
C	R	E	I	I	Q	H	M	O	I	F	T	N	X	M	A	X	F	C	T
N	M	T	S	N	A	U	Q	R	M	S	A	N	A	D	I	D	A	N	J
A	B	X	A	T	G	A	R	O	U	L	F	V	D	I	K	P	T	D	C
C	Y	C	H	I	G	A	M	M	R	D	T	I	Z	L	A	J	P	O	K
H	R	T	K	A	N	C	H	E	N	J	U	N	G	A	L	U	L	B	E
O	O	M	O	P	I	T	P	N	O	S	S	D	D	K	S	P	D	O	K
T	D	A	N	M	L	M	D	D	C	S	A	H	L	S	A	I	E	E	J
A	R	R	K	A	G	T	H	A	R	H	E	Y	D	H	H	A	I	A	R
N	S	A	A	L	I	A	T	L	E	I	Y	A	B	A	Y	T	H	R	L
A	Z	V	N	W	R	E	D	S	P	P	A	N	H	D	A	O	J	U	K
G	O	A	N	A	I	M	U	D	I	K	D	P	M	W	D	A	B	P	E
P	A	L	L	J	S	H	E	V	R	I	Y	E	V	E	R	E	S	T	M
U	O	I	M	Y	R	Y	P	A	T	L	I	G	J	E	I	T	H	A	R
R	K	I	Q	S	L	A	H	C	N	A	V	R	V	P	E	A	T	S	P

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CLASS

11TH

UNIT II

PHYSIOGRAPHY

This unit deals with

- *Structure and Relief; physiographic divisions*
- *Drainage systems: concept of water sheds — the Himalayan and the Peninsular*



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STRUCTURE AND PHYSIOGRAPHY

Do you know that our earth also has a history. The earth and its landforms that we see today have evolved over a very long time. Current estimation shows that the earth is approximately 4600 million years old. Over these long years, it has undergone many changes brought about primarily by the endogenic and exogenic forces. These forces have played a significant role in giving shape to various surface and subsurface features of the earth. You have already studied about the Plate Tectonics and the movement of the Earth's plates in the book *Fundamentals of Physical Geography* (NCERT, 2006). Do you know that the Indian plate was to the south of the equator millions of years ago? Do you also know that it was much larger in size and the Australian plate was a part of it? Over millions of years, this plate broke into many parts and the Australian plate moved towards the southeastern direction and the Indian plate to the north. Can you map different phases in the movement of the Indian plate? This northward movement of the Indian plate is still continuing and it has significant consequences on the physical environment of the Indian subcontinent. Can you name some important consequences of the northward movement of the Indian plate?

It is primarily through the interplay of these endogenic and exogenic forces and lateral movements of the plates that the present geological structure and geomorphologic processes active in the Indian subcontinent came into existence. Based on the variations in its geological structure and formations, India can be divided into three geological divisions. These

geological regions broadly follow the physical features:

- (i) The Peninsular Block
- (ii) The Himalayas and other Peninsular Mountains
- (iii) Indo-Ganga-Brahmaputra Plain.

THE PENINSULAR BLOCK

The northern boundary of the Peninsular Block may be taken as an irregular line running from Kachchh along the western flank of the Aravali Range near Delhi and then roughly parallel to the Yamuna and the Ganga as far as the Rajmahal Hills and the Ganga delta. Apart from these, the Karbi Anglong and the Meghalaya Plateau in the northeast and Rajasthan in the west are also extensions of this block. The northeastern parts are separated by the Malda fault in West Bengal from the Chotanagpur plateau. In Rajasthan, the desert and other desert-like features overlay this block.

The Peninsula is formed essentially by a great complex of very ancient gneisses and granites, which constitutes a major part of it. Since the Cambrian period, the Peninsula has been standing like a rigid block with the exception of some of its western coast which is submerged beneath the sea and some other parts changed due to tectonic activity without affecting the original basement. As a part of the Indo-Australian Plate, it has been subjected to various vertical movements and block faulting. The rift valleys of the Narmada, the Tapi and the Mahanadi and the Satpura block

mountains are some examples of it. The Peninsula mostly consists of relict and residual mountains like the Aravali hills, the Nallamala hills, the Javadi hills, the Veliconda hills, the Palkonda range and the Mahendragiri hills, etc. The river valleys here are shallow with low gradients.

