SOCIAL SCIENCE II

Part 1

Standard X

Government of Kerala

Department of General Education

State Council of Educational Research and Training (SCERT), Kerala

2025

THE NATIONAL ANTHEM

Jana-gana-mana adhinayaka, jaya he
Bharatha-bhagya-vidhata
Punjab-Sindh-Gujarat-Maratha
Dravida-Utkala-.Banga
Vindhya-Himachala-Yamuna-Ganga
Uchchala-Jaladhi-taranga
Tava subha name jage,
Tava subha asisa mage,
Gahe tava jaya gatha
Jana-gana-mangala-dayaka jaya he
Bharatha-bhagya-vidhata.
Jaya he, jaya he, jaya he,
Jaya jaya jaya, jaya he!

PLEDGE

India is my country. All Indians are my brothers and sisters.

I love my country, and I am proud of its rich and varied heritage. I shall always strive to be worthy of it.

I shall give my parents, teachers, and all elders, respect and treat everyone with courtesy.

To my country and my people, I pledge my devotion. In their well-being and prosperity alone lies my happiness.

SOCIAL SCIENCE II

10

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Dear Students,

The life and habitat of living organisms on the Earth develops in accordance with geographical features such as physiography and climate. It has been revealed through studies that small changes in the ecological balance of the environment can adversely affect the existence of the ecosystem. In the present time, as several natural disasters occur frequently, any further changes in relief and climate could worsen the situation even more. The social science textbook presented to students who are now in 10th standard discusses such topics.

Besides this, the topics in economics essential for the people to live in our society are also included in this textbook.

You will be a part of building the society of tomorrow by discussing these topics with great enthusiasm and caution.

Wishing you the success

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CONTENTS

Some symbols are used in this book for ease of study

For additional reading - not for assessment

Learning activity

Assessment Questions

Extended Activities

THE CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a [1]**[SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC]** and to secure to all its citizens :

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity; and to promote among them all

FRATERNITY assuring the dignity of the individual and the [2][unity and integrity of the Nation];

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949 do **HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.**

---

1. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Sovereign Democratic Republic" (w.e.f. 3.1.1977)
2. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Unity of the Nation" (w.e.f. 3.1.1977)

1 Weather and Climate

Fig 1.1

Observe the present atmospheric condition at your place. Are the atmospheric conditions that we experience such as sun light, rain, mist, wind, cloud, and the conditions such as hot and cold stable? The atmospheric conditions of any place depend on the factors such as temperature, pressure, wind and humidity. They in turn, are influenced by the amount of sunlight available there. Hence these are called **elements of weather**.

Atmospheric conditions such as temperature, pressure, wind, humidity and precipitation for a shorter period of time are termed as **Weather**.

The average weather condition experienced for a longer period over a larger area is termed as the **Climate**. The climate of a place is determined by considering the weather conditions of about 35 to 40 years. The climatic conditions of any place is detrimental to the diverse flora and fauna as well as human life of the place. The influence of climatic elements is evident not only in the food habits, dressing, settlement and occupation but also in the physical and mental conditions and in the colour and race of mankind as well. Agricultural practices world over mainly correspond to the climatic conditions. Weather has always been an influential factor right from the early marine voyages which revolutionised the world history, to the modern transport and communication systems.

Conduct a discussion in the class on the significance of weather studies in day-to-day human activities.

Hints: Agriculture, travel/ transport, fishing, tourism

Indian Meteorological Department (IMD)

Indian Meteorological Department is the agency functioning under the Ministry of Earth Sciences, Government of India. This is the principal agency responsible for the weather observations, weather forecast etc. in the country. Delhi is the headquarters of IMD. Hundreds of observation stations are functioning at various places in India as well as in Antarctica.

Let's have a detailed overview on the elements of weather and climate, being influential on every human activity on the earth.

Atmospheric Temperature

As you know, the sun is the sole source of energy for the earth. Energy is produced in the sun by nuclear fusion. Haven't you studied about nuclear fusion in the science class?

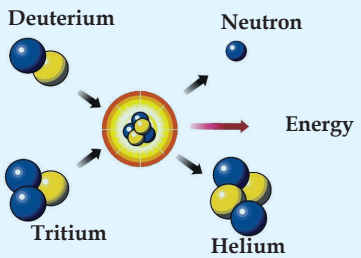
Massive amount of energy continuously produced in the sun through nuclear fusion is emitted in the form of short waves. Only a small amount of energy radiated from the sun reaches the earth's surface (approximately one part of 200 million). The amount of sun's rays reaching the earth's surface is called **Insolation**.

A part of insolation coming towards the earth gets reflected or absorbed by the atmospheric particles such as clouds and dust particles. As the incoming solar radiation is in the form of short waves, it does not heat the atmosphere considerably.

The earth's surface gets heated by insolation. Then the heat is transferred to the atmosphere through various processes from the earth's surface. Conduction, convection, advection and radiation are the major processes of heat transfer.

Nuclear Fusion

Nuclear fusion is the reaction in which two or more atomic nuclei collide and merge together to form a larger atom. This process is common in the case of elements with lower atomic number. Massive amount of energy is generated through this process.



In all the stars including the sun, energy is continuously generated through nuclear fusion. It is estimated that 600 million tonnes of Hydrogen is being converted to Helium every second in the sun through this process.

Processes of heat transfer in the atmosphere

Conduction : Heat is transferred to the lower part of the atmosphere which is directly in contact with the surface of the earth.

Convection: As the heated air expands and rises up, heat is transferred to higher reaches of the atmosphere.

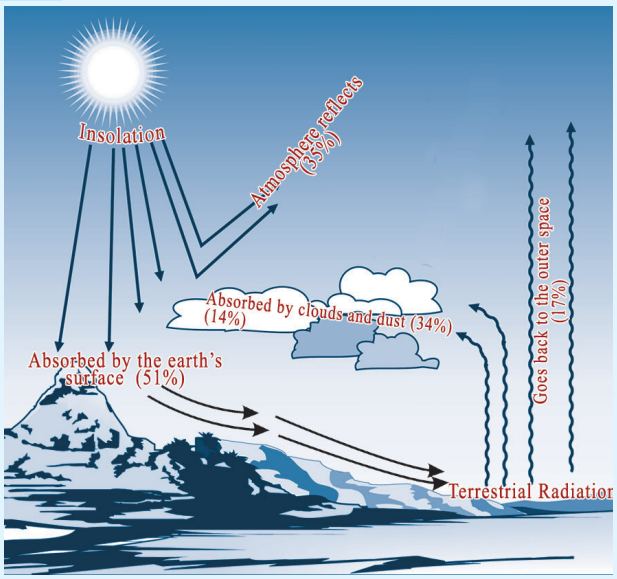
Advection: Heat is transferred horizontally through wind.

Radiation: Emission of energy in the form of long waves after the earth's surface gets heated up.

Short waves and Long waves

Energy is radiated in the form of short waves from hotter objects. Due to high frequency, the short waves traverse through the atmosphere without obstruction. Objects with relatively less heat radiate energy in the form of long waves. Due to low frequency, long waves will be absorbed or reflected by the atmospheric particles.

Heat Budget



Consider the total amount of solar energy reaching the top of the atmosphere of the earth as 100 units. Out of this, 35 units will be reflected back and 14 units will be absorbed by the atmospheric particles. The total amount of energy reaching the surface of the earth is estimated as 51 units. Out of this, 34 units will be transferred to the atmosphere through the processes of heat transfer such as conduction and convection. By re-radiating 17 units of energy directly from the earth's surface and 48 units from the atmosphere, the entire energy received by the earth and its atmosphere gets sent back.

The re-radiation of energy in the form of long waves from the earth's surface is called **Terrestrial radiation.** The absorption of terrestrial radiation by the atmospheric gases such as carbon dioxide heats up the atmosphere. This phenomenon is termed as **Green House Effect.**

What are Green Houses? Inquire.

Almost entire energy reaching the earth as insolation is radiated back every day Thus the surface temperature of the earth remains balanced without becoming extremely hot or cold. This process of heat balancing is called the **Heat Budget of the Earth.**

Discuss the importance of heat budget in sustaining the earth as a life supporting planet.

Do we get the same amount of energy from the sun throughout the day?

The surface temperature of the earth gradually increases by the flow of insolation since the sun rise and attains the maximum by the noon. As the atmosphere is heated through various processes of heat transfer, it takes more time for the atmosphere to get heated up than the time taken for the earth's surface. Thus the temperature recorded at 2pm is considered as the maximum temperature of the day by the meteorologists. The surface temperature of the earth gradually decreases in the afternoon due to the decrease in intensity of insolation as well as the simultaneous terrestrial radiation. The earth's surface as well as the atmosphere get cooled by more energy loss through terrestrial radiation during night. Thus the temperature recorded just before the sun rise is considered as the minimum temperature of the day.

Maximum – Minimum Thermometer

Atmospheric temperature is measured using an instrument called Thermometer.

Maximum – Minimum thermometer is a special type of instrument made by connecting two ordinary thermometers using a U-shaped glass tube. The Maximum temperature and the Minimum temperature of a day can be read out from the recordings of a Maximum-Minimum thermometer.

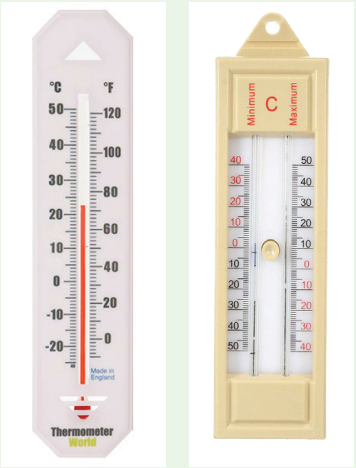


Fig 1.2

Degree Celsius and Degree Fahrenheit are the common units for recording temperature. In Fahrenheit the melting point of water is 32° and the boiling point is 212°. This is equivalent to 0° Celsius and 100° Celsius respectively.

$$°F = °C \times \frac{9}{5} + 32$$

$$°C = (°F - 32)\ \frac{5}{9}$$

By making use of the maximum temperature and the minimum temperature, diurnal range of temperature and daily mean temperature can be calculated.

Diurnal range of temperature is the difference between the maximum temperature and the minimum temperature of a day.

Diurnal Range = Maximum temperature – Minimum temperature

The average temperature of a day is called as **Daily mean temperature.**

$$\text{Daily mean temperature} = \frac{\text{Maximum temperature} + \text{Minimum temperature}}{2}$$

Heat and Temperature

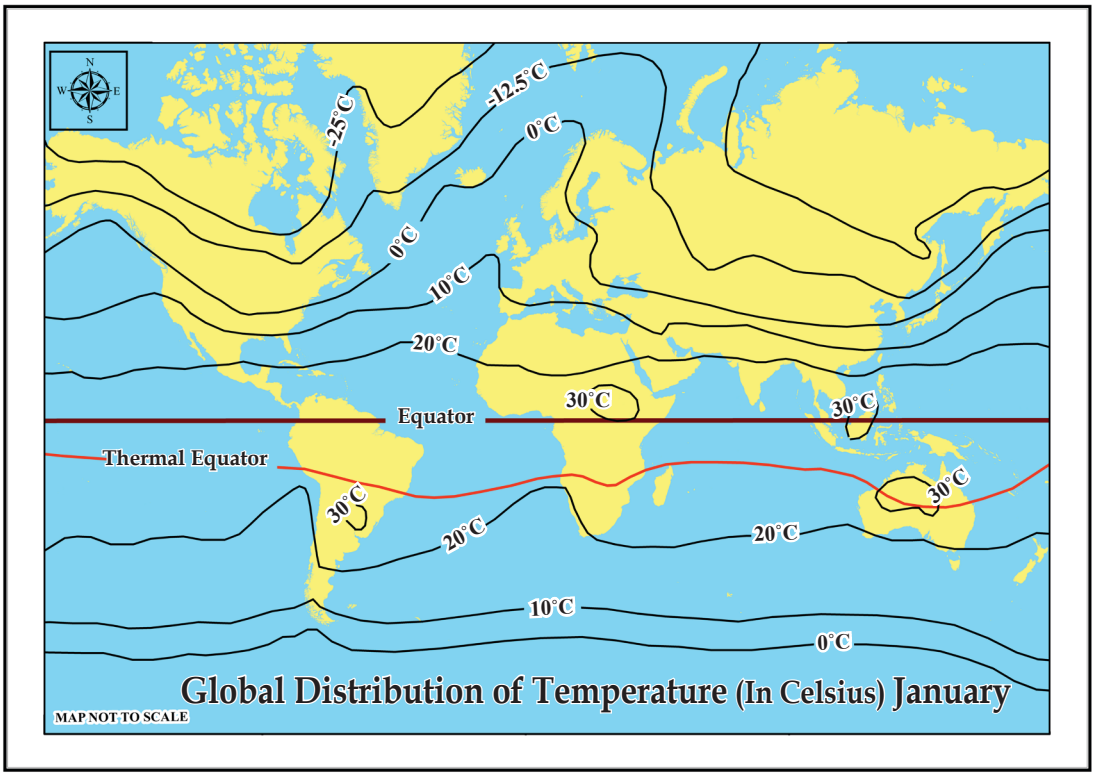
The total energy of an object due to molecular movement is termed as Heat. It is measured in Joule.

Degree of hotness of an object is its temperature. Temperature is recorded in units such as Degree Celsius, Degree Fahrenheit and Kelvin.

Calculate the diurnal range of temperature and the daily mean temperature if the maximum and minimum temperatures of a place are 36° C and 28° C respectively.

Data regarding the temperature are being utilized for climatic studies and further analysis. Plotting the temperature recorded at specific places, smooth curved lines are drawn connecting the places having equal temperature. These imaginary lines are called **Isotherms**. Isotherm maps are very useful for analysing temperature distribution.

See the map showing the world distribution of temperature using isotherms (Fig 1.3).



Global Distribution of Temperature- Isotherm Map
Fig 1.3

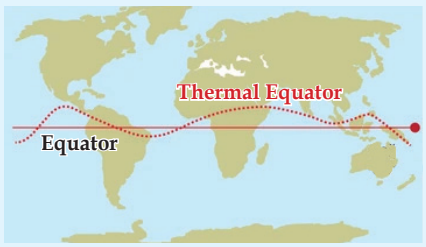
Is the distribution pattern of isotherms shown in the map uniform? You might have noticed that the temperature gradually decreases while moving away from the equator.

The isotherms show a noticeable bend along land-sea confluences. What may be the reason?

Compared to the Northern Hemisphere, Isotherms are more or less parallel to the latitudes in the Southern Hemisphere. Why?

There is spatial and temporal variation in the temperature experienced on earth. Let's examine the factors influencing the distribution of temperature.

Thermal Equator



Imaginary line connecting places with highest mean annual temperature along every longitude is termed as Thermal Equator.

Latitude

Very high temperature is experienced along the equatorial regions where the incidence of sun's rays is almost vertical.

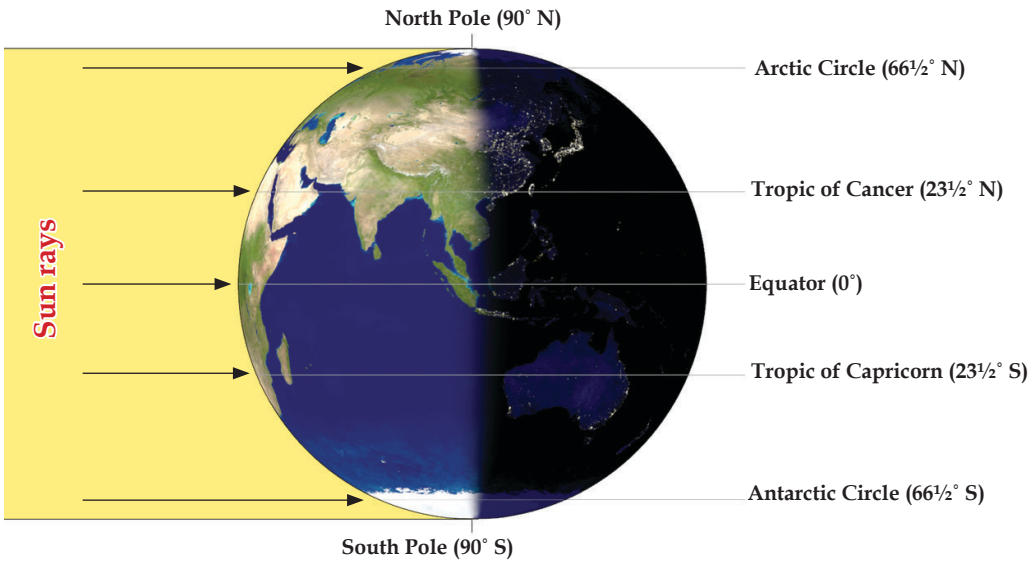
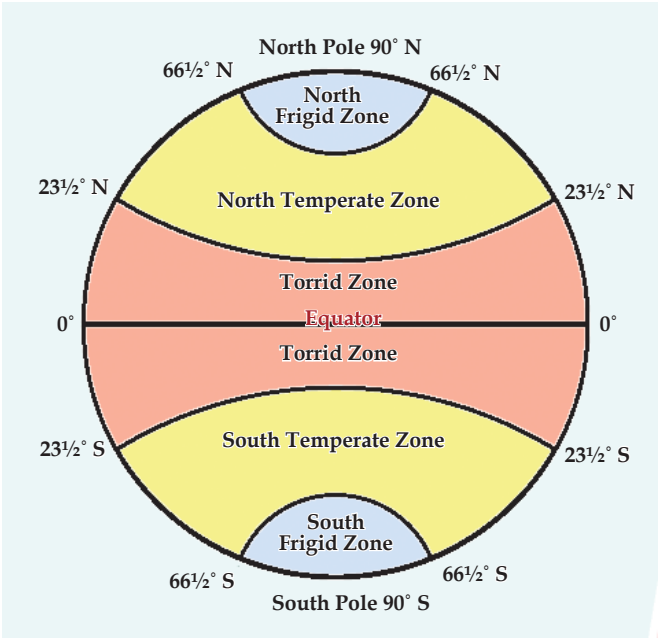


Fig 1.4

Owing to the spherical shape of the earth, the incidence of sun's rays are more inclined away from the equator towards the poles. Thus the temperature gradually decreases towards both the poles. On the basis of this, different temperature zones may be formed.



Temperature Zones
Fig 1.5

Observe the diagram (Fig 1.5). Familiarise the temperature zones and identify the latitudes between which these zones are located.

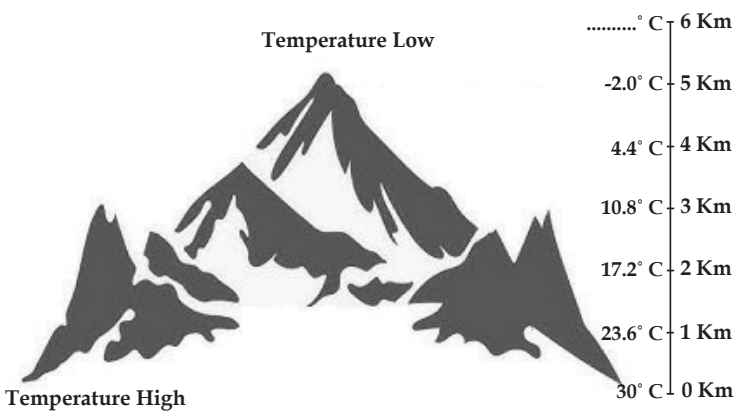


Fig 1.6

Altitude

Atmospheric temperature gradually decreases with increase in altitude. The phenomenon of gradual decrease in temperature at the rate of 6.4° Celsius per kilometre of altitude is termed as **Normal Lapse Rate.**

Observe the diagram (Fig 1.6). Familiarise the decrease in temperature with altitude. Estimate the temperature at 6 km altitude and label it.

Why do we generally experience low temperature at places situated at higher elevations such as Ooty, Munnar and Kodaikanal?

Differential Heating of Land and Sea

Compared to sea, land gets heated and cooled at a faster rate. Thus the land areas experience higher summer temperature and lower winter temperature, when compared to sea.

Distance from the Sea

The winds blowing from land to sea and vice versa help to moderate the temperature experienced along coastal areas. Away from the sea, the maritime influence gradually decreases to cause very high day temperature and low night temperature.

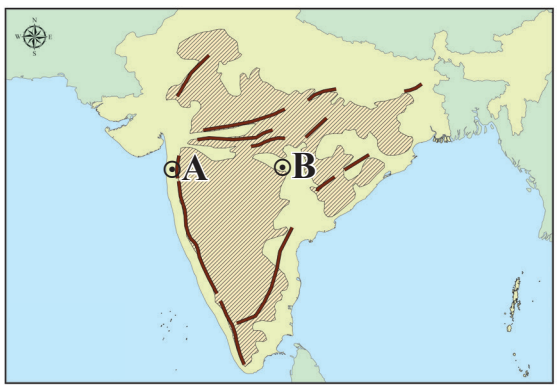


Fig 1.7

Look at the diagram (Fig 1.7). Analyse , which place, A or B, experiences the highest diurnal range of temperature. Give reason for your answer.

Diurnal range of temperature is generally low in Kerala. Why?

Ocean Currents

The temperature along the coastal regions is raised or lowered by the warm currents and cold currents respectively as they pass by. For example, the warm current called North Atlantic Current gives relief for the Western European countries

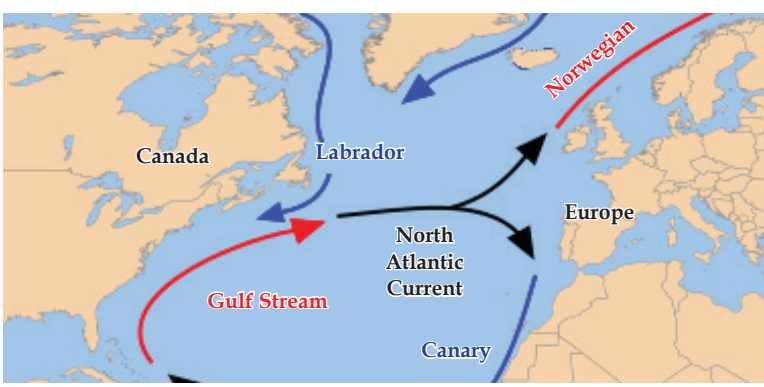


Fig 1.8

from severe cold. On the other hand, the places situated along the North Eastern Canada, which are also in the same latitude, experience severe cold for months due to the influence of Labrador cold current.

Relief

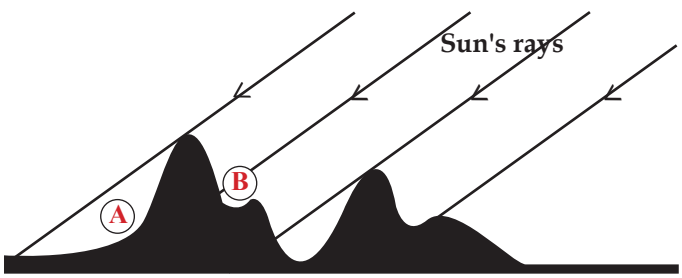


Fig 1.9

Observe fig 1.9, which of the two mountain slopes marked as A and B gets more sunlight? Now you must have understood that the availability of sunlight differs from one place to another in accordance with the relief. Due to this difference, the mountain slopes facing the sun experience higher temperature and opposite slopes experience lower temperature.

Barometer

Fig 1.10

Fig 1.11

Barometer is the instrument used to measure atmospheric pressure. Barometers are of different types such as Mercury Barometer (Fig 1.10) and Aneroid Barometer (Fig 1.11). In Mercury Barometer, the average pressure on the earth's surface is recorded as 76 cm. Atmospheric pressure is usually recorded in units millibars (mb) or hectopascal (hpa). The average atmospheric pressure experienced on the earth's surface is estimated as 1013.2mb or hpa.

Now you might have understood that there is spatial and temporal variability in the distribution of temperature and also know the reasons for the same.

Let's see how these spatio-temporal variations in temperature influence other atmospheric phenomena.

Atmospheric Pressure and Winds

Like any other matter, air also has weight. The weight exerted by the atmospheric air over the earth's surface is termed as **Atmospheric Pressure.**

Following are the factors affecting atmospheric pressure.

- Temperature
- Altitude
- Humidity

Let's examine how these factors influence atmospheric pressure.

Atmospheric air expands on getting heated, and rises up. Thus low pressure regions are formed. This rising air gradually cools, contracts and subsides to form high pressure regions. As the density of atmospheric gases decreases with increase in altitude, atmospheric pressure gradually decreases. The vertical variation of atmospheric pressure is at the rate of about 1mb per 10 metres.

Why do we feel discomfort like clogging of ears while travelling to higher elevations?

As the humidity increases, the water molecules displace the heavier gases in the atmosphere like nitrogen and oxygen. The atmospheric pressure becomes low, as humid air is lighter than dry air.

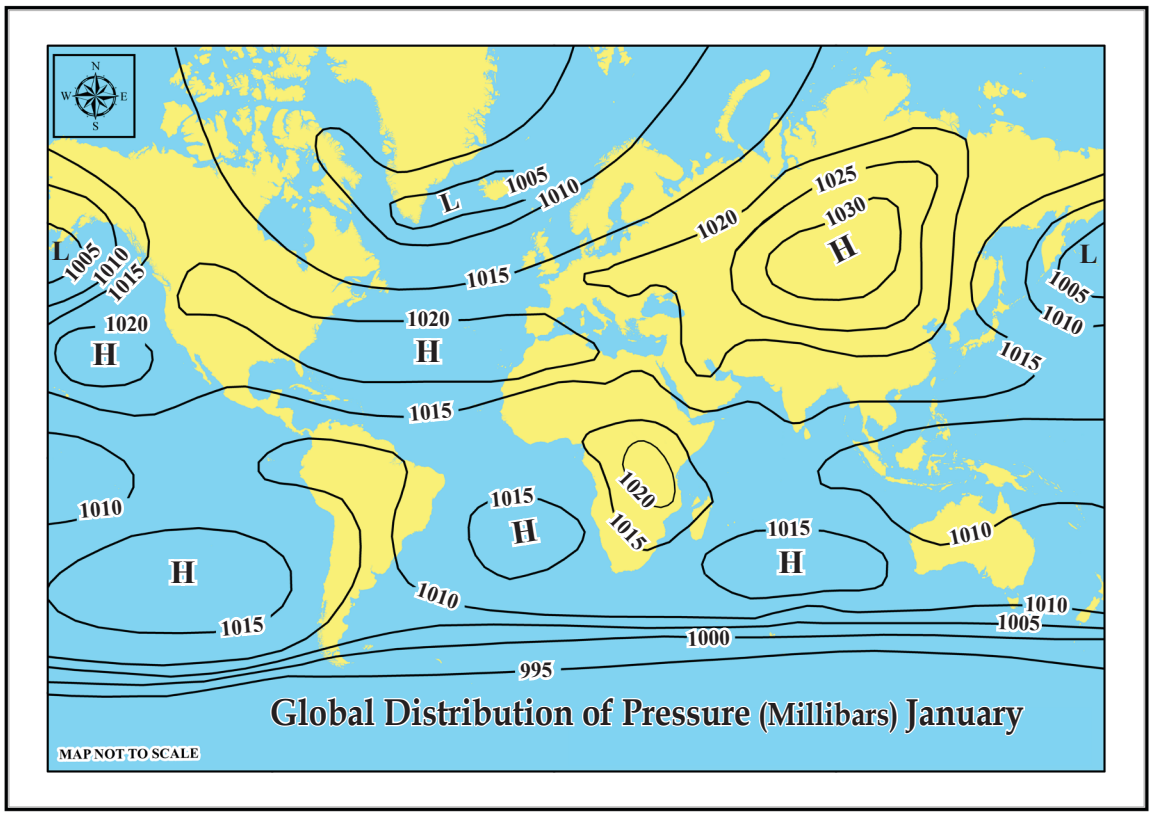
Do you know?

We do not feel the severe pressure exerted by the atmospheric air on us. This is because our body exerts an equivalent body pressure (opposing pressure) to balance this.

Coastal regions experience comparatively lower atmospheric pressure than interior locations. Why?

The air movements right from light breezes to violent gales are the results of variations in atmospheric pressure. Thus, thorough analysis regarding the spatial distribution of atmospheric pressure is essential for meteorological purposes. Smooth curved lines are drawn on maps to connect places having equal atmospheric pressure. These imaginary lines are called **Isobars.**

Map showing the world distribution of atmospheric pressure using isobars is given below (Fig 1.12). The symbol 'H' represents High Pressure Centres and 'L' Low Pressure Centres.



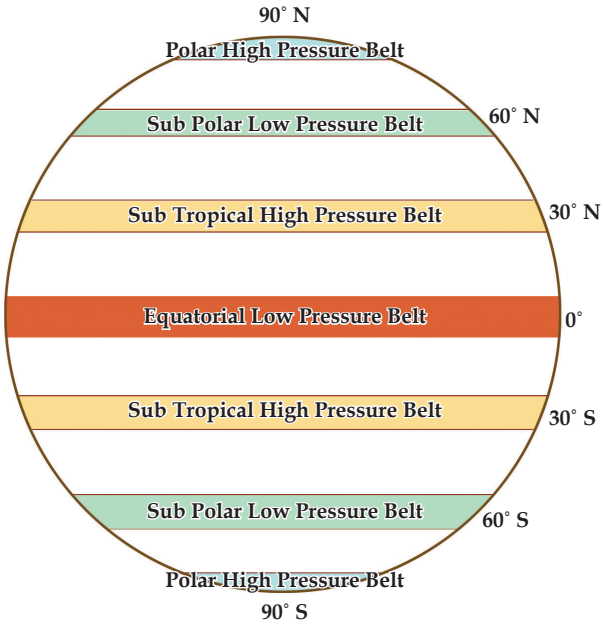
Global Distribution of Pressure - Isobar Map
Fig 1.12

Download the pressure distribution maps of different seasons with the help of ICT and familiarise the difference in pressure distribution.

As we know, temperature is inversely proportional to pressure. Thus the lowest atmospheric pressure might be experienced in the equatorial region and the highest might be in the polar regions. The pressure should therefore increase from the equator towards the poles. But actually this is not the case. Distinct pressure conditions prevail at certain specific zones due to the influence of the rotation of the earth. Different pressure belts are formed along certain specific latitudinal zones. These are called **Global Pressure Belts.**

Global Pressure Belts

Observe the given diagram (Fig 1.13) and identify the major Global Pressure Belts.



Global Pressure Belts
Fig 1.13

The expansion and rising up of air due to high temperature prevailing in the equatorial region is the cause for the formation of **Equatorial Low Pressure Belt.** This zone of vertical air currents is devoid of winds. Being the windless zone, this pressure belt is called **Doldrum.**

As we know the atmospheric conditions along the poles are just opposite to that in equatorial region. **Polar High Pressure Belts** are formed as a result of the contraction and subsidence of cold air.

The rising warm air along the equatorial region moves polewards as upper air winds which gradually cool and subside at about 30° North and 30° South latitudes. This results in the formation of **Sub Tropical High Pressure Belts.**

At about 60° North and 60° South latitudes, normally high pressure zones should be formed due to lower temperature conditions. But owing to the continuous throwing up of air along these regions caused by the influence of the rotation of the earth **Sub Polar Low Pressure Belts** are formed.

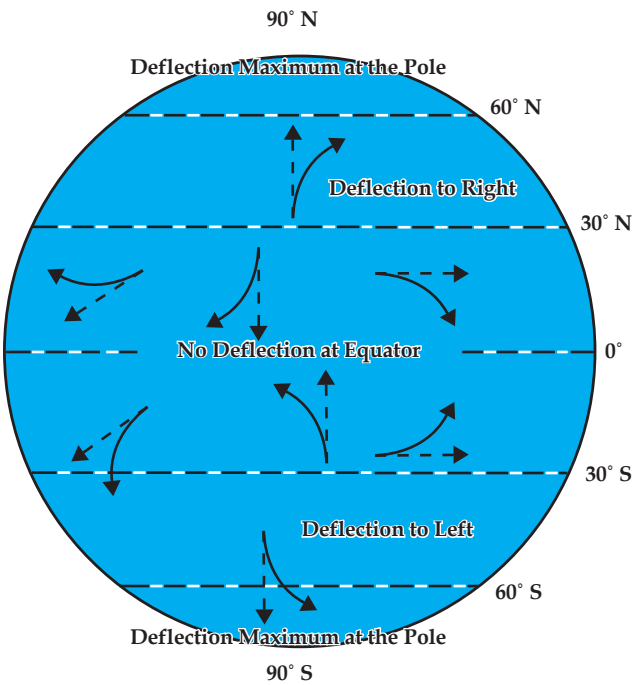
As the temperature conditions vary with the apparent movement of the sun, the global pressure belts are subjected to relative shifts. Global pressure belts may shift to about 5° to 10° northwards during summer season and shift southward

during winter season. This shifting of global pressure belts has decisive influence on global climate.

The pressure differences in the atmosphere are largely noticeable through air movements. There are two types of air movements in the atmosphere – Air Currents and Winds. **Air Currents** are the vertical movements of air and **Winds** are the horizontal movements of air from high pressure areas to low pressure areas. Winds are of different types, varying from light breezes to devastating gales.

Winds are named according to the direction from which they blow. For example, the winds blowing from the south west are termed as south west winds and the winds blowing from the sea towards the land are termed as sea breezes.

What is the name given to the monsoon winds blowing towards the north east direction in India?



Coriolis Force
Fig 1.14

One of the major factors influencing the direction of winds is the **Coriolis Force.** You have learnt about Coriolis Force in your earlier classes. What is Coriolis Force?

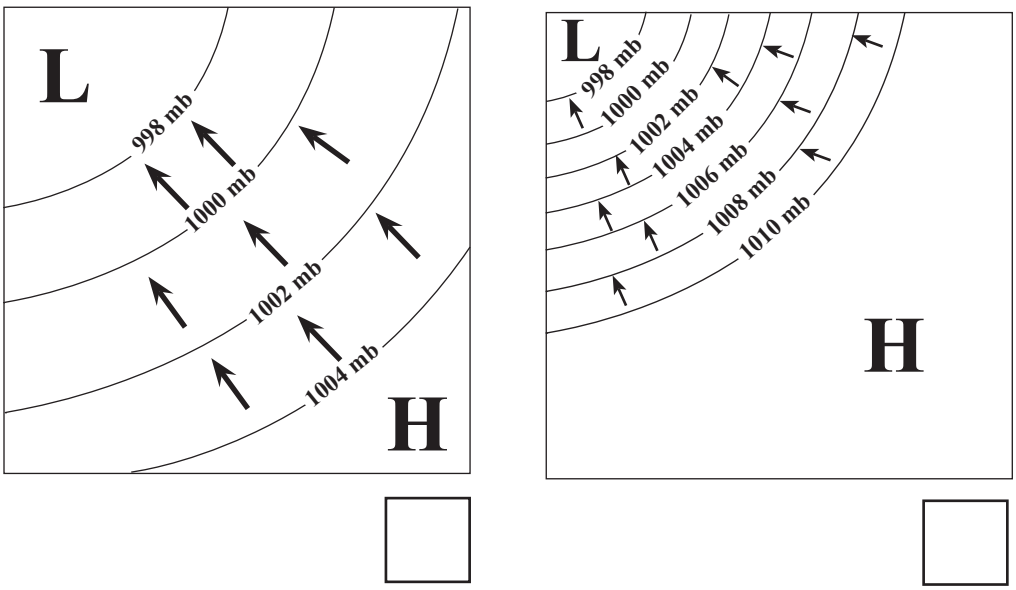
Owing to the Coriolis effect, the winds will deflect towards the right of its direction in the Northern Hemisphere and towards the left of its direction in the Southern Hemisphere.

The speed and intensity of winds are influenced mainly by two factors.

- Pressure gradient force
- Frictional force

Pressure gradient is the change in pressure over a horizontal distance. If there is considerable change in pressure between nearby places, it indicates high pressure gradient. If there is no considerable difference of pressure over horizontal distance, pressure gradient is said to be low. At places where there is high pressure gradient, winds will be strong.

Analyse the patterns of isobars given below (fig 1.15) and find out where the winds are strong. (Put a tick mark)



Pressure Gradient
Fig 1.15

The friction caused by hills, mountains, forests and man-made structures will obstruct the free flow of winds.

Winds are comparatively stronger over oceans than over continents. Why?

Anemometer and Wind Vane

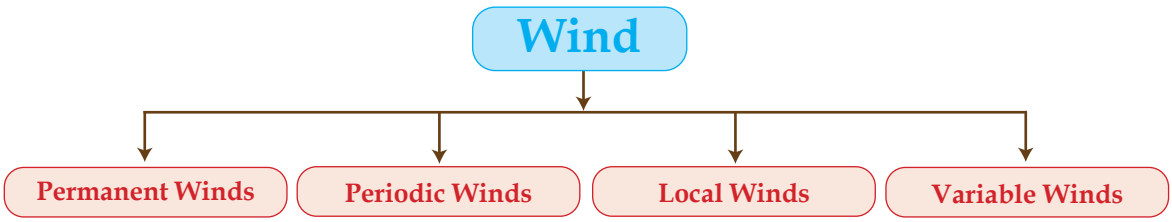
Anemometer is the instrument used to measure the speed of wind. The distance travelled by wind per hour can be estimated using this instrument.

Wind Vane is the instrument which indicates the direction of wind.

Fig 1.16

Now you might have understood how the winds are formed and also have familiarised the factors influencing the speed and direction of wind.

Let's go through the different types of winds.



Permanent Winds

The winds blowing constantly over a particular direction throughout the year are called **Permanent winds**. These winds are also known as prevailing winds and planetary winds. These winds blow between global pressure belts. Trade winds, Westerlies and Polar winds are the major permanent winds.

Observe the diagram (Fig 1.17) and identify the pressure belts between which each of these permanent winds blow. Make use of the diagram showing the global pressure belts (Fig 1.13) also.

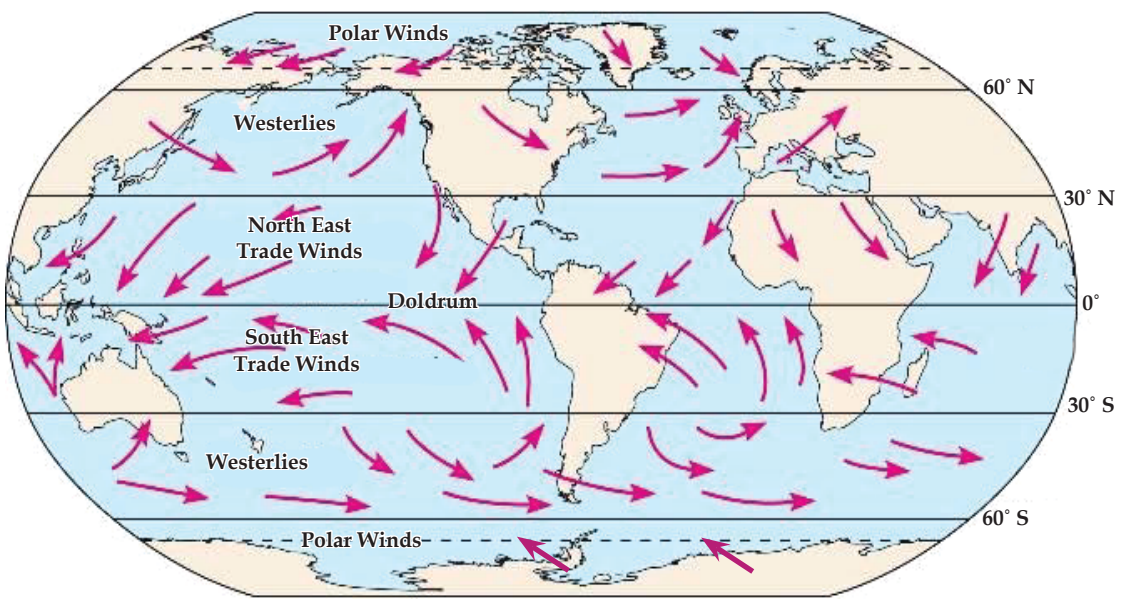


Fig 1.17

Permanent Winds	Pressure belts
• Trade Winds	From the Sub tropical high pressure belts to the equatorial low pressure belt
•	
•	

Trade winds are North Easterlies in the Northern Hemisphere and are South Easterlies in the Southern Hemisphere. Why?

Westerlies are comparatively stronger in the Southern Hemisphere than in the Northern Hemisphere. Why?

ITCZ

The equatorial low pressure region where the trade winds from the Northern Hemisphere and the Southern Hemisphere converge is known as Inter Tropical Convergence Zone (ITCZ) . ITCZ shifts with the apparent movement of the sun.

Periodic Winds

Winds subjected to the periodic reversal of their direction are termed as **Periodic winds**. Diurnal winds such as the land breezes, sea breezes, mountain breezes and valley breezes as well as the monsoon winds which repeat on summer and winter are periodic winds.

Land Breezes and Sea Breezes

You have learnt about the formation of land breezes and sea breezes in the previous class.

Illustrate the land breezes and sea breezes and write a note on their formation in your note book.