You are aware of the method of calculating the gradient as a part of your study of the book *Practical Work in Geography- Part I* (NCERT, 2006). Can you calculate the gradient of the Himalayan and the Peninsular rivers and draw the comparisons?

Most of the east flowing rivers form deltas before entering into the Bay of Bengal. The deltas formed by the Mahanadi, the Krishna, the Kaveri and the Godavari are important examples.

THE HIMALAYAS AND OTHER PENINSULAR MOUNTAINS

The Himalayas along with other Peninsular mountains are young, weak and flexible in their geological structure unlike the rigid and stable Peninsular Block. Consequently, they are still subjected to the interplay of exogenic and endogenic forces, resulting in the development of faults, folds and thrust plains. These



Figure 2.1 : A Gorge

mountains are tectonic in origin, dissected by fast-flowing rivers which are in their youthful stage. Various landforms like gorges, V-shaped valleys, rapids, waterfalls, etc. are indicative of this stage.

INDO-GANGA-BRAHMAPUTRA PLAIN

The third geological division of India comprises the plains formed by the river Indus, the Ganga and the Brahmaputra. Originally, it was a geo-synclinal depression which attained its maximum development during the third phase of the Himalayan mountain formation approximately about 64 million years ago. Since then, it has been gradually filled by the sediments brought by the Himalayan and Peninsular rivers. Average depth of alluvial deposits in these plains ranges from 1,000-2,000 m.

It is evident from the above discussion that there are significant variations among the different regions of India in terms of their geological structure, which has far-reaching impact upon other related aspects. Variations in the physiography and relief are important among these. The relief and physiography of India has been greatly influenced by the geological and geomorphological processes active in the Indian subcontinent.

PHYSIOGRAPHY

'Physiography' of an area is the outcome of structure, process and the stage of development. The land of India is characterised by great diversity in its physical features. The north has a vast expanse of rugged topography consisting of a series of mountain ranges with varied peaks, beautiful valleys and deep gorges. The south consists of stable table land with highly dissected plateaus, denuded rocks and developed series of scarps. In between these two lies the vast north Indian plain.

Based on these macro variations, India can be divided into the following physiographic divisions:

- (1) The Northern and North-eastern Mountains
- (2) The Northern Plain



Figure 2.2 : India : Physical

- (3) The Peninsular Plateau
- (4) The Indian Desert
- (5) The Coastal Plains
- (6) The Islands.

The North and Northeastern Mountains

The North and Northeastern Mountains consist of the Himalayas and the Northeastern hills. The Himalayas consist of a series of parallel mountain ranges. Some of the important ranges are the Greater Himalayan range, which includes the Great Himalayas and the Shiwalik. The general orientation of these ranges is from northwest to the southeast direction in the northwestern part of India. Himalayas in the Darjiling and Sikkim regions lie in an eastwest direction, while in Arunachal Pradesh they are from southwest to the northwest direction. In Nagaland, Manipur and Mizoram, they are in the northsouth direction. The approximate length of the Great Himalayan range, also known as the central axial range, is 2,500 km from east to west, and their width varies between 160-400 km from north to south. It is also evident from the map that the Himalayas stand almost like a strong and long wall between the Indian subcontinent and the Central and East Asian countries.

Himalayas are not only the physical barrier, they are also a climatic, drainage and cultural divide. Can you identify the impact of Himalayas on the geoenvironment of the countries of South Asia? Can you find some other examples of similar geoenvironmental divide in the world?



Figure 2.3 : The Himalayas

The Northern Plains

The northern plains are formed by the alluvial deposits brought by the rivers –

the Indus, the Ganga and the Brahmaputra. These plains extend approximately 3,200 km from the east to the west. The average width of these plains varies between 150-300 km. The maximum depth of alluvium deposits varies between 1,000-2,000 m. From the north to the south, these can be divided into three major zones: the Bhabar, the Tarai and the alluvial plains. The alluvial plains can be further divided into the Khadar and the Bhangar.