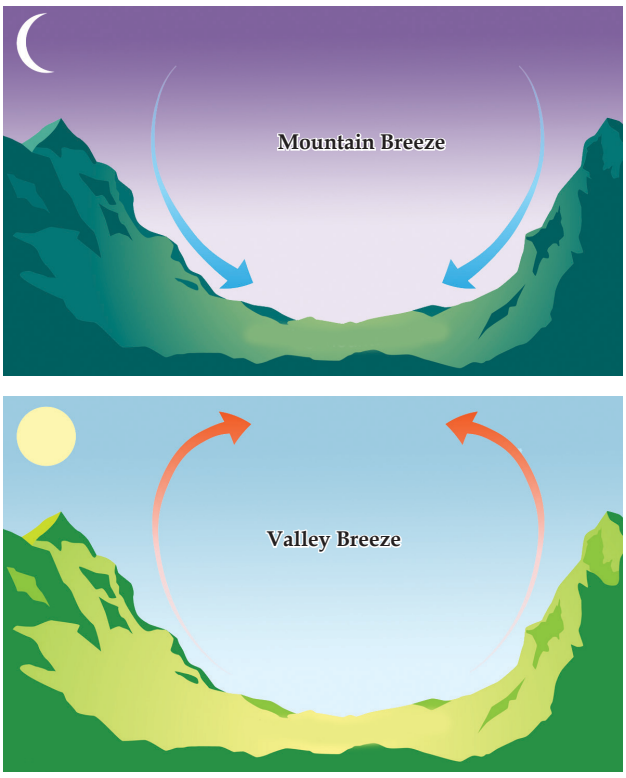


Fig 1.18

Mountain Breezes and Valley Breezes

During night, air along the mountain slopes cools, contracts and moves down slope. These winds are called **mountain breezes.**(Fig 1.18)

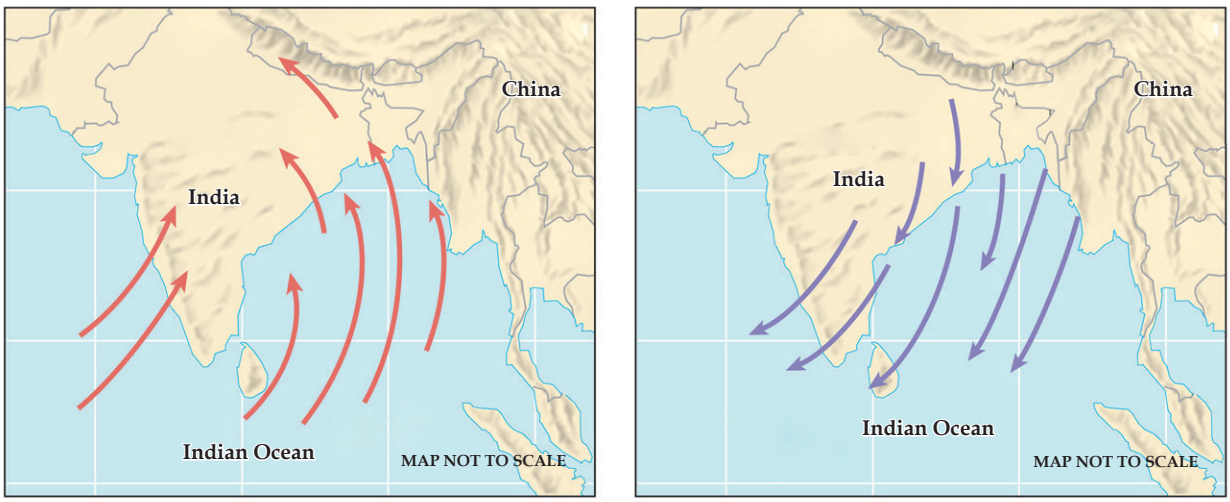
During day time, the heating by sunlight and rising up of air along the mountain slopes make the wind to blow up slope from the valley. These winds are called **valley breezes**. (Fig 1.18)

Monsoon Winds

The term 'monsoon' implies the seasonal reversal in the wind pattern. During summer the South Asian land masses, especially the Indian Sub Continent, gets heated up intensely and severe low pressure develops. Wind blows towards the land mass from the Indian Ocean where comparatively high pressure prevails. These winds blowing as South West winds due to Coriolis effect causes widespread rainfall on entering the land. This is **Southwest monsoon.**

During winter, as the northern land masses get severely cooled, high pressure develops over North India. This causes the winds to blow continuously from the land towards the Indian Ocean as north east winds. These winds which are generally dry in nature are called **Northeast monsoon winds.**

Observe the diagram (Fig 1.19) to familiarise the direction of monsoon winds.



South West Monsoon

North East Monsoon

Fig 1.19

Local Winds

Local winds are winds formed as a result of local differences in temperature and pressure in different parts of the world. Most of the local winds are periodic in nature. These winds are known by local regional names. Details regarding a few such local winds are given in the table (Table 1.1).

Local Winds	Region	Characteristics
Loo	North Indian Plains	Hot wind
Chinook	Slopes of Rocky Mountains in North America	Dry hot wind
Foehn	Slopes of Alps Mountain in Europe	Dry hot wind
Harmattan	Sahara Desert in Africa	Relief to intense heat

Table 1.1

Variable Winds

Winds of short duration, of which the intensity or direction cannot be predicted are called variable winds. Cyclones and Anticyclones belong to this category.

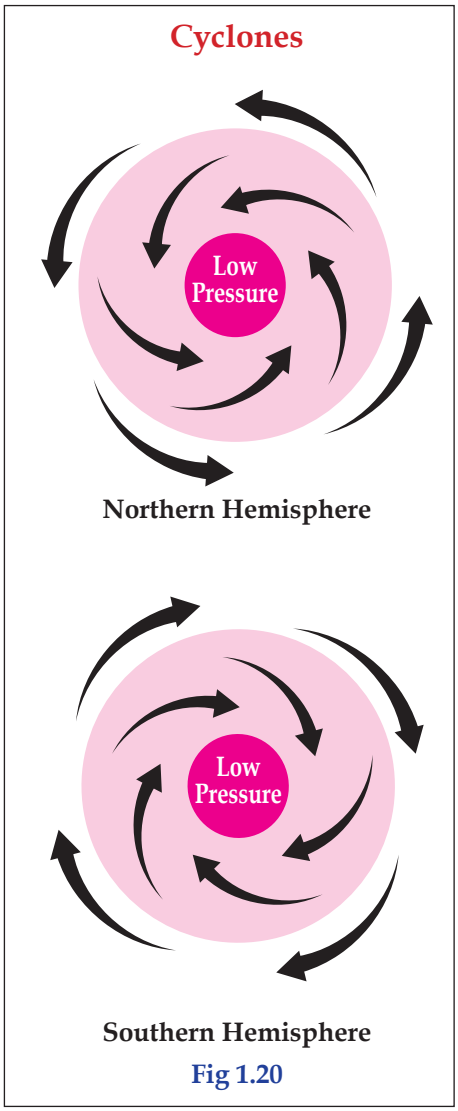


Fig 1.20

Cyclones

Cyclones are low pressure systems towards which winds whirl from the surroundings. Even if the cyclones developed over the tropical region are comparatively lesser in diameter, they are devastative than temperate cyclones. Tropical cyclones originate over tropical oceans. The tropical cyclones moving in north-west direction over the oceans, get dissipated on hitting the lands. Different temperature conditions prevailing on land and also the friction causes the dissipation of cyclones on entering land. The tropical cyclones cause intense rainfall and strong whirlwinds along the coasts. They are known by different names in different parts of the world such as Hurricanes, Typhoons, Willy Willies, Tornadoes etc.

Temperate cyclones are formed in temperate regions where warm and cold air masses meet. Even if the temperate cyclones are larger in diameter, they are less devastative. Unlike the tropical cyclones, these low-pressure systems can move over land also.

The direction of flow of air into the cyclones are anticlockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.

Compare the tropical cyclones with temperate cyclones and prepare a note.

Anticyclones

Anticyclones are high pressure system from which winds whirl outwards. Generally anticyclones do not cause atmospheric disturbances. The direction of flow of winds from anticyclones is clockwise in the Northern Hemisphere and anticlockwise in the Southern Hemisphere.

You have understood how the variability in sunshine at various places and at times leads to the air movements and circulations. Another weather element caused by solar energy is the atmospheric humidity. Let's discuss some important facts regarding atmospheric humidity.

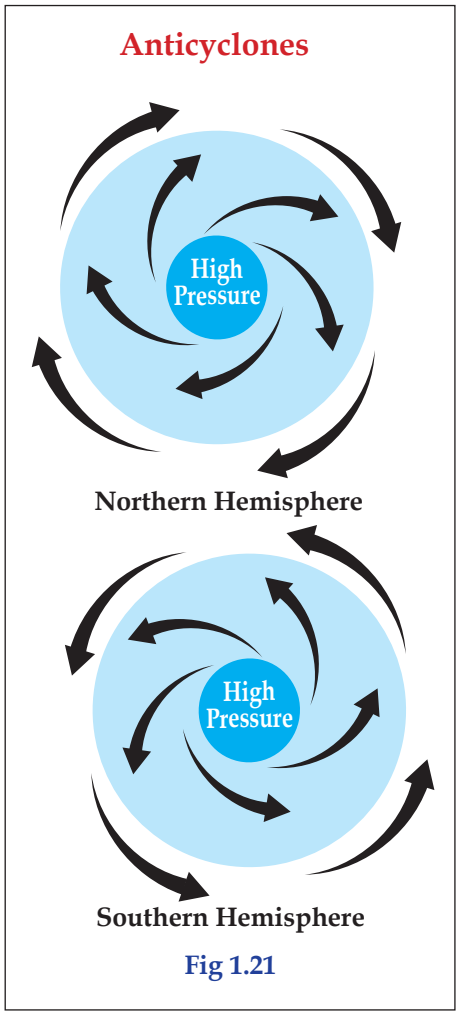


Fig 1.21

Humidity

You might have noticed that water rises as water vapour on heating. As a result of heating by sunlight water from different sources on the earth's surface turns to water vapour and reaches the atmosphere in different quantities.

Name the process by which water turns to water vapour?

Water vapour remains invisible in the atmosphere. The invisible water content in the atmosphere is called **Humidity**.

What are the sources through which water vapour reaches atmosphere?

Actual amount of water vapour present per unit volume of atmosphere is called **Absolute humidity**.

Atmospheric humidity varies from place to place depending on the temperature and availability of water. There is a limit to the amount of water vapour that the atmosphere can hold at a particular temperature. The ratio between the actual amount of water present in the atmosphere and the total water-holding capacity of atmosphere at that particular temperature and time is referred to as **Relative Humidity**. It is expressed in percentage.

$$\text{Relative Humidity} = \frac{\text{Absolute Humidity}}{\text{Total water holding capacity of the atmosphere}} \times 100$$

Hygrometer and Wet and Dry Bulb Thermometer

Fig 1.22

Fig 1.23

Hygrometer is the instrument used to measure atmospheric humidity. Relative humidity can be estimated based on the difference in temperature recorded in wet and dry bulb thermometers.

Measure the relative humidity everyday for a particular period by using the wet and dry bulb thermometer in the school weather station/ social science lab and prepare a table.

The state at which the atmosphere is fully saturated with moistur/water vapour is known as **saturation level** and the temperature at which this level is attained is termed as **saturation point.** When the atmosphere is fully saturated with water vapour, condensation begins.

At the saturation level, what may be the relative humidity in percentage?

What is condensation?

The atmospheric moisture is visible only when the water vapour condenses to form tiny droplets of water. Different forms of condensation are shown in the pictures (Fig 1.24) given below.

Forms of Condensation

Dew | Frost | Mist and Fog | Cloud

Fig 1.24

Dew: During the night, as the earth's surface cools down, the atmosphere close to the earth's surface also cools. The water vapour condenses to form tiny droplets of water which may cling on to the grass tips, leaf blades as well as other cold surfaces.

Frost: Whenever the atmospheric temperature falls below 0^{o} Celsius, especially during nights, tiny crystals of ice are formed instead of dew.

Mist and Fog: When the atmosphere gets cooled, the water vapour condenses to form tiny droplets of water and remains suspended in the lower atmosphere. Fog or mist is formed as a result of condensation of water vapour around tiny dust particles in the lower atmosphere. Fog and mist can be distinguished based on the range of visibility through them.

Clouds: Clouds are formed as a result of condensation around the tiny dust particles in the atmosphere. The water droplets thus formed are less than 0.001 cm in diameter. This is why, they remain suspended in the atmosphere.

We can see various types of clouds in the sky. Clouds can be classified based on their form as well as the height at which they are formed.

Thin, delicate, feather-like clouds formed at very high altitudes are called **Cirrus clouds.**

Cirrus Cloud

Cumulus Cloud

Nimbus Cloud

Stratus Cloud

Fig 1.25

Thick-layered clouds, usually formed in the lower atmosphere, are called **Stratus clouds.**

Cotton wool-like clouds formed as a result of intense convection currents, are called **Cumulus clouds**. These clouds have great vertical development.

Dark, rain-bearing clouds, formed in the lower part of the atmosphere, are called **Nimbus clouds**. The dark colour is due to the thick concentration of water droplets which does not allow light to penetrate through them.

The clouds mentioned above are not usually seen independently. Mostly we see the combinations of different types of clouds. Such clouds are called as cirro stratus, strato cumulus, cumulo nimbus, nimbo stratus etc.

Watch the sky and try to distinguish the various types of clouds. Remember to note the season and time at which the different clouds appear.

As a result of continuous condensation, the size of water droplets within the clouds gradually increases. As the size of water droplets grows beyond the limit of resistance against gravity, water droplets will be released from the clouds and may fall on earth in various forms. This is termed as **precipitation**. Rainfall, snow fall and hailstones are the different forms of precipitation.

Rainfall is the common and familiar manifestation of precipitation which is in the form of water droplets.

Temperature falls below 0^{o} Celsius in cold climatic regions as well as in temperate regions during winter. In such places, precipitation occurs in the form of tiny crystals of ice. This form of precipitation is called **snowfall**.

The water droplets released from the clouds are subjected to repeated condensation at different levels of atmosphere. It reaches the earth in the form layered ice pellets. These are termed as **hailstones**.

Rain

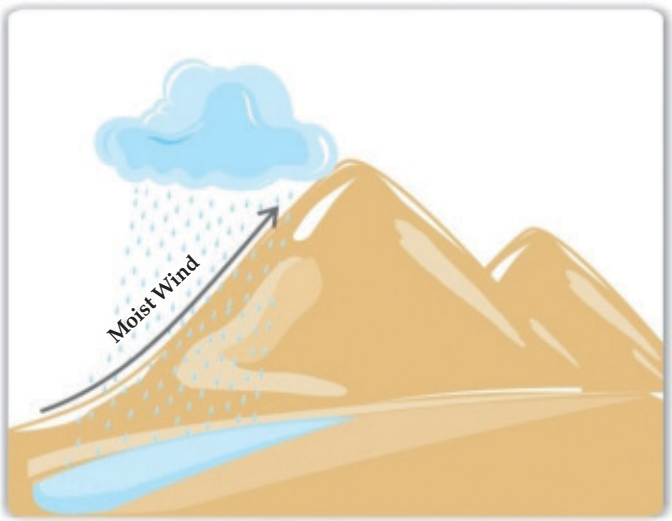
Snowfall

Hailstones

Fig 1.26

Is hailstone a winter phenomena? Inquire.

What is the form of precipitation most familiar to you?

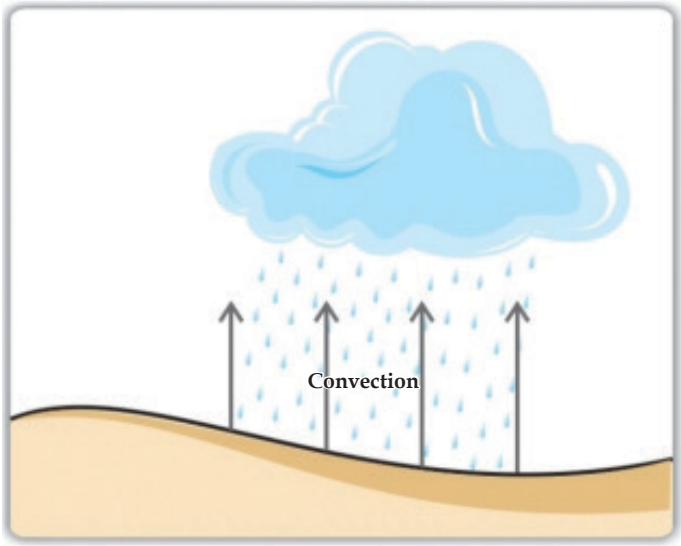


Orographic Rainfall
Fig 1.27

Types of Rainfall

Moisture-laden winds from the sea enter the land and will be raised along the mountain slopes. This leads to condensation and formation of rain clouds along the windward slopes of mountains. Rainfall occurring in this manner is called **Orographic rainfall** or **Relief rainfall**. While the windward slopes of mountains get plenty of rainfall, the descending dry air makes the leeward side rainless. Such regions are called **Rain Shadow Regions.**

While Kerala receives Southwest monsoon rains, the western parts of Tamil Nadu receives very little rainfall. Why?



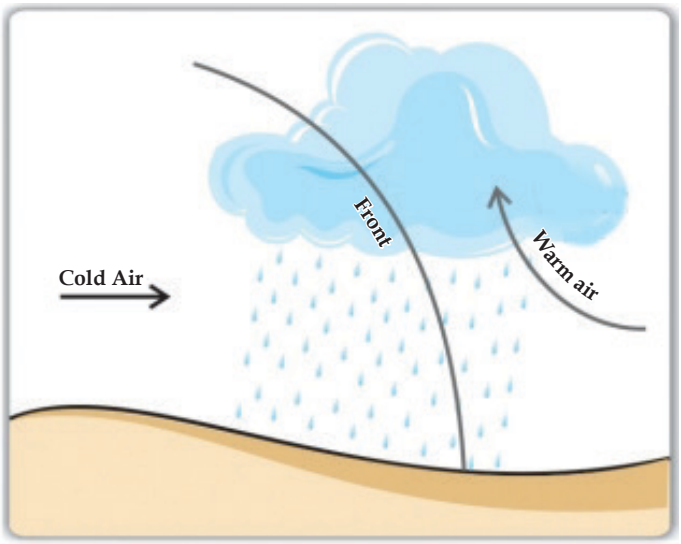
Convectional Rainfall
Fig 1.28

Haven't you noticed the occurrence of afternoon rains during summer season? This is due to convection process. Rainfall occurring in this manner are called **Convectional Rainfall.**

In equatorial climatic regions convectional rainfall is a diurnal phenomenon. Why?

As the convectional rainfall commonly occurs during afternoons, it is also called **4 O'Clock rains**.

In cyclonic systems where warm and cold air meet, the warm air will be raised up to cause condensation and rainfall. This type of rainfall is called **Cyclonic Rainfall**. As the boundary lines between warm and cold air masses are known as **fronts**, this type of rainfall are also called **Frontal Rainfall**.



Cyclonic Rainfall
Fig 1.29

You might have realised that every pulse on our earth is being sustained by the sun. You have also understood that the earth maintains a natural heat balancing system. Studies reveal that this balance is being disturbed due to abrupt changes in the composition of the atmosphere. The following chapter discusses in detail the natural and anthropogenic causes for global climatic change. We must check the unscientific and non-sustainable human interventions, to keep the delicate balance of the atmosphere, so as to safe guard this living planet for generations to come.

Torrential rain and Cloud burst

Intense rainfall occurring at certain specific areas for a shorter duration is refereed to as torrential rain. This may lead to flash floods and landslides. If the amount of rainfall exceeds 10 cm per hour, it is considered as Cloud burst. It is most common in mountainous regions. Meteorologists recognised that the landslides that occurred in Kavalappara and Puthumala in Kerala during 2019 were the result of torrential rain following cloud burst. Experts perceive the landslides of Mundakkai and Chooralmala in 2024 to be the result of cloud burst.

Extended Activities

1. Read the daily maximum temperature and minimum temperature using the max-minimum thermometer in the school weather station/social science lab. Estimate the daily mean temperature and diurnal range of temperature, and display it in the school notice board.
2. Measure the daily amount of rainfall using rainguage for a particular period. Prepare a bar diagram using the data and exhibit it in your class room. Remember to display the daily amount of rainfall in the notice board.
3. Prepare a digital album by collecting pictures of different types of clouds using ICT.

2 Climatic Regions and Climate Change

I came to Canada for higher education and staying in the province of New Brunswick, now it is the starting of cold season here. The maple trees have begun to shed their leaves, heralding the arrival of winter. But the pine trees still remain green. Winter begins here in mid-September. It peaks by the end of January and gradually cools off to an end by April. The average temperature during this period is -20˚C and can touch as low as -35˚C. The most difficult thing in winter is the cold wind. There will be heavy snowfall during this time. 40 to 50 cm of snow will accumulate. One has to wear multiple layers of clothing to survive winter conditions. Without a jacket, gloves and footwear, it is a mess. Heaters are installed in all houses and buildings. As the month of May begins, the temperature starts to rise and by August it may reach up to 30˚ C. Daytime is hot and humid during summer and sometimes it even rains. Thin clothes will suffice in winter.

Nikhil Shibu

Did you read the note?

Is the climate where Nikhil is residing, similar to ours? Analyse the writing based on the weather elements given below.

- Temperature
- Precipitation
- Wind

Did you notice that New Brunswick, where Nikhil lives, experiences severe winters and snowfall?

Is climate the same everywhere in the world? Some places experience severe cold and snowfall, whereas it will be extremely hot and arid elsewhere. There are also areas with moderate temperature and humidity. Our earth is enriched with such diverse climates. You have studied about weather elements in the previous chapter.

Based on the fluctuations in elements of weather such as temperature and precipitation, the world can be divided into different climatic regions.

What is a climatic region?

A climatic region is an extensive geographical area in which similar climate characteristics are observed.

Look at some of the major climatic regions of the world that are given below.

- Equatorial climatic region
- Monsoon climatic region
- Savanna climatic region
- Hot deserts
- Temperate grasslands
- Mediterranean climatic region
- Taiga region
- Tundra region

Each climatic region has its own unique climate, and flora and fauna developed according to it. Human life of the respective climatic region is also moulded according to the geographical features. Let's delve deep into the characteristics of the major climatic regions.

Equatorial climatic region

Fig 2.1

Look at the picture (Fig.2.1). It shows the lifestyle of the pygmy tribe living in the equatorial climatic region.

This climatic region extends up to 10° North and South of the equator. Observe the map (Fig 3.3) and identify of the areas included in this region. The equatorial climatic region is characterised by high temperatures and high rainfall throughout the year. This climatic region is hotter because sun's rays fall almost vertically throughout the year. This results in higher air convection and convectional precipitation. These areas receive rainfall every day in the afternoon. Don't you remember the previous chapter discussing convectional rainfall?

Evergreen forests are abundant in the equatorial climatic region due to high temperatures and high rainfall. Further details of the equatorial climatic region will be discussed in the following chapter.

Monsoon climatic Region

Didn't you know that the Indian subcontinent, of which our country is a part, receives rain mostly during the monsoon season?

Monsoons are the seasonal reversal of wind system.

These winds blow from sea to land in summer and get reversed from land to sea in winter.

This region is known as monsoon climatic region, because of the decisive influence of monsoon winds.

Is monsoon climate experience only in the Indian subcontinent?

Some other regions of the world also experience similar climatic conditions. Observe the map (Fig 2.2) and atlas, and list the regions experiencing monsoon climate.

- Indian sub continent
-

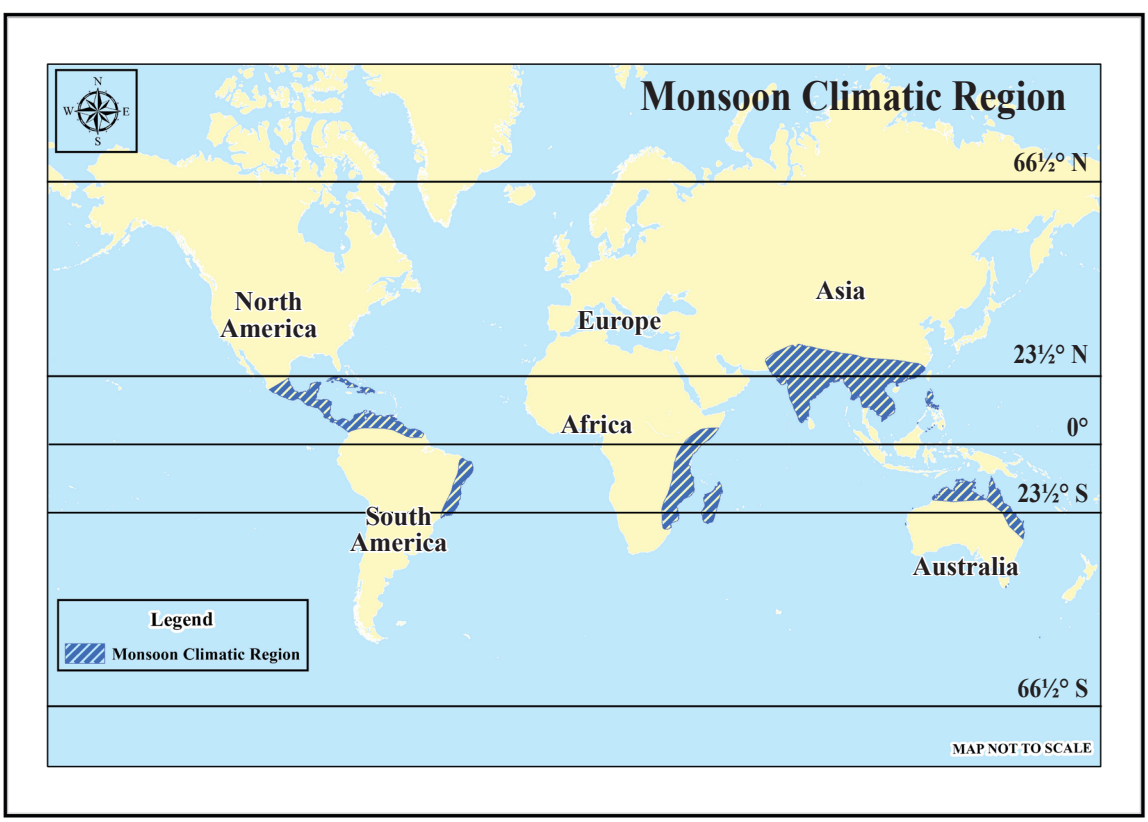


Fig 2.2

Monsoon climate is characterised by long and humid summer and short dry winter. In monsoon climatic regions, diurnal range of temperature is very low in coastal areas and very high in the interiors.

Why does this difference in diurnal range of temperature occur?

Depending on the factors like physiography, direction of wind, and distance from the coast, rainfall distribution also varies in the monsoon regions. Regions with as little as 50 cm of rainfall to areas receiving over 1000 cm of annual rainfall can be found in this region.

Don't you remember different types of rainfall discussed in the previous chapter?

Does convectional rainfall occur in the monsoon climatic region?

Luxuriant growth of vegetation due to the high temperature and rainfall helps forests in this region to become dense. Evergreen and deciduous trees are generally found here. However deciduous trees are more common. Monsoon forests also known as tropical deciduous forests have a mixture of different types of trees depending on the amount of rainfall received.

Monsoon Forests
Fig 2.3

With the help of ICT, collect images of plants and animals found in monsoon forests and create a digital album of the same. Caption them.

Monsoon region is one of the most densely populated areas in the world. High rainfall and availability of labour keeps monsoon climatic region an important agricultural region. Tropical crops like rice, sugarcane, jute, cotton, tea and coffee. are cultivated here. Why are these crops called tropical crops?

Intensive subsistence agriculture, is prevailing in this region. In rare areas, shifting cultivation, a primitive subsistence agriculture also exists.

Shifting cultivation has different names in different countries of the monsoon region. Find these names.

With the variations in the availability of rainfall, the type, height and diversity of flora also vary. Diversity is evident in fauna also.

Savanna Climatic Region

Savannas are tropical grasslands found between 10° and 30° latitudes in both the hemispheres. These grasslands are known by different names in different regions. It is known as Savanna in Africa, Campos in Southern Brazil and Llanos in Venezuela.

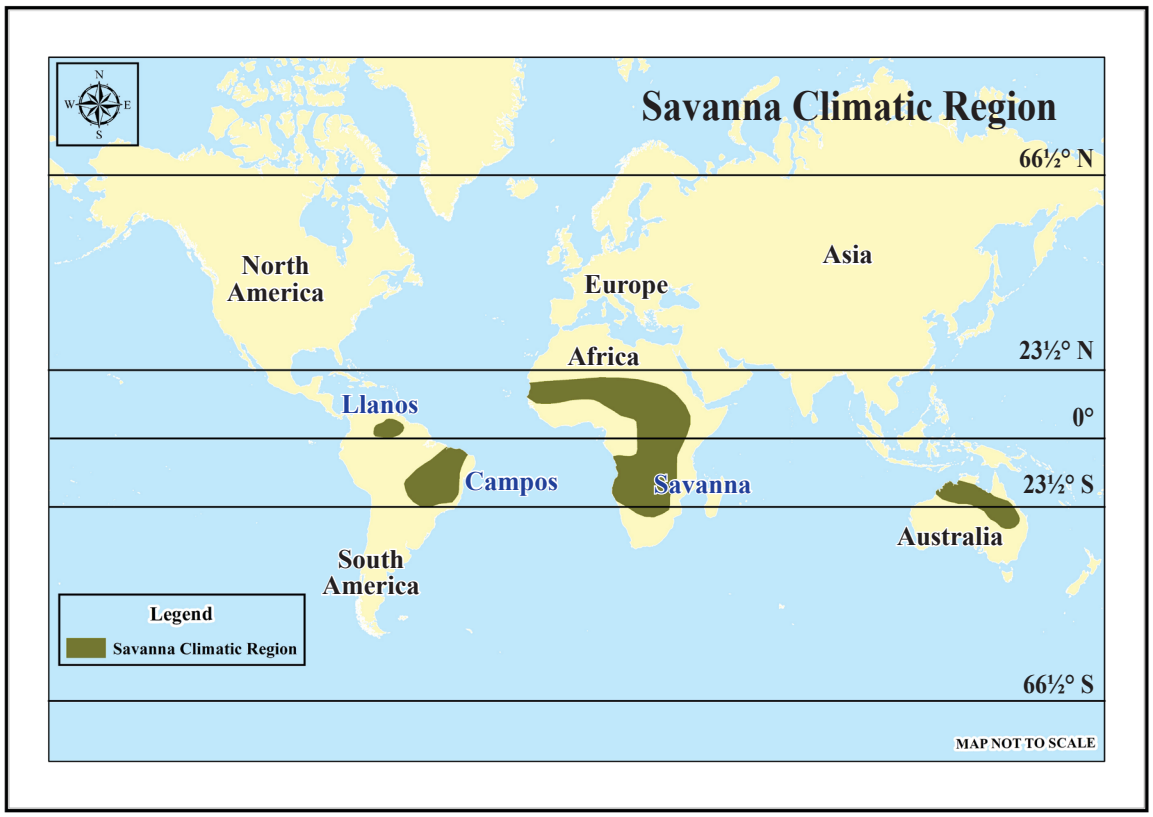


Fig 2.4

With the help of map (Fig 2.4) and atlas, identify the countries in which tropical grasslands are found.

Tropical grasslands have hot and humid summers, and cool and dry winters. The annual average temperature here is between 21° C and 32° C and also receives annual rainfall of 25 cm to 125 cm.

Deciduous trees and tall grasses are the dominant vegetation of this region. As we move closer to the deserts, short bushes and thorny forests are seen. The forests and grasslands here provide a favourable habitat for wild animals. Herbivorous animals like giraffes and zebras abound in these grasslands. Carnivorous animals like lion and tiger are also found here.

Although soil found here is relatively fertile, due to low rainfall, 'dry farming' that requires less amount of water is adopted. Animal husbandry and agriculture are the means of livelihood of the people. Population density is generally low in the savanna region. Maasai, an indigenous tribe of the African savanna, leads a pastoral life. Cash crops are cultivated extensively in the savanna areas of former European colonies. Cotton cultivation in Sudan and coffee cultivation in Brazil are examples.

When we approach the western margins of tropical grasslands, height of the trees gradually decreases with the decrease in rainfall. This is followed by desert vegetation.

Maasai Tribal Village
Fig 2.5

Hot deserts

We have discussed the characteristics of tropical grasslands and monsoon climatic regions. Though located at the same latitudes, hot deserts are regions with very little rainfall.

Observe the map (Fig 2.6) and atlas, identify the continents where hot deserts are located.

Locate hot deserts in the outline map and include in 'My Own Atlas'.

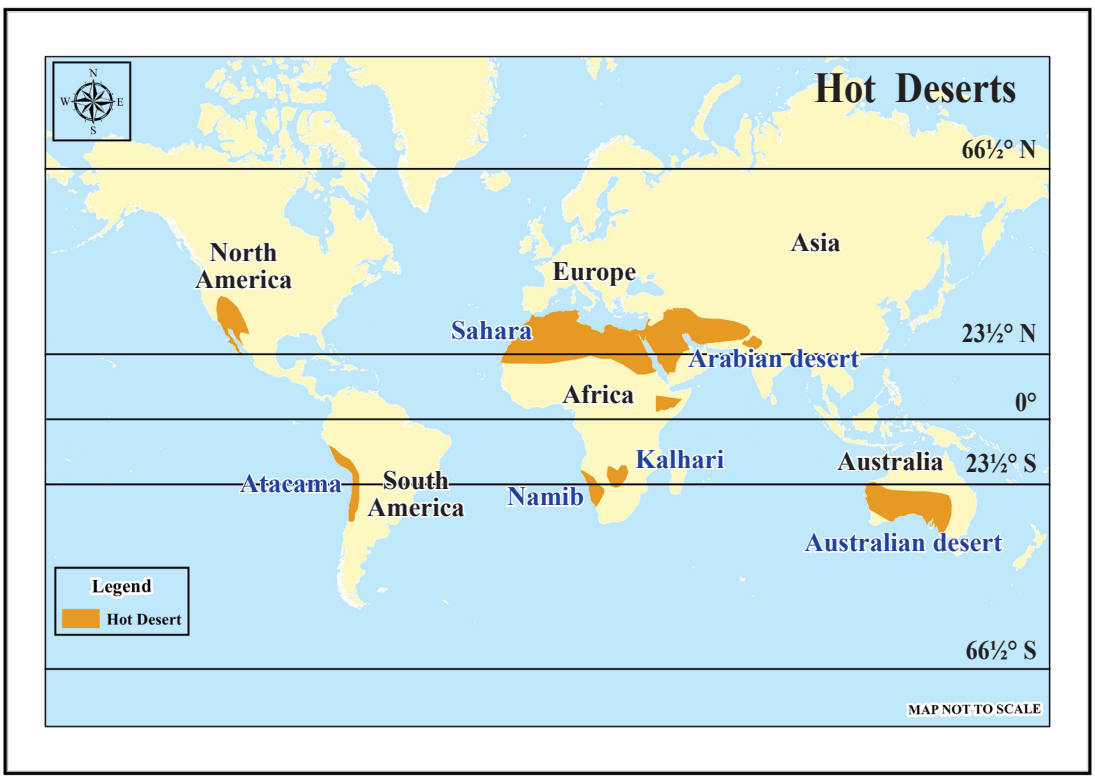


Fig 2.6

Tropical deserts are the hottest regions on earth with an average annual temperature of 30° C. The highest recorded temperature in Al Aziziya in the Sahara desert is 58° C. High diurnal range of temperature makes desert climate very difficult. Annual rainfall in desert areas is generally less than 25 cm and in some places it may not rain for several years. In the tropical region, hot deserts are located mostly on the western margins of continents. As the trade winds travel across the continents and reach the western margins, the wind loss its moisture and become dry. Therefore the western margins of continents remain dry throughout the year. This is the main reason for the formation of deserts on the western margins of continents.

Plants adapted to low rainfall climate such as cactus, shrubs and palms are mostly found here. Oases are formed in places where water sources are found. What are oases?

Identify and list the animals found in hot deserts. Collect their pictures with the help of ICT and prepare a digital album.

These areas are sparsely populated due to the unfavourable climate and other factors. However there are indigenous tribal communities, who have adapted to the adverse conditions in most of the desert regions. The Bushmen of Kalahari Desert are an example for this.

An oasis in Sahara
Fig 2.7

Agriculture and animal husbandry are the main means of livelihood in deserts.

Another factor that promotes human life in desert is the presence of economically valuable minerals. Gold mining in Australia and

Riyadh City in Saudi Arabia
Fig 2.8

copper in Atacama Desert are examples for this. Discovery of petroleum deposits and the starting of oil mining in the Sahara and Arabian deserts, have changed the very face of these regions.

We have discussed three different climatic regions in the tropical region. Now let's get familiarise with the characteristic features of the climatic regions in the temperate zone.

Mediterranean Climatic Region

Have you seen the location of the Mediterranean Sea on the map, Fig 2.9? The areas around this sea are the Mediterranean region.

It is a region that experiences dry summers and humid winters. Temperature of around 20-25° C is experienced in summer. Highest temperature during winter is 10° C to 16° C. Winter rainfall of 30 to 75 cm distinguishes this region from other climatic regions. Rains during the winter are beneficial to the winter crops.

Apart from the coasts of Mediterranean Sea, some other regions lying between 30° and 45° latitudes also experience the same climate. All these regions are collectively known as the Mediterranean climatic regions.

Observe the map (Fig 2.9) and atlas, identify the areas included in the Mediterranean climatic region. Depict them on the world map and add to My Own Atlas.

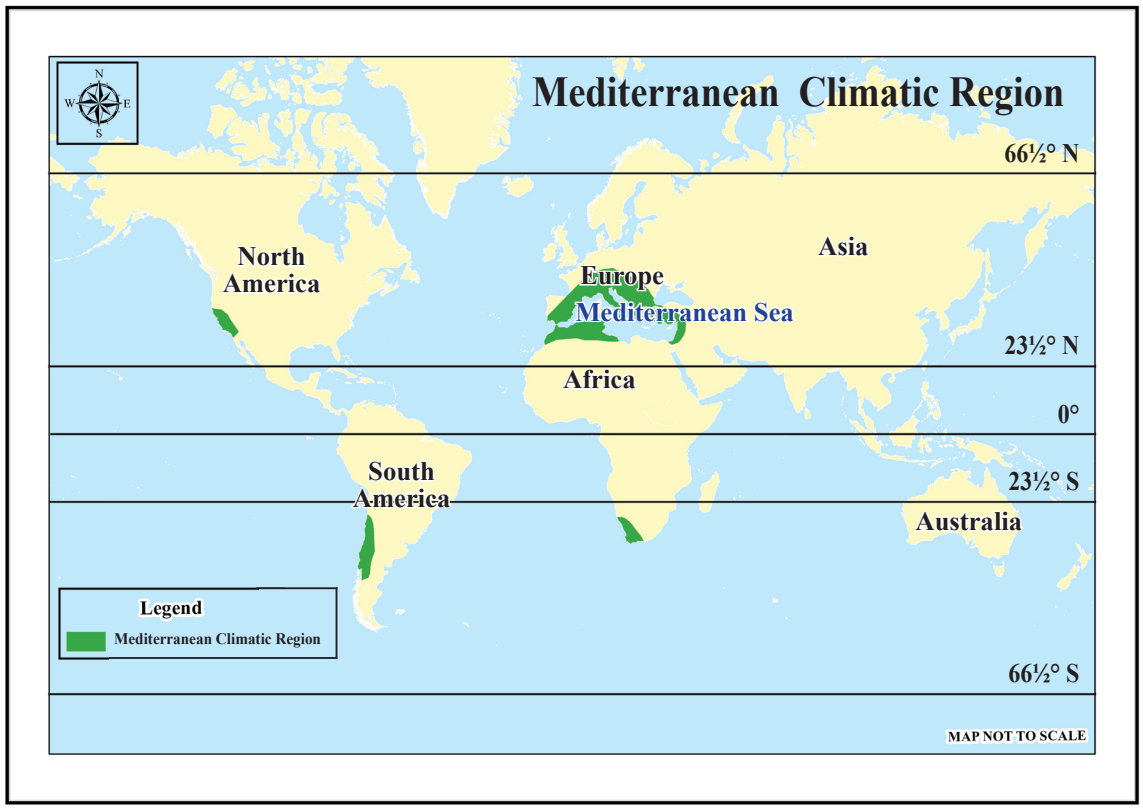


Fig 2.9

Westerlies are responsible for winter rainfall in the Mediterranean region. Dense forests are not found due to low rainfall. Tall evergreen trees such as oak and sequoia, evergreen conifers such as pine and fir, and shrubs are found here. Fruits and vegetables are the major produces of this region. Cereals and pulses are also cultivated wherever possible.

A Vine Yard in Mediterranean region
Fig 2.10

Agricultural practices developed according to the climate conditions and related activities make the Mediterranean region an area of great economic importance. The Mediterranean countries are the world's leading producers of wine. About 70 precent of citrus fruit export comes from the Mediterranean countries.

As in the tropics, in the interior of the subtropical zone, the maritime influence is minimal and treeless grasslands are found. These are the temperate grasslands.

Temperate Grasslands

These grasslands are located in both the hemispheres at a latitudes between 40° and 50° and are known by different names in different regions.

Observe the map given below Find out the continents where grasslands are located and complete the table below.

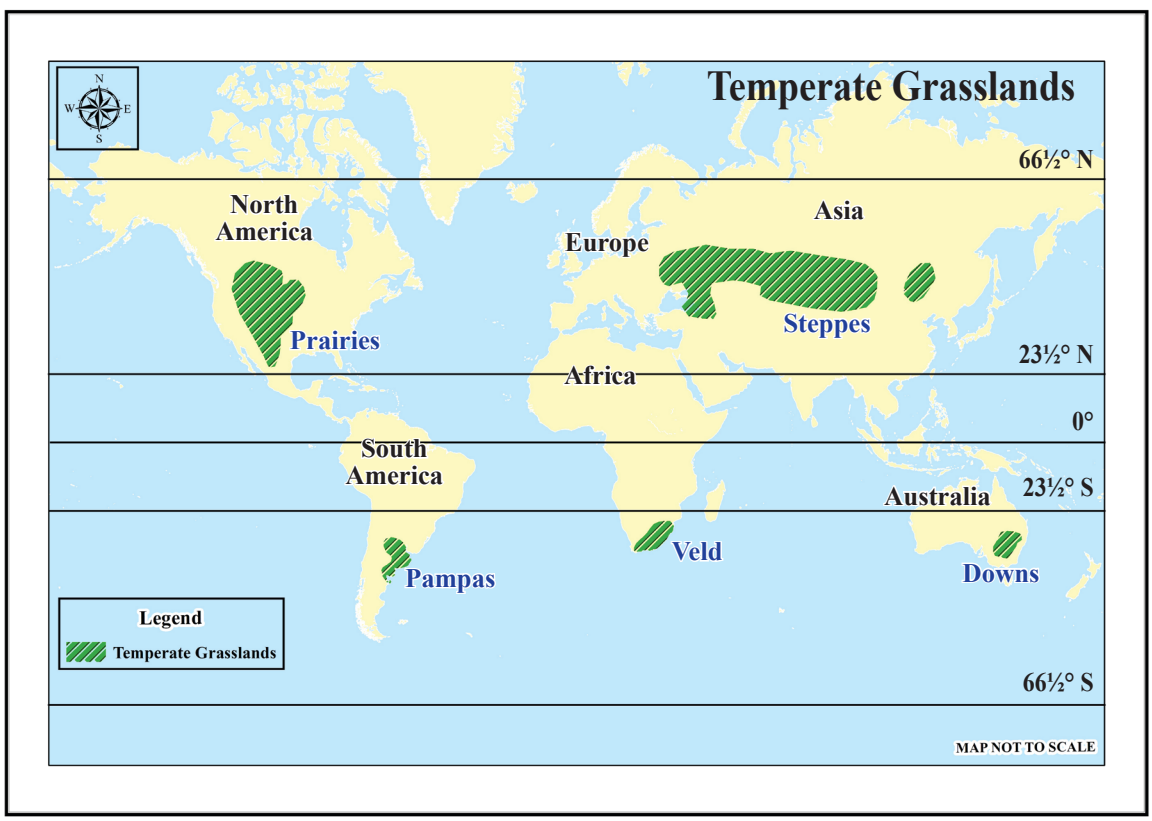


Fig 2.11

Temperate Grasslands	
Continent	Name of the Grassland

Though temperate grasslands are found in different parts of the world, their climate characteristics are almost the same. Short summers and long winters are the characteristics of the temperate grasslands. These regions experience high temperature in summer as they are located at the interior of the continents. Average winter temperature ranges from 2° to 13° C.