Bhabar is a narrow belt ranging between 8-10 km parallel to the Shiwalik foothills at the break-up of the slope. As a result of this, the streams and rivers coming from the mountains deposit heavy materials of rocks and boulders, and at times, disappear in this zone. South of the Bhabar is the Tarai belt, with an approximate width of 10-20 km where most of the streams and rivers re-emerge without having any properly demarcated channel, thereby, creating marshy and swampy conditions known as the Tarai. This has a luxurious growth of natural vegetation and houses a varied wildlife.

The south of Tarai is a belt consisting of old and new alluvial deposits known as the Bhangar and Khadar respectively. These plains have characteristic features of mature stage of fluvial erosional and depositional landforms such as sand bars, meanders, oxbow lakes and braided channels. The Brahmaputra plains are known for their riverine islands and sand bars. Most of these areas are subjected to periodic floods



Figure 2.4 : Northern Plain

and shifting river courses forming braided streams.

The mouths of these mighty rivers also form some of the largest deltas of the world, for example, the famous Sunderbans delta. Otherwise, this is a featureless plain with a general elevation of 50-150 m above the mean sea level. The states of Haryana and Delhi form a water divide between the Indus and the Ganga river systems. As opposed to this, the Brahmaputra river flows from the northeast to the southwest direction before it takes an almost 90° southward turn at Dhubri before it enters into Bangladesh. These river valley plains have a fertile alluvial soil cover which supports a variety of crops like wheat, rice, sugarcane and jute, and hence, supports a large population.

The Peninsular Plateau

Rising from the height of 150 m above the river plains up to an elevation of 600-900 m is the irregular triangle known as the Peninsular plateau. Delhi ridge in the northwest, (extension of Aravalis), the Rajmahal hills in the east, Gir range in the west and the Cardamom hills in the south constitute the outer extent of the Peninsular plateau. However, an extension of this is also seen in the northeast, in the form of Shillong and Karbi-Anglong plateau. The Peninsular India is made up of a series of patland plateaus such as the Hazaribagh



Figure 2.5 : A Part of Peninsular Plateau

plateau, the Palamu plateau, the Ranchi plateau, the Malwa plateau, the Coimbatore plateau and the Karnataka plateau, etc. This is one of the oldest and the most stable landmass of India. The general elevation of the plateau is from the west to the east, which is also proved by the pattern of the flow of rivers. Name some rivers of the Peninsular plateau which have their confluence in the Bay of Bengal and the Arabian sea and mention some landforms which are typical to the east flowing rivers but are absent in the west flowing rivers. Some of the important physiographic features of this region are tors, block mountains, rift valleys, spurs, bare rocky structures, series of hummocky hills and wall-like quartzite dykes offering natural sites for water storage. The western and northwestern part of the plateau has an emphatic presence of black soil.

This Peninsular plateau has undergone recurrent phases of upliftment and submergence accompanied by crustal faulting and fractures. (The Bhima fault needs special mention, because of its recurrent seismic activities). These spatial variations have brought in elements of diversity in the relief of the Peninsular plateau. The northwestern part of the plateau has a complex relief of ravines and gorges. The ravines of Chambal, Bhind and Morena are some of the well-known examples.

On the basis of the prominent relief features, the Peninsular plateau can be divided into three broad groups:

- (i) The Deccan Plateau
- (ii) The Central Highlands
- (iii) The Northeastern Plateau.

The Deccan Plateau

This is bordered by the Western Ghats in the west, Eastern Ghats in the east and the Satpura, Maikal range and Mahadeo hills in the north. Western Ghats are locally known by different names such as Sahyadri in Maharashtra, Nilgiri hills in Karnataka and Tamil Nadu and Anaimalai hills and Cardamom hills in Kerala. Western Ghats are

comparatively higher in elevation and more continuous than the Eastern Ghats. Their average elevation is about 1,500 m with the height increasing from north to south. 'Anaimudi' (2,695 m), the highest peak of Peninsular plateau is located on the Anaimalai hills of the Western Ghats followed by Dodabetta (2,637 m) on the Nilgiri hills. Most of the Peninsular rivers have their origin in the Western Ghats. Eastern Ghats comprising the discontinuous and low hills are highly eroded by the rivers such as the Mahanadi, the Godavari, the Krishna, the Kaveri, etc. Some of the important ranges include the Javadi hills, the Palconda range, the Nallamala hills, the Mahendragiri hills, etc. The Eastern and the Western Ghats meet each other at the Nilgiri hills.