Rainfall here ranges from 25 cm to 60 cm Fluctuations in the rainfall availability is reflected in vegetation also. Due to less rain, trees are also few. Varieties of grass are generally found. Since temperate grasslands are natural grazing lands, most of the inhabitants are shepherds.

Nowadays grasslands are widely converted into agricultural lands. Commercial mechanised grain farming and animal husbandry are increasing day by day in this region.

Prairie – The Granary of the World

The Prairie, the temperate grasslands of North America, are often referred to as the world's granary. Nearly two million acres of this vast grasslands, spread across the United States and Canada, are under commercial grain cultivation today. Wheat is the main crop. Moderate temperature, rainfall availability and fertile soil make this region highly suitable for wheat cultivation. The large scale production of wheat earned the prairies the title of the world's granary.

The flora and fauna and the life of the people of each region are formed according to the climate characteristics. However as part of the technological progress achieved over time, humans are changing the natural features of many areas.

Don't you see that the temperate grasslands, which were once natural grazing lands, have been now converted into areas of agriculture and animal husbandry, practiced widely on industrial basis?

Efforts to utilize all possible areas of the world will continue as long as there is ever- increasing population and human needs.

Let's examine the geographical features and life of the people in the climatically difficult cold region.

Taiga Region

It is a cold region located between latitudes of 55° and 70° in the Northern Hemisphere. Short summers and long winters are experienced there. Summer temperature is from 15° C to 20° C while winter temperature drops up to -13° C to -25 ° C. This region receives an annual rainfall of 50 cm to 70 cm. In winter, precipitation is in the form of snowfall.

Taiga climatic region is absent in high latitudes of Southern Hemisphere because the extent of landmass is generally less.

This region is dominated by sub-Arctic coniferous evergreen trees. Taiga is the Russian word for 'coniferous trees'. This region is named as Taiga because of the abundance of such coniferous trees. Coniferous trees such as pine, fir and spruce are the main vegetation types.

Observe the map (Fig 2.12) to identify the continents where Taiga region is located, and include it in My Own Atlas.

Most of the crops cannot be grown in sub-Arctic climates, hence the cultivation is very less in this region.

Lumbering and wool industry are the main economic activities. Lumbering industry is very popular in Canadian Taiga region.

Lumbering is more industrialized in the Taiga region than in the equatorial region. Why?

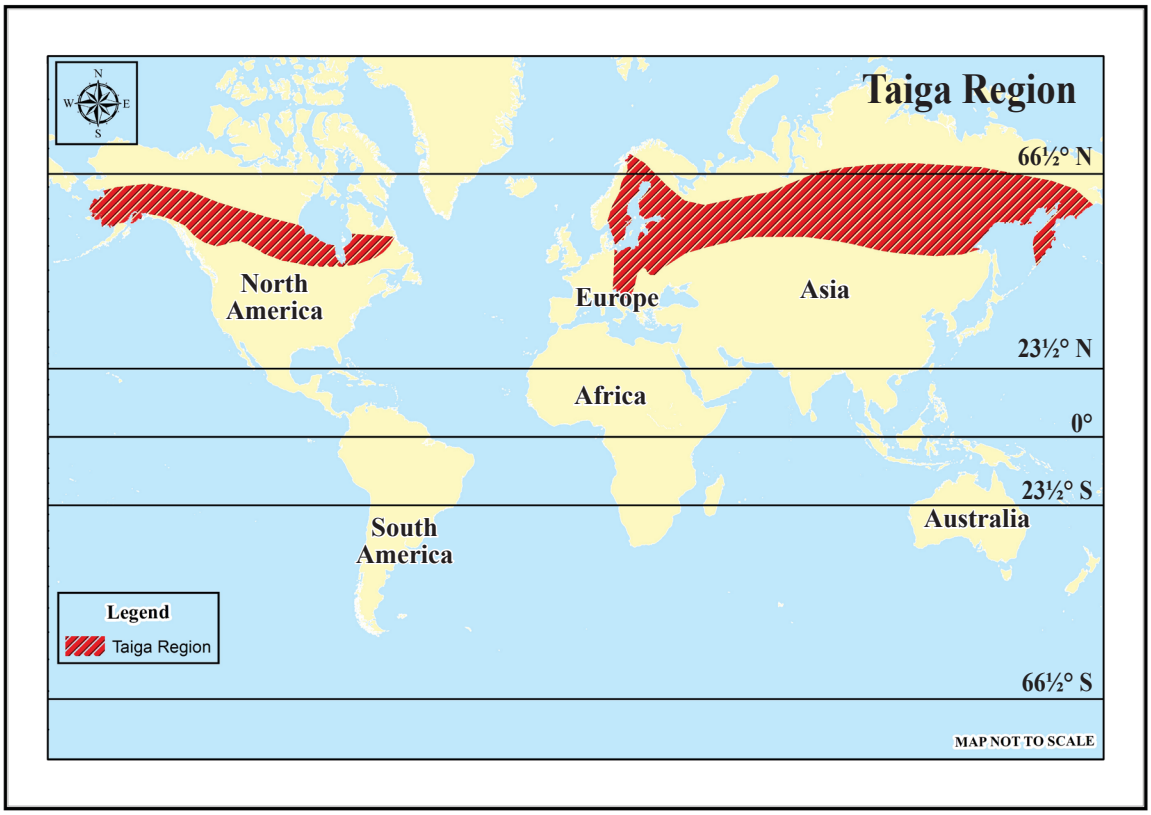


Fig 2.12

As we move from the Taiga region to the polar region, the height of vegetation decreases and becomes sparse and less in number. Only frigid vegetation such as shrubs and mosses can be found in regions close to the Poles.

Tundra region

Tundra region is the extreme cold zone extending from north of the Arctic Circle in Alaska, Canada, Greenland, and the Arctic coasts of Europe and Asia. Here winter temperature ranges from -25°C to -40°C and the summer temperature rises up to 10°C . Precipitation is mainly in the form of snowfall.

Only a few plants can survive in the harsh climatic conditions of the Tundra region. Plants grow only in summer. Due to the very short growing season available, short shrubs and mosses are the main plants found here. The native people of this region such as Eskimo, and Lappas lead a semi nomadic life. Arctics

are the regions with relatively little human intervention. Scientists and explorers are continuing their studies in this region in search of future possibilities for mankind. Further details about this climatic region will be discussed in the next chapter.

Haven't you understood the different climatic regions of the world and their characteristics? Complete the table given below, based on their characteristics.

Climatic Region	Location	Climate	Vegetation	Human Activities
Equatorial Climatic Region	0° to 10° North and South latitudes			

Climate change

Didn't you understand that each climate zone has a unique climate, flora and fauna, and human living conditions? Studies indicate that uncontrolled exploitation of resources and unscientific developmental activities affect the unique climatic characteristics of each region.

UN defines 'climate change' as a long-term shift in weather patterns and temperatures that is caused by human activity or natural variability. The timescale of climate change may range from a few years to millions of years. It affects ecosystems severely.

Fig 2.13

Picture of two differently-held cabinet meetings are given (Fig 2.13). The first picture shows a cabinet meeting held at Mt. Everest, by Nepal, a country belongs to the Himalayas, which is the highest point of the world. The second picture is of a cabinet meeting held under water by Maldives, an island nation with an average elevation of just one and a half metres above the mean sea level.

These cabinet meetings were organized in a different manner to draw attention of the world nations to the problems of climate change. The mountain country of Nepal and the island nation of Maldives are among the countries most affected by the global climate change. It is estimated that the Himalayan glaciers are melting at a rate of 12 to 20 metres per year as a result of global climate change. The increase in global temperature is causing rapid melting of glaciers and undesirable changes in ecosystem.

If the sea level rises by two and a half metres, the Maldives will be completely submerged in the sea. Global sea level is estimated to rise by 0.42 cm per year as a result of climate change.

Haven't you understood that climate change is the long term shift in elements of climate?

Which are these elements? Atmospheric temperature, pressure,

winds, precipitation and humidity are the elements of climate. Climate change results from the shift in quantity, distribution pattern, and seasonal pattern of these elements. It may affect a specific region or the whole world.

Earth's climate has not always been the same; climate has undergone cyclic changes throughout the Earth's history. Ice ages and inter glacial periods are examples of Earth's natural climate change. Along with the natural climate changes, human intervention also causes changes in the world climate. Therefore, climate change can be classified into two categories as natural and anthropogenic.

Below are some of the activities that cause climate change. Find more of them and classify them as natural and anthropogenic causes.

- Deforestation
- Oil mining
- Industrialization
- Volcanic eruption
- Ocean currents
-

Natural climate change resulting from endogenic earth processes cannot be controlled by human efforts. Climate change affects nature and human life in various ways. Human interventions often aggravate climate change. Climate change does not affect just one region alone but it creates multi-faceted implication globally.

How does climate change affect human life?

Information from study reports conducted by international agencies on the effect of climate change are given below. Based on these, gather more information and organize a discussion on the challenges of climate change.

1. Average sea level rise over 10 to 20 mm per year

   IPCC Sealevel Rise Report 2023

2. The polar ice caps which had an area of 7.5 million square kilometres in 1978 has shrunk to 3.74 million square kilometres by 2019.

   NASA Global Climate Change Report 2020

3. About 135 million people are at risk of being displaced by desertification.

   UN Convention to Combat Desertification

4. Global surface temperature in 2011-2020 showed a rise of 1.1° C compared to that in 1850-1900.

   IPCC Climate Change 2023 Report

5. The studies during 1985-2019 reveals that the nature of monsoon rain has been shifted from the rains lasted for a few months to torrential rain lasting for a few days.

   IPCC Sixth Assesment Report

Greenhouse Effect and Global Warming

Certain gases in the atmosphere are capable of trapping the solar energy (insolation) in the atmosphere. Such gases like carbon dioxide and nitrous oxide are known as Greenhouse Gases.

Greenhouse gases allow sunlight to pass into the earth's surface and keep the atmosphere warm by intercepting terrestrial radiation returning from the Earth's surface. This process is known as Greenhouse Effect of the Atmosphere.

Some human activities results in excess production of greenhouse gases. Due to this, greenhouse effect of the atmosphere becomes stronger and the temperature increases. This increase in atmospheric temperature is called Global warming.

Burning of fossil fuels such as coal and petroleum, industrial effluents and solid waste are the sources of excess greenhouse gases in the atmosphere. Global warming accelerates climate change.

Changes resulting from global climate change can be seen in the different climate zones of the world and their unique climatic characteristics. If this continues, it will destabilize the climate zones and adversely affect the ecological balance.

Identity how climate change affects climatic regions, and prepare a note.

Activities such as industrialization, land use change, and urbanization are some of the human interventions that lead to climate change. International initiatives to protect climate and environment have begun ever since it is noted that there activation may harmfully affect the climate and environment. Let us see such initiatives.

International initiatives	Year	Place	Interventions
Establishment of World Meteorological Organisation	1950	Geneva	Organises world climate conferences
Stockholm Conference	1972	Stockholm	Environmental conservation and development
Earth Summit	1992	Rio de Janeiro	Prepared UN Agenda 21 to promote environment friendly development
Kyoto Protocol	1997	Kyoto	Reduce the amount of Green House gases in the atmosphere
Montreal Protocol	1987	Montreal	Reduce the production and consumption of ozone depleting substances
Paris Agreement	2015	Paris	Reduce Global warming, helping world nations to cope up with the harmful effects of climate change
G 20 Summit	2023	New Delhi	One earth, one family, one future. Green development, climate finance, overall development

Climate change cannot be completely prevented. But human intervention that induces climate change can be controlled. Organise a discussion in the class on the changes to be brought about in industrial and other developmental activities enabling sustainable resource utilisation.

Discussion points

- Promotion of energy efficiency
- Protection of forests
- Change in technology
- Encouragement of the use of non-conventional energy such as wind and solar energy.

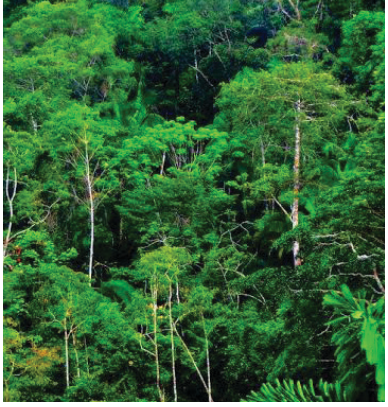
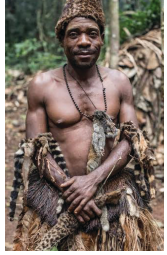
Millions of people of the world's ever-increasing population depends on the climate for their livelihoods. Even a small change in climate can affect lives of people adversely. Therefore it is essential to control activities that cause climate change. Since climate change is not a problem that affects only one region or country, it is essential for all the nations to work together for the sustainable existence of human life.

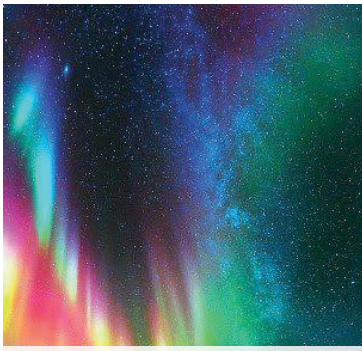
Climate Refugees

Many people are being forcibly displaced by the impacts of climate change-induced disasters such as droughts, floods, desertification, sea-level rise, and sea inundation. They are forced to migrate to other regions or countries. Such migrations are called climate migration. UN figures indicate that around 50 million people have been displaced due to climate-related events. Those who have to leave their homes and livelihood due to climate-related phenomena are called climate refugees.

Extended Activities

1. Compare the climate and life of people in different climatic regions and prepare a note. For this, information about climate and life of people in different regions of world can be collected with the help of IT.
2. Collect indigenous climate knowledge by interviewing senior citizens in different areas. Prepare a questionnaire for this. Find out, changes that have taken place in the current climate.

3 From The Rainy Forests to The Land of Permafrost

It was yesterday that I arrived here in Naryanmar from St. Petersburg. This town, located on the banks of River Pechora, attracts many tourists like me. The objective of the expedition team, including myself, is to understand the characteristic features of the Tundra region on foot. The Tundra, covered by snow throughout the year, reveals a world of wonders, especially for someone from Kasai Province of Congo. For someone like me, living in the equatorial region, which receives maximum insolation, it is beyond words to describe the astonishment of reaching and viewing a region so close to the pole. The diversity of flora and fauna, along with the stark contrast in human life between these two regions, are experiences that must be encountered firsthand. In the Tundra, the temperature during July, the hottest month, remains below 10 degrees Celsius, while in winter, it drops to as low as -50 degrees Celsius. Then, I just thought of my home country, where high temperature prevails throughout the year. After putting on thick woollen clothes and caps, we got ready to explore the Tundra. Along with our breakfast, we had pelmeni, an indigenous dish made with fish. In Congo, cassava is an integral part of almost every dish. Kwanga, cooked cassava served in banana leaves; Fufu, made from pounded cassava; and Sombe, made from cooked cassava leaves, are the prominent cassava dishes. Curiosity stirred in my mind as I compared the food habits of my home country with those of the Tundra…

Visuals from the Tundra Region
Fig 3.1

Visuals from the Equatorial Rain Forest

Fig 3.2

The excerpt you have read is part of the description of a Tundra expedition carried out by a traveller from Kasai Province of the Republic of Congo, located in the equatorial region.

You have understood from the previous chapter that different climatic regions exist on Earth. Haven't you noticed that someone who has been living in a place located in the equatorial climatic region wrote in his travelogue that entirely different conditions exist in Tundra, another climatic region he visited?

Let's explore the characteristic features of these two regions.

With the help of an atlas, find the locations of Congo and Naryanmar Town, and identify the climatic regions they belong to.

You have identified that Congo belongs to the Equatorial Climatic Region?

Now, Let's discuss the features of the same.

The map given below (fig 3.3) illustrates places that belong to the equatorial climatic region. With the help of an atlas answer the questions based on the map provided.

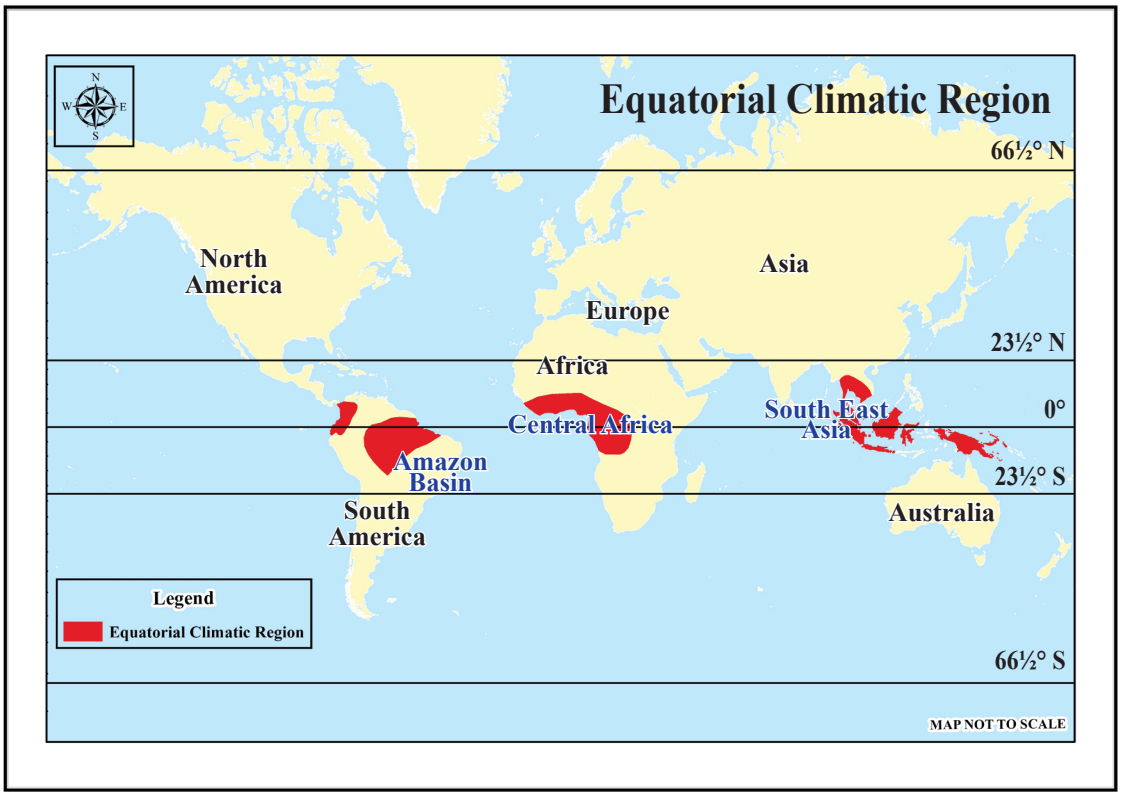


Fig 3.3

- Which continents does the Equatorial climatic region spread across?
- Identify the places that belong to this climatic region.
- To which heat zone does this climatic region belong?
- Identify the countries that are included in the equatorial climatic regions of continents like Asia, Africa, and South America, and complete the table provided.

Continents	Countries
Asia	• Indonesia • • •
Africa	• Democratic Republic of Congo • • •
South America	• Brazil • • •

Mark the places that belong to the equatorial region on the outline map of the world and include it in My Own Atlas.

Why is this climatic region called the equatorial climatic region?

You might have acquired a basic understanding of the latitudinal extension of the equatorial region and the places that belong to this region. Now, let's examine the features of the climate that prevail over this region. One of the salient features of the equatorial climate is that the temperature remains more or less the same throughout the year. In the equatorial region, there is no significant variation in the annual and diurnal ranges of temperature. The mean monthly temperature and the mean annual temperature are both around 27 degrees Celsius.

There is no winter in the equatorial climatic region. Do you know why this peculiar type of climate is experienced here? You have understood that the equatorial region receives vertical solar rays throughout the year. The high rate of insolation received here causes consistently high temperature. Because of this, the region does not experience winter.

The mornings experience moderate temperature but as the day progresses, it increases considerably. This significant rise in temperature causes a high rate of evaporation, followed by heavy downpours of convectional rain in the afternoons.

Haven't you learned about the convectional rainfall in the previous chapter?

How does convectional rainfall occur? What are the features of convectional rainfall? Discuss in the classroom and prepare a note.

Does Kerala experience convectional rainfall, and in which months does this rainfall occur in Kerala?

The equatorial climatic region is the region where the rainfall is heavy and well-distributed throughout the year. The annual rainfall in this region is between 175 cm and 250 cm. High temperature and high rate of evaporation are the reasons for the heavy rainfall. Along with convectional rainfall, orographic rainfall is also received in certain places. It is the mountainous areas of Indonesia and Africa where orographic rainfall is experienced.

The atmospheric disturbances caused by the convergence of air currents in the Doldrums occasionally lead to intermittent rainfall of cyclonic origin.

Unlike in the monsoon climate or the savanna region, there is no distinct dry season in the equatorial climatic region. This is due to the abundant rainfall received in the equatorial region throughout the year.

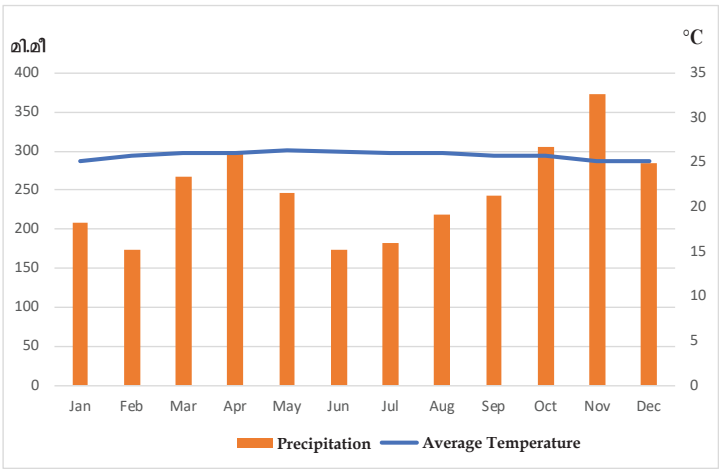
Doldrums

The equatorial region receives a high rate of insolation throughout the year. As a result, a low-pressure region develops along the equator. Horizontal movement of air is minimal in this region. This region is called the doldrums. It is also where the trade winds from both hemispheres converge.

The following diagrams represent the distribution of annual rainfall and temperature recorded in two different places of the equatorial climatic region. Analyse the diagrams and answer the questions that follow.

Month	Precipitation (mm)	Average Temperature (°C)
January	209	25.1
February	174	25.7
March	268	26
April	300	26.1
May	246	26.3
June	174	26.2
July	183	26.1
August	219	26
September	243	25.8
October	305	25.7
November	373	25.2
December	284	25.1

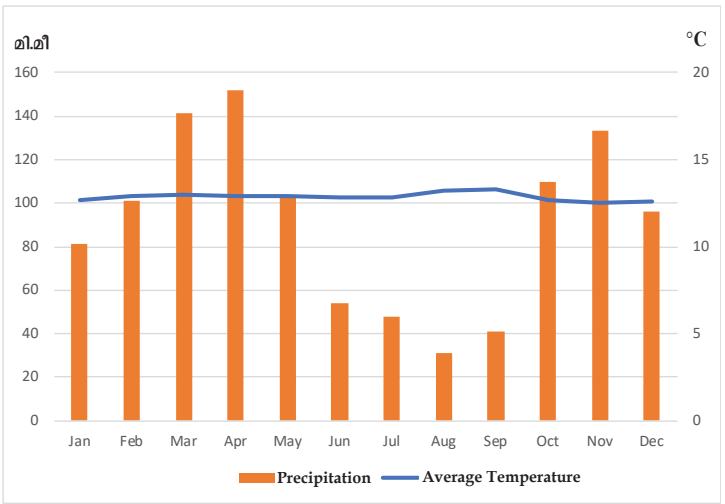
Source: Certificate Physical and Human Geography - Goh Chengleong



Kuala Lampur
Fig 3.4

Month	Precipitation (mm)	Average Temperature (°C)
January	81	12.7
February	101	12.9
March	141	13
April	152	12.9
May	103	12.9
June	54	12.8
July	48	12.8
August	31	13.2
September	41	13.3
October	110	12.7
November	133	12.5
December	96	12.6

Source: Certificate Physical and Human Geography - Goh Chengleong



Bogota
Fig 3.5

- Find the highest and the lowest mean monthly temperatures for each place.
- What is the annual range of temperature at each place?
- Is there any month that does not receive rainfall?

Haven't you understood that the equatorial climatic region generally receives high temperature and abundant rainfall throughout the year?

In spite of being situated in the equatorial climatic region, Kilimanjaro, the highest mountain peak in Africa is snow-covered throughout the year.

Kilimanjaro
Fig 3.6

Why is Kilimanjaro snow-covered throughout the year?

Excessive humidity, high rates of insolation and intense heat make the days in the equatorial climatic region quite oppressive. However, the moderating effect of winds blowing from the sea brings some relief along the coastal areas. As a result, coastal regions tend to be more populated.

Do you know?

The local wind called Harmattan blowing along the Guinea coast during the night reduces the temperature of that region.

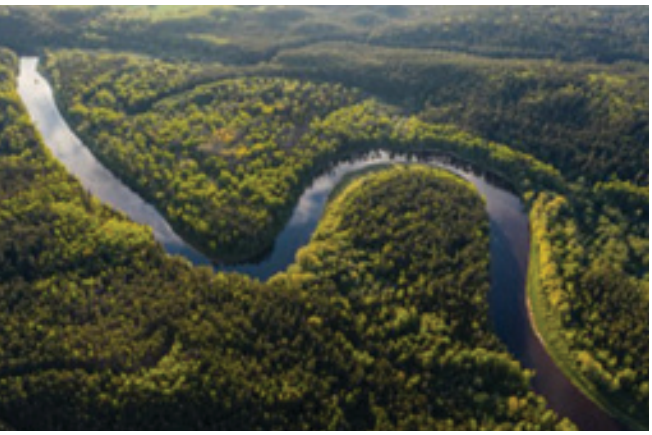
Conduct a classroom discussion to compare the climatic conditions experienced in the equatorial climatic region and Kerala. Have you understood how the climate in the equatorial region differs from the climate of Kerala? The significant features of the equatorial climatic region include consistently high temperature and heavy rainfall throughout the year.

The high temperature and abundant rainfall in this region pave the way for luxuriant vegetation growth. Let's explore the diverse natural vegetation found in the equatorial climatic region, which plays a significant role in maintaining the global ecological balance.

Natural Vegetation

Luxuriant forests, called tropical rainforests, are one of the salient features of this climatic region. These forests spread over the Amazon Basin in South America, West-Central Africa, Indonesia, the Malay Peninsula, and New Guinea.

Rainforest in Congo basin
Fig 3.7



Rainforest in Amazon basin
Fig 3.8

The rainforest found in the Amazon Basin is called Selvas. In this climatic region, there is no particular season for seeding, flowering, fruiting, and shedding leaves. As these processes occur year round in the tropical rainforest, they remain evergreen throughout the year. Hence, these rainforests are also called equatorial evergreen forests.

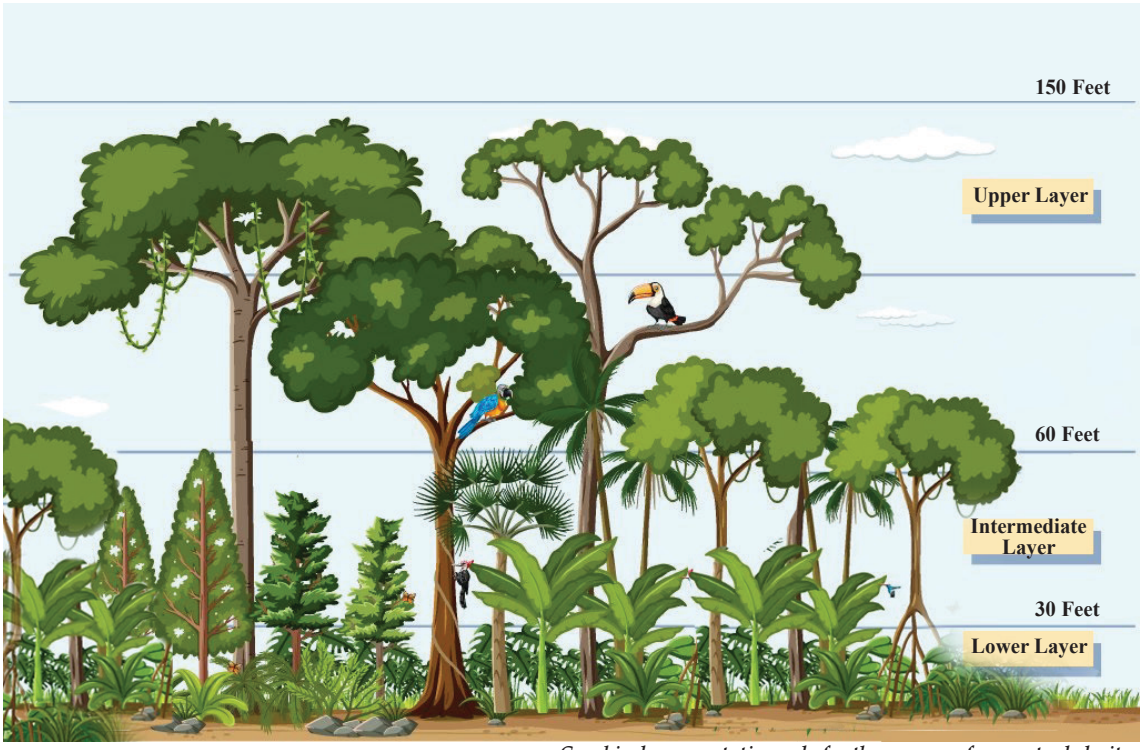
Let's explore the important features of the equatorial evergreen forests.

A wide variety of evergreen trees, including ebony, mahogany, cinchona, rosewood, and others are seen abundantly in these forests.

Besides large trees, smaller palms, climbing plants like lianas, epiphytes like orchids, numerous parasitic plants, ferns, and grasses like lalang grow luxuriantly here.

Another significant feature of these rainy forests is that multiple species co-exist in a particular area. It has been estimated that in the Malaysian rainforests, as many as 200 species of plants may be found in an acre of forest.

Plants grow to varying heights depending on the availability of sunlight. Trees form canopies at different levels, according to their heights. Observe the diagram (fig 3.9) given below and identify the distinct canopy layers formed by trees at different heights.



Graphical representation only for the purpose of conceptual clarity

The distinct canopy layers formed by plants at different heights
Fig 3.9

These evergreen rainforests absorb carbon dioxide and produce oxygen at a massive rate. As a result, these forests are often referred to as the 'Lungs of the World'.

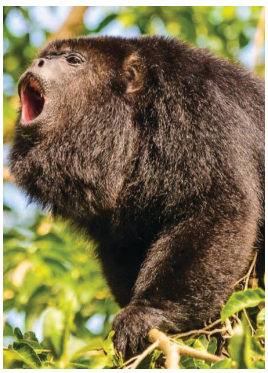
In equatorial rainforests, the forest is cleared at certain places for shifting cultivation. When these clearings are abandoned after cultivation, less luxuriant secondary forests spring up. Such secondary forests are called 'belukar' in Malaysia. In the coastal areas and brackish swamps, mangrove forests thrive.

Haven't you identified the characteristic features of the flora in the equatorial climatic region? Now, let's discuss the diversity of fauna in this region.

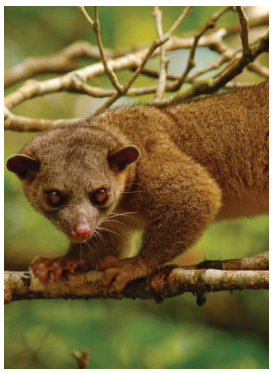
The equatorial climatic region is rich in the diversity of wildlife. Because of the climatic characteristics of this region, most of the wildlife thrive in trees. The animals which spend most of their lives in trees are called arboreal animals.

Since sufficient sunlight does not penetrate to the floor in these dense forests, undergrowth is absent. As a result, herbivores that feed on this undergrowth are not commonly seen. Consequently, carnivores that prey on them are also negligible in number.


Orangutan


Howler Monkey


Emerald Tree Boa


Kinkajou


Lemurs

Arboreal animals
Fig 3.10

Wildlife in this region includes lemurs, chimpanzees, orangutans, tree-dwelling reptiles, hippopotamuses, alligators, and many birds such as parrots, toucan and hornbills.


Alligator


Hippopotamus


Anaconda


Macaw

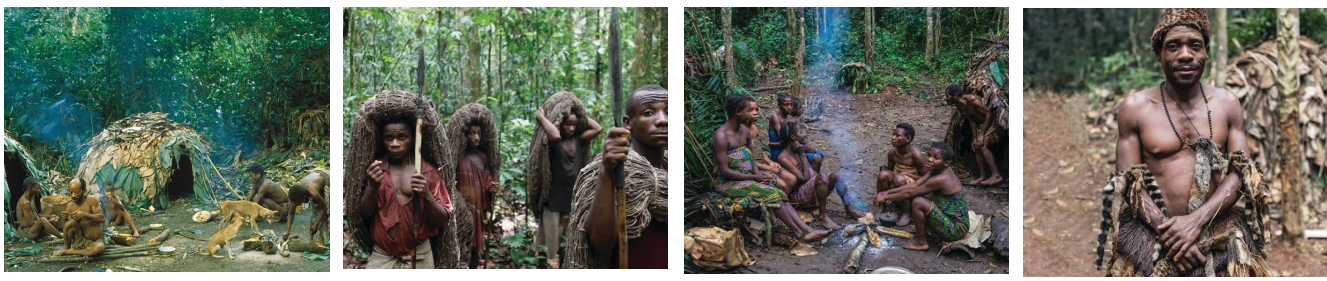
Fig 3.11

With the help of information technology create a digital album containing the pictures of fauna in the equatorial climatic region.

You have understood the physical features of the equatorial climatic region. Now, let's discuss human life in this region. The relationship between humans and their environment plays a

crucial role in shaping human life. Due to the physical conditions prevalent in the equatorial climatic region, this area is sparsely populated.

The Pygmies of Africa, the Indian tribes of the Amazon Basin, and the Orang Asli of Malaysia are some of the important native groups of this region.



The Indigenous people of Equatorial Rain forests
Fig 3.12

Pygmies

Pygmies are the indigenous people found in different parts of Africa, especially in the Congo Basin. They are comparatively short-statured. Traditionally, they live by hunting and heavily depend on the forest for subsistence. They also gather fruits, pulses, honey and other forest resources for food. Their diet includes meat, fish, roots and fruits. They follow a nomadic lifestyle and often live in small temporary huts made of leaves and branches. Pygmies live in groups. Decisions are also made collectively. They follow their traditional rituals strictly. Their rituals and beliefs are closely related to the environment. Indigenous musical instruments, music and dance are important parts of their culture.

The tribes living in these rainforests sustain themselves by hunting animals, gathering nuts and fruits, and fishing. The traditional method of cultivation practiced here is shifting cultivation, also known as slash-and-burn agriculture. Crops are grown after clearing a forest area by cutting and burning the trees. Cultivation continues until the land loses its fertility. Once the soil becomes infertile, the tribes move to another forest area, leaving the previous clearings behind, and

Burning forest for slash-and-burn agriculture
Fig 3.13

Cocoa Plantation in West Africa
Fig 3.14

Oil Palm Plantation in Indonesia
Fig 3.15

repeat the same process. Crops such as manioc (tapioca), yam, maize, bananas, and groundnuts are primarily grown through shifting cultivation.

With the arrival of Europeans, plantation agriculture was started extensively. The prevailing climate in this region has proven to be highly favourable for the cultivation of certain crops that are highly significant for industrial purposes. An important crop among them is rubber. Malaysia and Indonesia are the leading rubber-producing countries in the world.

Another plantation crop widely cultivated in the equatorial climatic region is cocoa.

Other major plantation crops extensively grown here include oil palm, coconuts, sugarcane, coffee, tea, bananas, and pineapples.

With the help of information technology, prepare a table containing a list of major plantation crops in the equatorial climatic region and the corresponding areas where they are grown.

Most of the natives in the equatorial climatic region are nomads. Most houses are built with locally available resources.

Pictures of houses seen in different places of the equatorial climatic region are given below; have a look at them.

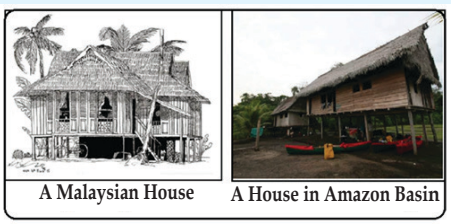
Fig 3.16

We should never assume that most of the people living in the equatorial climatic region are either primitive tribes or nomads, residing in houses built with wood and stones. On the contrary, there are many beautiful tourist destinations and modern cities here. Cities like Equitas, Quito Bogotá, Singapore, Jakarta, and Manaus and Belem cities of Amazon basin are a few examples. In Malaysia, Singapore, and Eastern Brazil, significant development has also been made through systematic planning and hard work.

With the help of information technology, find out the major cities in the equatorial climatic region. Locate them on an outline map of the world and include it in 'My Own Atlas'.

Shelters in the Amazon and Malaysian Equatorial Region

In the Amazon Basin, people live in a distinct type of house called Maloca. Malocas have steep-sided slanting roofs. Houses thatched with coconut leaves are also seen here. Villages in the equatorial regions of Malaysia are called Kampongs. Houses are mainly made of wood here. As the houses are constructed with wood, bamboo, and leaves, extreme heat is not felt inside these houses.

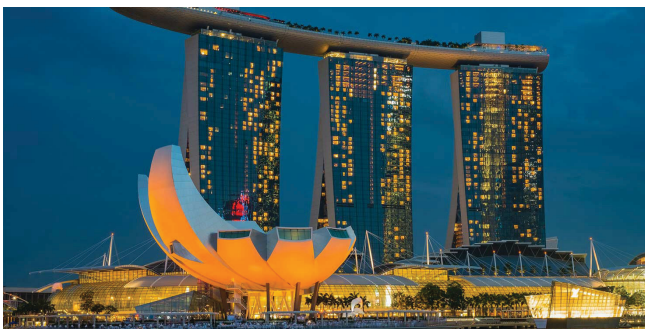


A Malaysian House | A House in Amazon Basin

Equitas
Fig 3.17

Bogota
Fig 3.18

Amazon Forest and Manaus City
Fig 3.19



Singapore
Fig 3.20

Sleeping Sickness

Sleeping sickness is a type of disease found in equatorial rainforests. It is spread through Tse Tse flies. Another fatal disease in the equatorial rainforests is yellow fever, caused by mosquitoes.

Though the equatorial climatic region is blessed with rich forests, numerous rivers, abundant water, and scenic beauty, it encounters many challenges. Let's glance at them.

We know that the hot and wet equatorial climate is highly supportive of plant growth. At the same time, it also encourages the spread of insects and pests. As germs and bacteria are more easily transmitted through moist air, this leads to a widespread occurrence of diseases in the region. The spread of insects and pests is also harmful to crops.

Unlike in modern cities, most of the equatorial climatic region is devoid of basic amenities. The thick, luxuriant forest hinders the development of this region. It is too difficult and expensive to construct and maintain roads and railway lines through these dense forests and over swamps. Lalang (tall grasses) and thick undergrowth spring up as soon as the trees are cut. It often adversely affects the cultivation of crops too. Wild animals, disease-spreading insects, and poisonous creatures pose a threat to the lives of those engaged in construction work in these forest areas. Many remote parts of the Amazon Basin, the Congo, and Borneo lack modern communication systems even today. The rivers form the only natural highways.

Lalang
Fig 3.21

Although equatorial climatic regions are blessed with thick forests, commercial extraction remains challenging. The density of forest and the difficulty of transporting logs hinder commercial lumbering. Additionally, the hardwoods are too heavy to be floated down the streams.

Livestock rearing is not a primary subsistence activity in most parts of this climatic region due to the absence of grazing land as well as insect attacks on the animals.

The equatorial rainforests play a crucial role in making the world's climate sustainable. About one-third of the world's total forests are located in three regions: the Amazon Basin, the Congo Basin, and Southeast Asia. These forests, which play a significant role in influencing the world's climate, face numerous threats of deforestation in many ways.

Haven't you heard of forest fires in the Amazon forests?

Forest fire in Brazilian Rainforests
Fig 3.22

By utilizing the possibilities of information technology, collect news on forest fires in the Amazon forests from the media and prepare a note on it. Present the same in your classroom.

Another issue encountered by this region is human-induced forest deterioration. Human activities such as agriculture, construction, urbanization, and mining are alarmingly destroying these forests.

Use information technology to gather details on the challenges faced by equatorial rainforests. Lead a discussion on the topic.

So far, we have discussed the characteristic features of the climate, the diversity of flora and fauna, and human life in the equatorial climatic region. Now, let's explore the geographic features of another climatic region, which has entirely different conditions from those of the equatorial climatic region.

Longyearbyen Town
Fig 3.23

Northern Lights
Fig 3.24

Read the travel diary given below.

My intense longing for many years to see the northernmost town in the world has finally brought me to Longyearbyen, a town in the Svalbard Islands located north of Norway in the Arctic Sea. The Svalbard Islands, covered by snow throughout the year, are part of Norway. This mining town, inhabited by more than a thousand people, is considered the northernmost settlement in the world.