The Central Highlands

They are bounded to the west by the Aravali range. The Satpura range is formed by a series of scarped plateaus on the south, generally at an elevation varying between 600-900 m above the mean sea level. This forms the northernmost boundary of the Deccan plateau. It is a classic example of the relict mountains which are highly denuded and form discontinuous ranges. The extension of the Peninsular plateau can be seen as far as Jaisalmer in the West, where it has been covered by the longitudinal sand ridges and crescent-shaped sand dunes called *barchans*. This region has undergone metamorphic processes in its geological history, which can be corroborated by the presence of metamorphic rocks such as marble, slate, gneiss, etc.

The general elevation of the Central Highlands ranges between 700-1,000 m above the mean sea level and it slopes towards the north and northeastern directions. Most of the tributaries of the river Yamuna have their origin in the Vindhyan and Kaimur ranges. Banas is the only significant tributary of the river Chambal that originates from the Aravalli in the west. An eastern extension of the Central Highland is formed by the Rajmahal hills, to the south of

which lies a large reserve of mineral resources in the Chotanagpur plateau.

The Northeastern Plateau

In fact it is an extension of the main Peninsular plateau. It is believed that due to the force exerted by the northeastward movement of the Indian plate at the time of the Himalayan origin, a huge fault was created between the Rajmahal hills and the Meghalaya plateau. Later, this depression got filled up by the deposition activity of the numerous rivers. Today, the Meghalaya and Karbi Anglong plateau stand detached from the main Peninsular Block. The Meghalaya plateau is further sub-divided into three: (i) The Garo Hills; (ii) The Khasi Hills; (iii) The Jaintia Hills, named after the tribal groups inhabiting this region. An extension of this is also seen in the Karbi Anglong hills of Assam. Similar to the Chotanagpur plateau, the Meghalaya plateau is also rich in mineral resources like coal, iron ore, sillimanite, limestone and uranium. This area receives maximum rainfall from the south west monsoon. As a result, the Meghalaya plateau has a highly eroded surface. Cherrapunji displays a bare rocky surface devoid of any permanent vegetation cover.

The Indian Desert

To the northwest of the Aravali hills lies the Great Indian desert. It is a land of undulating topography dotted with longitudinal dunes and *barchans*. This region receives low rainfall below 150 mm per year; hence, it has arid climate with low vegetation cover. It is because of these characteristic features that this is also known as *Marusthali*. It is believed that during the Mesozoic era, this region was under the sea. This can be corroborated by the evidence available at wood fossils park at Aakal and marine deposits around Brahmsar, near Jaisalmer (The approximate age of the wood-fossils is estimated to be 180 million years). Though the underlying rock structure of the desert is an extension of the Peninsular plateau, yet, due to extreme arid conditions, its surface



Figure 2.6 : The Indian Desert

Can you identify the type of sand dunes shown in this picture?

features have been carved by physical weathering and wind actions. Some of the well pronounced **desert land features present** here are **mushroom rocks**, shifting dunes and **oasis** (mostly in its southern part). On the basis of the orientation, **the desert can be divided into two parts**: the **northern part is sloping towards Sindh** and the **southern towards the Rann of Kachchh**. Most of the **rivers** in this region are **ephemeral**. The Luni river flowing in the southern part of the desert is of some significance. Low precipitation and high evaporation makes it a **water deficit region**. There are some streams which disappear after flowing for some distance and present a typical case of inland drainage by joining a lake or playa. The **lakes and the playas have brackish water** which is the **main source of obtaining salt**.

The Coastal Plains

You have already read that India has a long coastline. **On the basis of the location** and active geomorphological processes, it can be broadly **divided into two**: (i) the **western coastal plains**; (ii) the **eastern coastal plains**.