The conditions in this region and the way people live here will generate both astonishment and curiosity in anyone. Is it necessary to specify how amazing the experiences in this part of the world are for someone like me, especially coming from the equatorial region? The day I arrived, there was heavy snowfall. Every year, from mid-November to January, this town experiences seemingly everlasting nights. Those living here must adjust their lives during this period, known as the polar night. When they go out for work during the day, they must wear reflective clothing over their usual woollen clothes to be recognized in the darkness. One of nature's wonders that can be witnessed here is the Northern Lights. As I gazed at the multi-coloured sky and the snow-covered mountains reflecting the same sky, I stood still, forgetting everything around me.

The extract you have read is a travel memoir by a traveller with an Arctic expedition, who visited the northernmost human settlement of Longyearbyen.

What features have you noticed here that are different from those in the equatorial region?

- Snow fall
-

By using an atlas, find the location of the town of Longyearbyen and identify the climatic region to which this town belongs.

Examine the map given below and write down the regions marked on the map.

- Ice cap
-

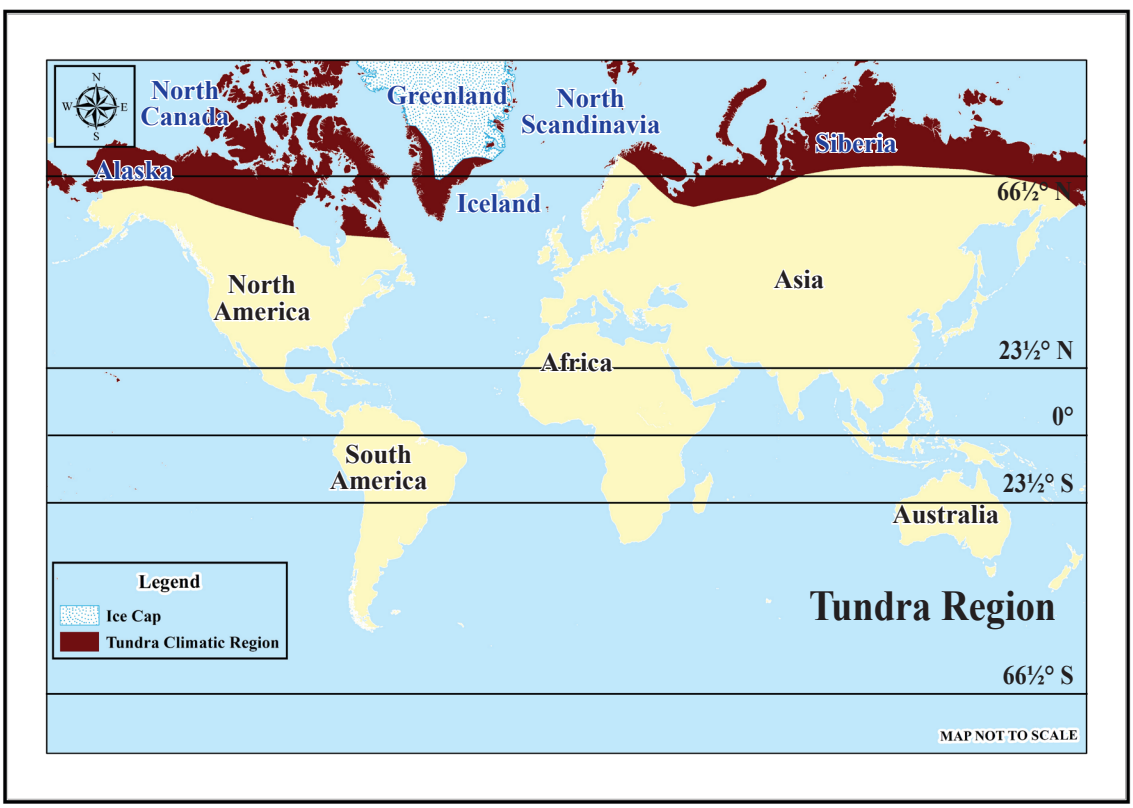


Fig 3.25

Have you identified the location of the Tundra region? Now, find the continents over which the Tundra region spreads. Complete the table given below.

Places	Continents
• Siberia • Greenland • Iceland • North Scandinavia • North Canada • Alaska	

The Tundra region is located to the north of the Taiga region. It spreads along the Arctic coasts of North America and Eurasia, and that of Greenland.

The Tundra region can be categorized into Arctic Tundra and Alpine Tundra. Identify from the table below the regions to which each type of Tundra belongs.

Arctic Tundra	Alpine Tundra
• In parts located to the north of Taiga in Alaska, Northern Canada, Siberia, Greenland, Iceland, Scandinavia	• In high mountainous regions

Fig 3.26

Fig 3.27

With the help of an atlas, identify the location of the Tundra region and mark it on the outline map of the world. Include the map in My Own Atlas.

The Tundra climatic region is also called the Arctic or Polar Climate. The polar climate is characterized by short summers and long winters. Let's explore the features of the climate prevailing here.

The climate of the Tundra is characterized by a very low mean annual temperature. In mid-winter, temperature falls between -25 and -35 degrees Celsius and the temperature in the interior parts of the Tundra falls still lower. Summers are short here during which, a few weeks have the temperature rising above 0 degrees Celsius. The sun never sets for weeks in the area between the Arctic Circle and the Pole. Likewise, the sun never rises for weeks in this area either. Don't you remember the polar night mentioned in the travelogue by the traveller who visited Longyearbyen, which lies beyond the Arctic Circle?

Haven't you learned in your lower classes why long nights and days occur in the area that lies north of the Arctic Circle?

One of the features of this region is that during the period when the sun's apparent position is in the Northern Hemisphere, the North Pole experiences day for around six months. In contrast, during the period when the sun's apparent position is in the Southern Hemisphere, the North Pole experiences night for around six months.

- In which months is the apparent position of the sun in the Northern Hemisphere?
- In which months is the apparent position of the sun in the Southern Hemisphere?
- How long are the nights and days during these periods at the Poles?

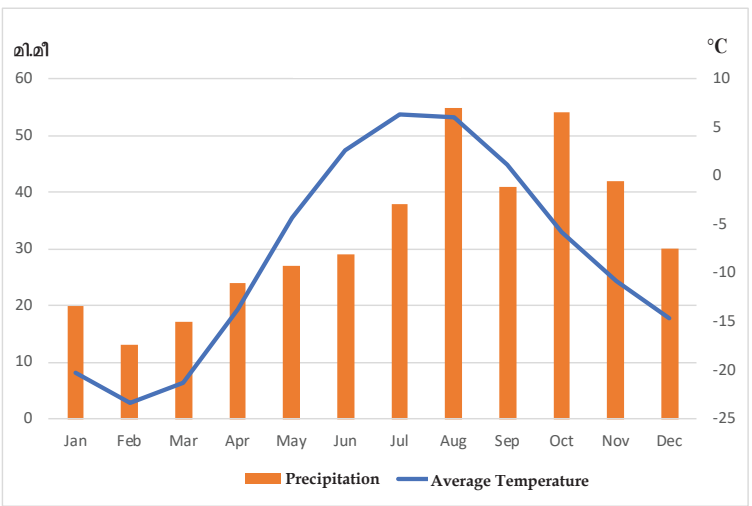
Snowfall in the Tundra Region
Fig 3.28

During winter the precipitation is in the form of snow. The coastal areas where cyclones are strong have much heavier rainfall. The strong snowstorms that blow over this region are called blizzards. They often cause heavier snowfall.

The following diagram represents the average annual temperature and rainfall recorded at a place in the Tundra region. Analyze the diagram using the indicators given below.

Month	Precipitation (mm)	Average Temperature (°C)
January	20	-20.2
February	13	-23.4
March	17	-21.3
April	24	-13.7
May	27	-4.3
June	29	2.6
July	38	6.4
August	55	6
September	41	1.2
October	54	-5.7
November	42	-10.8
December	30	-14.6

Source: Certificate Physical and Human Geography - Goh Chengleong



Upernavik in Greenland
Fig 3.29

Indicators

- Month that receives the maximum rainfall
- Month that receives the minimum rainfall
- Month in which the maximum average temperature is recorded
- Month in which the minimum average temperature is recorded

- The maximum average temperature and the minimum average temperature
- The Annual range of temperature

Haven't you explored the characteristic features of the climate experienced in the Tundra region? We know that the diversity of flora and fauna in any region depends on the climatic features of that region. The natural vegetation is scanty in this region due to insufficient in sunlight and long winters. The diversity of fauna is also scanty here.

Lichens
Fig 3.30

Let's take a look at the significant features of the natural vegetation and wildlife of this region.

Trees are normally absent in the Tundra region due to the challenges posed by the climate. Mosses, lichens, sedges, and bushes are commonly found here. Dwarf willows and stunted birches withstand the harsh climatic conditions and survive in certain places.

Some hardy grasses grow in the coastal lowlands where favourable conditions prevail. Herbivores like reindeer make survival possible here only by depending on these pastures.

Hardy Grasses
Fig 3.31

Bushes
Fig 3.32

Dwarf willows
Fig 3.33

Even though summer is very short in the Tundra, which is covered by snow throughout the year, this region becomes active with the onset of summer. In brief summer, as the snow melts, bushes start bearing berries and flowers begin to bloom. Birds migrate to the Tundra during this period from

the south to prey on insects that come out at this time. Arctic foxes, wolves, polar bears, musk-oxen, and arctic hares are the other animals found here.

Polar Bears
Fig 3.34

Arctic Fox
Fig 3.35

Arctic Hare
Fig 3.36

Musk-Ox
Fig 3.37

With the help of information technology, create a digital picture album of animals found in the Tundra region.

Human life in the Tundra

Normally, the Tundra is a sparsely populated region. Human life in this region is largely confined to the coast.

Plateaus and mountains are permanently snow-covered, making them uninhabitable. The Tundra is mainly inhabited by some nomadic tribes.

Examine the table given below. Identify the different tribes in the tundra and the regions they belong to.

Greenland, North Canada, Alaska	Eskimos or Inuit
North Finland, Scandinavia	Lapps
Siberia	Samoyeds
Lena Basin	Yakuts
North- Eastern Asia	Koryaks, Chuckchi

With the help of an atlas, identify the regions where each tribal group lives in Tundra and mark these regions on an outline map of the world. Write the name of each tribal group appropriately on the map. Include this map in My Own Atlas.

Hunting and fishing are the major activities for subsistence by the people of the Tundra. Whales, seals, caribou, various kinds of fish, birds, and fur-bearing animals provide them with everything they need for food and clothing. Their bones and other parts are used as weapons, tools, and even utensils. The Polar Eskimos of Greenland still lead a primitive lifestyle, not very much different from their forefathers. During winter, they live in houses called igloos and in summer, they migrate to other places for hunting and fishing. During the summer season, they live by the side of streams in portable tents made of animal skin. There are Eskimos who hunt and feed on even polar bears.

Alaskan Eskimo
Fig 3.38

Koryaks of North- Eastern Asia
Fig 3.39

Samoyeds of Siberia
Fig 3.40

In the last sixty years, the way of life of the Eskimos has undergone tremendous changes through their contact with Europeans. In coastal villages, Eskimos live in houses with modern amenities. They now use speedboats for fishing instead of small rowing boats called kayaks.

Reindeer Farm in Siberia
Fig 3.41

Modern Agriculture in the Tundra Region
Fig 3.42

Fur-bearing animals are being reared on a commercial scale. In some areas of the Tundra in Canada and Alaska, schools have been established for Eskimo children to enable them to live a modern life.

In the Eurasian Tundra, most of the tribal groups lead a nomadic life, wandering with their herds of reindeer in search of pastures. In the Siberian Tundra, large farms have been established for rearing fur-bearing animals, including reindeer, on a commercial scale.

Mining in the Tundra region results in the development of new settlements. In certain areas of the Southern Tundra where favourable conditions exist, cereals with short growing season are also cultivated.

Igloo

The dome-shaped, temporary shelters made out of blocks of snow by Eskimos in the Tundra region.

Sledges

In some areas of the Tundra, a distinct type of vehicle called sledge, which slides over snow, is used for transportation. Dogs are usually used to pull these vehicles.

The Tundra and the Climate Change

You have learned from the previous chapter that climate change occurs globally. The Tundra is one of the places that is adversely affected by climate change.

Due to global warming, the permafrost in the Tundra melts considerably. This adversely affects the ecosystem and environmental equilibrium of the region.

With the help of information technology, prepare a note on the topic 'The Challenges Posed by Climate Change in the Tundra Region'. Present it in the classroom.

We have, so far, discussed the geographical features of two regions with distinctly different climatic conditions. Haven't you read the imaginary travel memoirs included in the chapter? Imagine that you are the expeditioner travelling from the Equatorial region to the Tundra.

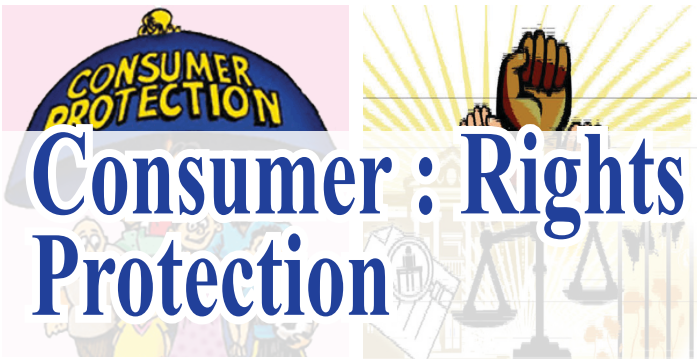
Prepare a travelogue comparing these two regions based on the indicators given below. Make it attractive by including appropriate pictures.

- Climate
- Flora and Fauna
- Human Life
- Challenges faced by each region

We have gone through the characteristics of two regions: the Equatorial climatic region which experiences high temperatures throughout the year and the Tundra climatic region which experiences extreme cold year-round. The place we live in is entirely different from these two regions, isn't it? How diverse our Earth is! We have seen how some people, flora, and fauna make life possible by adapting to the unique conditions of their respective regions. Our duty is to live in harmony with the environment by internalizing and respecting all these diversities.

Extended Activities

1. Conduct a seminar in your class on the topic "Human Life in the Equatorial Climatic Region and the Tundra Region."
2. With the help of information technology, create a digital album containing pictures that illustrate the lifestyles of tribes in the Equatorial Climatic Region and the Tundra Region. Make a comparative study of their lifestyles.
3. Prepare a note comparing the climate of both the Equatorial Climatic Region and the Tundra Region.
4. Prepare a pictorial description of the Northern Lights after collecting more information about it. Present it in the classroom.
5. Conduct a debate on the topic 'The Challenges faced by the Equatorial Rainforests'.



4 Consumer : Rights and Protection

Don't we purchase goods and services for our daily use? From where do we get these goods and services? We get them from markets right from the small shops around us to the online chains spread all over. A market is thus a place where sellers and buyers establish close links.

Fig 4.1

We have learned in previous classes that consumption is the process of buying and using goods and services to fulfil one's needs. We also know that a consumer is someone who buys and uses goods and services for a price, or under an agreement to buy them for a price. We had also discussed the various factors that influence consumption. What are they? Write them down.

- Price
-
-
-

Fig 4.2

Consumer Satisfaction

Alfred Marshall
Fig 4.3

The customer gets satisfaction from using goods and services. Can this kind of satisfaction be measured and quantified? We know that consumer satisfaction is the main objective of all economic activities. But satisfaction is difficult to measure mathematically because it is subjective and depends on each person's mental state. However, if we want to know the dynamics of satisfaction, we need to quantify it. Alfred Marshall was the first economist to make an attempt at such a quantification. The satisfaction gained through consumption can be considered as the utility of goods and services.

Utility

Utility is the want-satisfying power of a commodity/ good. We can measure this utility by using the unit of utils. Cardinal Utility Theory states that the satisfaction derived by the consumer through the consumption of goods and services can be quantified by using cardinal numbers. Changes in utility can influence the choice and consumption of goods and services. To understand the change in utility when a good is consumed continuously over a given period of time, we need to know about the measures of utility. Let's take a look at them.

Total Utility (TU)

Total utility is the total amount of utility that a person receives when he continuously consumes several units of a particular commodity.

Marginal utility (MU)

The change in total utility that occurs when one additional unit of a commodity is consumed is called marginal utility. Let's illustrate this with an example.

Suppose your classmate Nina's favourite fruit is oranges.

Imagine that you are giving oranges one by one for her to eat. When she eats the first orange, her satisfaction will be great. Imagine that she gets 20 utils as satisfaction from it. If you give her another orange to eat, she may not get as much satisfaction from it as she did from the first one. Let's assume that satisfaction obtained from the second orange is 18 utils(38-20=18). Thus, the total utility derived from both oranges is 38 utils.18 utils is the marginal utility obtained from the consumption of the second orange. Suppose five oranges are continuously eaten one by one. The utility gained from the consumption of all the five units is called total utility and the change in total utility between the consumptions of the 4th and the 5th oranges consumed is called marginal utility. The change in total utility and marginal utility after the consumption of each additional unit of orange is given in the table below. Analyse the table and answer the following questions:

No. of Oranges	Total Utility (TU)	Marginal Utility (MU)
1	20	20
2	38	18
3	53	15
4	63	10
5	67	4
6	67	0
7	64	-3
8	57	-7

- What happens to total utility when 1 to 5 units of oranges are consumed? What is the change in total utility after the consumption of the 6th unit?
- When a certain unit of oranges in consumed, the marginal utility is shown as zero. Which is it? Why does the marginal utility become negative when 7 and 8 unit oranges are consumed?

Using the quantities given in the above table, let's draw a Total Utility Curve and a Marginal Utility Curve.

Total Utility Curve and Marginal Utility Curve

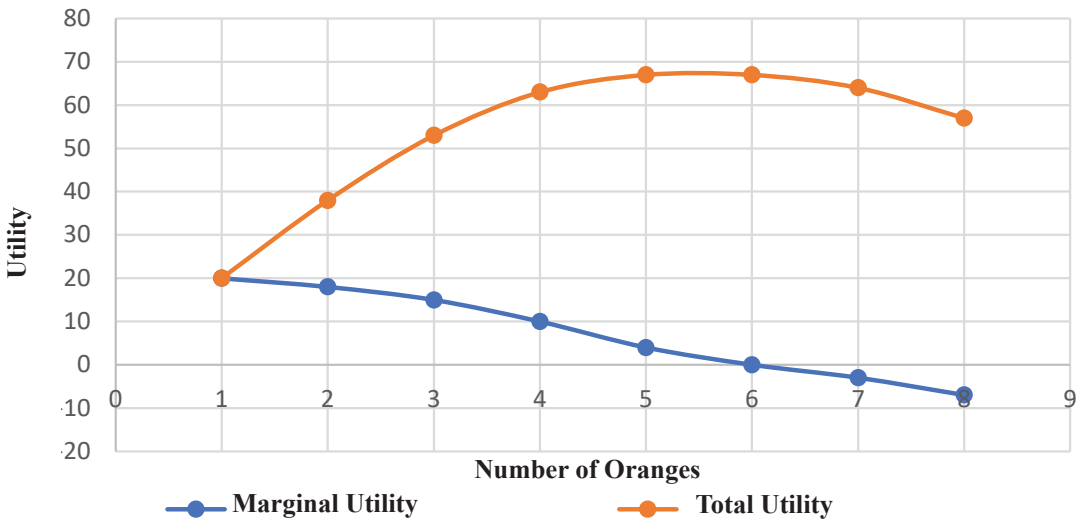


Fig 4.4

Observe the graph (Fig 4.4) and prepare a note explaining the relationship between total utility and marginal utility.

Law of Diminishing Marginal Utility

Marginal Utility from consuming each additional unit of a commodity declines as its consumption increases, while keeping consumption of other commodities constant.

Assumptions and Limitations of Cardinal Utility Theory

The Law of Diminishing Marginal Utility is based on the assumptions that all products must be of the same quality and that the consumer's income and tastes do not change. Some of the limitations of the Law of Diminishing Marginal Utility are that consumption must be continuous, that the use of other goods must be ascertained, and that the units must be of a fixed quantity and quality. Since utility cannot be quantified using cardinal

numbers, new theories have been developed to replace the Cardinal Utility Theory. However, it is a fact that the utility obtained from a good decreases as additional units of it are consumed and it also generally influences consumption.

Utility is individual-based. It may vary depending on place and time. For example, the utility provided by a fan to a person living in a hot climate may not be the same for a person in a cold climate. Any consumer would prefer to choose goods and services that provide the most utility. But we know that the price of goods and the income of the consumer often influence the choice of goods and services. Every consumer would like to have quality goods and services available at a reasonable price and in accurate measurement. It is also the right of the consumer. What other rights does a consumer have?

Utility and Usefulness

All the goods and services we use in our daily lives have utility. But all of them need not be useful. For example, a person who smokes a cigarette gets utility from it. But as we know, cigarette is not a useful thing, and it is harmful to health. Ethics has no relevance in utility.

Consumer Rights and Protection

Before explaining the rights of the consumer and how to protect them, let's get acquainted with the different types of goods and services. Different types of goods and services and their characteristics are given below. Complete the table using the hints provided.

Types of Goods	Peculiarities	Examples
Free goods	Free goods are those that are abundant in nature and are freely available to everyone. They need not be paid for.	
Economic goods	These are goods and services that are purchased and used for a price. They can often be manufactured or collected from nature.	