The **western coastal plains** are an example of **submerged coastal plain**. It is believed that the city of Dwaraka which was once a part of the Indian mainland situated along the west coast is submerged under water. Because of this submergence it is a **narrow belt** and

provides natural conditions for the development of **ports and harbours**. Kandla, Mazagaon, JLN port Navha Sheva, Marmagao, Mangalore, Cochin, etc. are some of the important natural ports located along the west coast. **Extending from the Gujarat coast** in the north to the **Kerala coast** in the south, the **western coast may be divided into** following divisions – the Kachchh and Kathiawar coast in **Gujarat**, Konkan coast in **Maharashtra**, Goan coast and Malabar coast in **Karnataka and Kerala** respectively. The western coastal plains are **narrow in the middle** and get **broader towards north and south**. The **rivers** flowing through this coastal plain **do not form any delta**. The **Malabar coast** has got certain **distinguishing features** in the **form of 'Kayals'** (backwaters), which are **used for fishing, inland navigation** and also due to its special attraction for tourists. Every year the **famous Nehru Trophy Vallamkali** (boat race) is held in **Punnamada Kayal** in Kerala.

As compared to the western coastal plain, the **eastern coastal plain is broader** and is an example of an **emergent coast**. There are **well-developed deltas** here, formed by the rivers flowing eastward in to the Bay of Bengal. These include the deltas of the Mahanadi, the Godavari, the Krishna and the Kaveri. Because of its emergent nature, it has **less number of ports and harbours**. The **continental shelf extends up to 500 km into the sea**, which **makes it difficult** for the development of **good ports and harbours**. Name some ports on the eastern coast.



Figure 2.7 : Coastal Plains

On 26 December 2004, the Andaman and Nicobar Islands experienced one of the most devastating natural calamity. Can you name the calamity and identify some other areas which were adversely affected by the same calamity? What was its major consequence?

The Islands

There are two major island groups in India – one in the Bay of Bengal and the other in the Arabian Sea. The Bay of Bengal island groups consist of about 572 islands/islets. These are situated roughly between 6°N-14°N and 92°E -94°E. The two principal groups of islets include the Ritchie's archipelago and the Labrynth island. The entire group of island is divided into two broad categories – the Andaman in the north and the Nicobar in the south. They are separated by a waterbody which is called the Ten degree channel. It is believed that these islands are an elevated portion of submarine mountains. However, some smaller islands are volcanic in origin. *Barren island*, the only active volcano in India is also situated in the Nicobar islands.

Some important mountain peaks in Andaman and Nicobar Islands are Saddle peak (North Andaman – 738 m), Mount Diavolo (Middle Andaman – 515 m), Mount Koyob (South Andaman – 460 m) and Mount Thuiller (Great Nicobar – 642 m).

The coastal line has some coral deposits, and beautiful beaches. These islands receive convectional rainfall and have an equatorial type of vegetation.

The islands of the Arabian sea include Lakshadweep and Minicoy. These are scattered between 8°N-12°N and 71°E -74°E longitude. These islands are located at a distance of 220 km-440 km off the Kerala coast. The entire island group is built of coral deposits. There are approximately 36 islands of which 11 are inhabited. *Minicoy* is the largest island with an area of 453 sq. km. The entire group of islands is broadly divided by the Nine degree channel, north of which is the Amini Island and to the south of the Canannore Island. The Islands of this archipelago have storm beaches consisting of unconsolidated pebbles, shingles, cobbles and boulders on the eastern seaboard.



Figure 2.8 : An Island

EXERCISES

1. Choose the right answer from the four alternatives given below.
 - (i) Which one of the water bodies separates the Andaman from the Nicobar?
 - (a) 11° Channel
 - (b) Gulf of Mannar
 - (c) 10° Channel
 - (d) Andaman Sea
 - (ii) On which of the following hill range is the 'Dodabeta' peak situated?
 - (a) Nilgiri hills
 - (b) Anaimalai hills
 - (c) Cardamom hills
 - (d) Nallamala hills
2. Answer the following questions in about 30 words.
 - (i) If a person is to travel to Lakshadweep, from which coastal plain does he prefer and why?
 - (ii) Where in India will you find a cold desert? Name some important ranges of this region.
 - (iii) Why is the western coastal plain devoid of any delta?
3. Answer the following questions in not more than 125 words.
 - (i) Make a comparison of the island groups of the Arabian Sea and the Bay of Bengal.
 - (ii) What are the important geomorphological features found in the river valley plains?
 - (iii) If you move from Badrinath to Sunderbans delta along the course of the river Ganga, what major geomorphological features will you come across?

Project/Activity

- (i) Make a list of major Himalayan peaks from the west to the east with the help of an atlas.
- (ii) Identify the major landforms of your state and analyse the major economic activity practised by the people in each landform.