Consumer goods	Consumer goods are the final goods used by the consumers to satisfy their wants. They are bought and sold for a price and are not subjected to production process again.	
Capital goods	It is a physical product which is used in the production of another product. Capital goods are goods that assist in the production process and are sometimes used as consumables. It is not considered as capital goods at such instances.	
Durable goods	Durable goods are things that last for a long time. They can be reused.	
Non -Durable goods	Non-durable goods are items that can be used only for a short period of time.	

Hints

- Sunlight, Air
- Food, Vehicles
- Clothes, Minerals
- Factory, Machinery
- House, Footwear
- Table, House
- Milk, Vegetables

We have become familiar with various types of goods and we often go to markets to buy them. What are the things a consumer should pay attention to while buying goods and services from markets? Complete the list.

- Quality of the product

- Expiry date
-
-

Consumers who do not have a clear understanding of product-related issues such as price, quality, warranty, and safety standards are sometimes duped. This can result in consumer exploitation. To avoid such exploitation, we need to know many basic things related to goods and services.

It is the right of the consumer to receive a bill when purchasing goods and services. Make sure that the bill has the GST number. Otherwise, you may be cheated. By collecting the bill, you not only protect consumer rights but also ensure a social commitment.

Goods and Exercises Tax (GST)

GST came into effect in India on 1 July 2017, as part of the implementation of the 101st Amendment to the Constitution. The aim of GST is to make the economy transparent by unifying various taxes and implementing the concept of "One Nation, One Tax". There are various rates of GST such as 5%, 12%, 18% and 28%. There are also products that are exempted from GST. The structure of GST is as follows. The state government receives 50% of the GST we pay as SGST and the Central Government receives 50% (CGST). GST registration is mandatory for traders with an annual turnover of more than Rs 20 lakhs.

1. When you receive a bill for purchasing goods and services, check whether it has the GST number. Write down the other things you should pay attention to.
   - GST rate
   -
   -
2. Check the bills of goods purchased in your household over a period of time and prepare a list of items that are subject to different GST rates.

Take a look at the collage below and observe the types of scams that are happening around us.

Fig 4.5

We have come across such news items in print and electronic media, the basis of which is the violation of consumer rights and the cheating of consumers. Such incidents, although on a smaller scale, have been happening in our country for a long time. Many initiatives have been taken to address them, the most important being the Consumer Protection Movement.

Consumer Protection Movement

The Consumer Protection Movement in India came into being with the formation of the Consumer Guidance Society of India in Mumbai in 1966. It is a social movement formed to protect the rights, and ensure the welfare of consumers. This movement is led by various consumer organizations and individuals who work against firms or institutions that cheat consumers. Their objectives are as follows:

- To protect consumer rights
- To prevent frauds

- To empower consumers
- To legislate
- To ensure the credibility of advertisements
- To ensure representation of consumers in political forums

Consumers should be able to consume with ease and without becoming a victim to exploitation, and for this, legal help is needed. The Consumer Protection Act came into force in India on 24 December 1986, following the adoption of the 1985 United Nations Resolution containing guidelines on consumer protection. To commemorate the event, 24th December is being observed as National Consumer Day.

Consumer Protection Act 1986

This is a law passed by both the Houses of Parliament in 1986 to protect consumer rights. The Consumer Protection Act of 1986 clearly defined consumer rights and established a separate judicial system in India for consumer protection.

Fig 4.6

With the emergence of e-commerce platforms, a law to protect consumers in such areas has become imperative. It is against this backdrop that the Consumer Protection Act 2019 was enacted.

Consumer Protection Act 2019

This Act came into force on 20 July 2020, replacing the Consumer Protection Act of 1986. This Act aims at empowering consumers and protecting their rights.

Fig 4.7

Features

- Established The Central Consumer Protection Authority (CCPA) to protect and enforce the rights of consumers.
- Covers rules to prevent unfair trade practices by e-commerce platforms.
- Helps in simplifying the consumer dispute resolution process.
- Provides for punishment of those who manufacture or sell adulterated counterfeit goods.
- Prohibits the dissemination of misleading advertisements.
- Guarantees the right to consumer education.

Apart from the Consumer Protection Act of 1986, there are other laws in place to protect the rights of consumers on specific issues. For example, the Food Safety Act, 2006, was enacted to ensure the quality of food products. We are now familiar with laws that protect consumer rights. Let's see the rights of the consumer ensured by these laws.

Fig 4.8

Right to Safety

The right to be protected from those goods and services that pose a threat to life and property.

Right to Choose

Right to choose goods and services at competitive prices.

Right to Know

Right to know the quality, quantity, purity and price of goods to protect the consumer from unfair trade practices.

Rights to seek Redressal

Right to seek redressal from unfair trade practices and consumer exploitation.

Right to Consumer Education

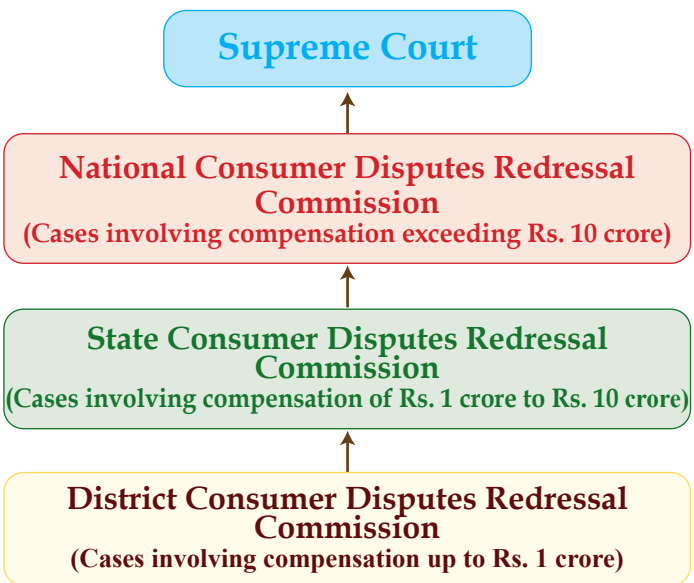
The right to acquire the knowledge and skills to be an informed consumer.

Prepare posters on consumer rights and display them in the class.

Consumer Courts

The history of consumer courts begins with the enactment of the Consumer Protection Act in India in 1986. With this, consumer courts were established and tribunals were formed for speedy resolution of complaints. Consumer courts are deployed at three levels.

Structure of Consumer Courts



Consumer courts play a crucial role in intervening in consumer disputes and providing justice, including redressal. There are over 600 district forums and 35 state commissions across India. At the top of all this, there is an apex body called the National Consumer Disputes Redressal Commission (NCDRC).

In addition to consumer courts, there are also three-tier advisory committees under the Consumer Protection Act.

They are:

- District Consumer Protection Council
- State Consumer Protection Council
- National Consumer Protection Council

The role of these committees is to advise the respective governments on matters related to consumer rights.

Various types of fraud and the institutions and methods to be approached to resolve them

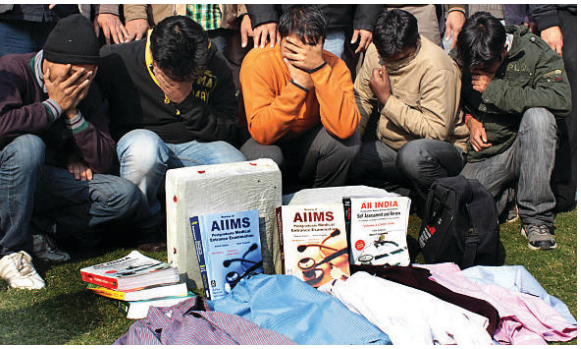


Fig 4.9

Fig 4.10

1. Frauds related to educational institutions

a) Contact UGC, AICTE, State Board

b) Approach Consumer Forum

c) Lodge a complaint with the police

d) Contact the Ministry of Education

2. Healthcare Frauds

a) File a complaint through the grievance portal of the State/National/Medical Council

b) Complain with a report to the Director of Health.

c) File Public Interest Litigation (PIL) in the High Court and Supreme Court for serious health frauds

d) File a complaint through the Aarogya Setu app.

3. Fraudulent offers of jobs abroad

a) Can complain through the Protectorate of Emigrants (P0E)

b) A case can be filed under IPC Section 420.

c) If you were scammed after arriving at the foreign country, you can lodge a complaint with the Indian Embassy or High Commission.

d) Can get in touch with at Pravasi Sahayata Kendra (PBSK) Toll No: 1800-11-3090

Fig 4.11

4. Online Fraud

a) Complain to Cyber Crime Cell at cybercrime.gov.in

b) Report to the CERT - IN portal (Indian Computer Emergency Response Team)

c) Submit a complaint through the National Consumer Helpline or at info@cert.in.org.in

Fig 4.12

5. Banking frauds

a) Approach the Bank Grievance Redressal Mechanism (Branch Manager)

b) If the bank does not respond within 30 days, you can approach the RBI Ombudsman.

c) Banking Ombudsman Toll free no: 14448, cgmbank@rbi.org.in

Fig 4.13

Search the newspapers of the last six months available at your school library. Prepare a note on the various types of frauds reported in them.

How to file complaints

If a consumer is cheated, he/she can file a complaint with the respective office or consumer courts. Persons with grievance can write a detailed complaint on a white paper and submit it directly to the consumer dispute redressal court, along with supporting documents as evidence. Insisting on bills at the time of purchase assumes significance in this context.

Some quality symbols

Symbol	Name	Related sector
	ISI mark	The Bureau of Indian Standards (BIS) issues the ISI mark to ensure that products meet certain quality standards. This mark can be found on industrial products such as cement, paper, paint, and gas cylinders.
	AGMARK	This symbol is used to ensure the quality of agricultural and forestry products.
	FSSAI	Ensures food security.

To make consumers aware and to ensure the quality of the products before purchasing and using them, some symbols like the ones mentioned above are given on the labels of the products. Have you noticed them?

Examine the labels of the two toothpastes given in Fig 4.14 and prepare a note by adding the symbols found and their meanings.

Fig 4.14

There are many other symbols that indicate the quality of products. Find them and prepare a picture album.

Carelessness, ignorance and being cheated

Why do consumers get cheated? Don't you think it is the carelessness and ignorance of the consumer that often causes them to be cheated? In the following questionnaire, mark the ones that are applicable to your family and evaluate yourself with the help of your parents.

Consumer Rights - Questionnaire

1. When purchasing goods and services, do you check whether the quantity and weight are correct?

   ☐ Always ☐ Sometimes ☐ Never

2. Do you check the maximum shelf life of the product you are purchasing?

   ☐ Always ☐ Sometimes ☐ Never

3. Do you compare the price listed on the purchased goods with the price on the bill?

   ☐ Always ☐ Sometimes ☐ Never

4. Have you ever received damaged goods from the stores?

   ☐ Always ☐ Sometimes ☐ Never

5. Have you noticed what ingredients are used in the purchased product?

   ☐ Always ☐ Sometimes ☐ Never

6. Do you check the manufacturing date of the product on the product labels?

   ☐ Always ☐ Sometimes ☐ Never

7. Do you check whether there is warranty/guarantee for the purchased product?

☐ Always ☐ Sometimes ☐ Never

8. Do you read the statutory warnings on the wrapper of the products?

☐ Always ☐ Sometimes ☐ Never

9. Do you normally buy products only after as curtaining the meaning of the symbols and images on the product wraps?

☐ Always ☐ Sometimes ☐ Never

10. Do you check whether the products you order online are the same as advertised?

☐ Always ☐ Sometimes ☐ Never

11. Have you ever noticed the street vendors using other materials to manipulate weights instead of the scales prescribed by the Legal Metrology Department?

☐ Always ☐ Sometimes ☐ Never

12. Have you checked the density of petrol and diesel while fueling your vehicle with?

☐ Always ☐ Sometimes ☐ Never

13. After travelling in an auto rickshaw, do you pay the same fare as the meter reading?

☐ Always ☐ Sometimes ☐ Never

14. Have you checked whether all commercial establishments are differently abled friendly?

☐ Always ☐ Sometimes ☐ Never

16. Do you check with the distributor that there is no leak in the cooking fuel supplied in the cylinders?

☐ Always ☐ Sometimes ☐ Never

17. Do you try to complain if you realize that you have been cheated as a consumer?

☐ Always ☐ Sometimes ☐ Never

Consumer Education

Consumer education is about educating consumers about their rights, responsibilities, choices of products and services, differences in markets and consumer laws. Its objectives are as follows:

1. To protect consumer rights
2. To make consumers aware of their responsibilities
3. To ensure safety in trade, especially online trade
4. To identify ethics and regulations in the market
5. To create awareness about consumer protection laws
6. To ensure health safety
7. To promote consumer justice

Fig 4.15

Consumer education raises awareness and instills self-protection values among consumers. This helps consumers to be protected from frauds and wrongful transactions.

We can create a better consumer society through consumer awareness. Consumer education is being included as a separate topic in the curriculum and through this, practical experiences are being presented to the children in the classroom. Online courses for consumer education are available today. Consumer clubs in schools also help in raising consumer awareness among students.

Wake up consumer.... wake up....

Fig 4.16

Laws and procedures alone cannot fully ensure customer satisfaction. We need intervention of a civic-minded society also. How can a society intervene in this matter? Organize a discussion in the class and prepare a note.

To register complaints with the State Consumer Helpline, visit the website consumeraffairs.kerala.in Consumers can also call 1800 425 1550, 1967, 1915 to lodge complaints.

Consumers need to be aware of their rights and be able to complain and get solutions to the problems they face. We need to develop a mindset of consuming only the necessary goods. This will provide an opportunity for the people, who do not have access to goods and services, to get them. This way, sustainable consumption and development can be achieved.

Consumer protection law plays a major role in ensuring ethical practices in the business sector where producers and consumers come into contact. The intervention of a society that has civic consciousness and consumer education, should be there in consumer protection.

Extended Activities

1. Visit the website nationalconsumer helpline.gov.in, study the Consumer Handbook and prepare an album of pictures related to consumer protection.
2. Visit the different markets in your area and conduct a survey to identify the changing consumer preferences, product characteristics, and price variations.
3. Conduct a survey of homes in your neighborhood by adding appropriate questions to the questionnaire on consumer rights already given in this chapter.

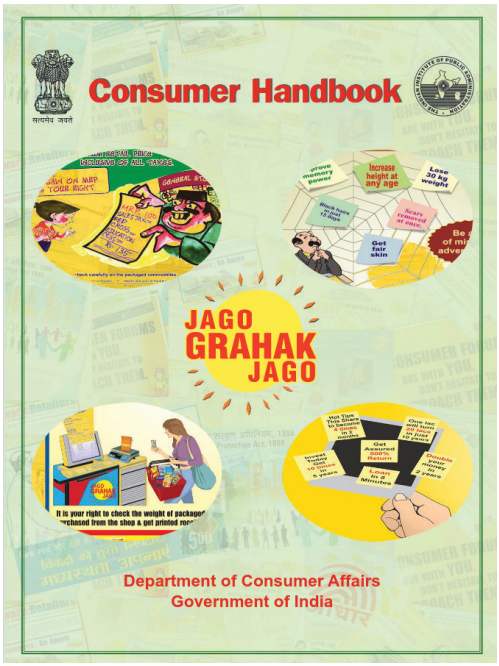


Fig 4.17

4. Set up a consumer help desk under the auspices of the school's consumer club. With the help of teachers, educate the public on the steps to be taken if a consumer is cheated.
5. If any of your school's alumni is working in consumer courts, invite them to your school and organize an interview about consumer rights.
6. Celebrate Consumer Day in a grand manner by including seminars, exhibitions, etc.
7. Prepare short documentaries on what you, as students, can do to spread consumer education.
8. Prepare a note examining recent court observations and judgments against misleading advertisements.

5 Money and Economy

Have you ever thought how many exchanges of goods and services are taking place in the economy every day? These exchanges of goods and services between individuals, and between production units became easier with the advent of money.

Fig 5.1

Anything accepted in the exchange of goods and services can generally be called money. It is money that made the exchange of goods and services faster and made specialization possible. For example, rubber farmers are able to focus solely on their production because they can convert their product, which is rubber, into money and use that money to buy other goods and services he needs.

Forms of money change day by day but we cannot think of an economy without money. This is because money influences human life at different levels such as consumers, producers, and suppliers. Banks play a major role in facilitating the activities of money in the economy. Let's examine this in the context of the functions of money.

Fig 5.2

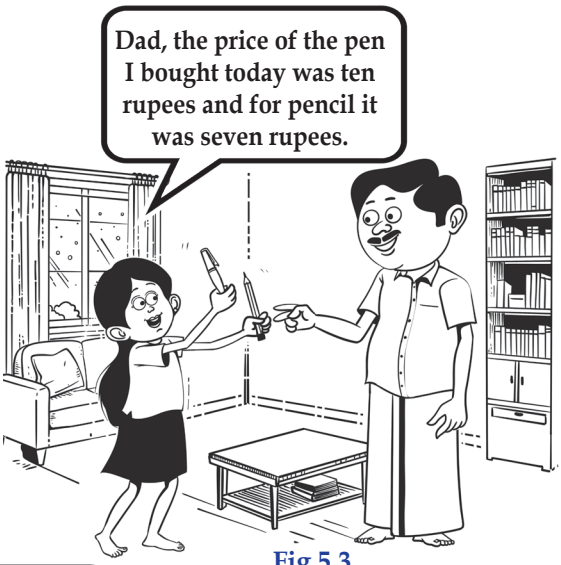


Fig 5.3

Fig 5.4

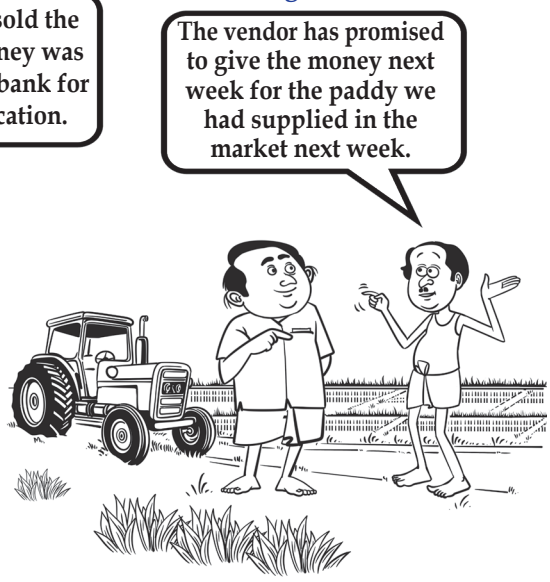


Fig 5.5

Observe the pictures. Picture 5.2 shows that money is used to buy goods. Similarly, all the pictures show the various activities that money does. Discuss with your friends and explain pictures 5.3, 5.4 and 5.5.

The above pictures indicate the various roles money plays in the economy. Money helps people to buy and sell goods and services, compare the prices of different goods and services,

store the value of savings and assets, and lend and borrow money.

What were the transactions of goods and services using money in your household in the past month? Prepare a list in consultation with your parents.

General Functions of Money

Medium of Exchange: Goods and services can be sold for money, and the money can be used to purchase the goods and services that are needed. For example, labour can be supplied and its reward can be received in the form of money. The same money can be used to purchase goods and services. In this way money is crucial for making countless transactions in the economy.

Measure of value: The value of all goods can be expressed in monetary terms. In the barter system, it was not easy to compare the value of one good with the value of another. Money made it easy to compare the values of two goods. The value of a good is the price that is assigned to it in the transaction process.

Fig 5.6

Just as the value of good is measured in monetary terms, the value of money can also be expressed in terms of other goods. The value of money is its purchasing power. When the price of goods increases, the purchasing power of money will decrease, and when the price of goods decreases, the purchasing power of money will increase. Changes in the purchasing power of money are keenly felt when there is inflation or deflation in the economy.

Store of Value: When money became something that was acceptable to everyone, it had become possible to store the value of any good in the form of money. This was not possible in the barter system. Through this it is possible to convert the value of goods, including that of perishable items, into money or asset and it can be used in the future.

Means of Deferred Payments: In the modern times many business activities are carried out with ease because of the advantage of settling the financial transactions at a later date. Both buyers and sellers generally agree that the cash settlement of the transactions of goods and services can be cleared later. It is possible to measure the value of borrowing and lending in the form of money. This is very helpful for short and long-term business transactions.

Characteristics of Money

A key characteristic of money is that it is generally recognised and accepted. What other characteristics should money possess? Discuss and complete the list.

- Generally accepted
- Durable
-
-

Write down the various functions of money.

How does money work in the economy?

Fig 5.7

It is money that moves the economy and speeds up its functioning. Let's look at an example of how it stimulates the economic activities of production, distribution and consumption and strengthens the economy by making the transactions faster.

Rice production is an economic activity in the primary sector. A farmer who produces rice may need fertilizers, seeds, pesticides, machinery, and labour. When money is spent on fertilizers and machinery, it becomes a source of income for the producers in the industrial sector. When the rice producers depend upon transportation facilities to get the rice to the market, it becomes a source of income for service providers.

The money received as income by the industrial and service sectors is pumped back into the economy. In this way, each

currency spent in the economy changes hands again and again. As the number of exchanges increase, the transactions in the economy also increase.

My trail

I am a hundred rupee note. At 9 am today, a student took me to a shop and bought two notebooks worth Rs. 50 each.

Using your imagination, complete my journey by writing down how many transactions I would have undergone by 5 pm, fully utilising my value. How many transactions have taken place in my journey according to you? What is the total value of these transactions?

The number of times a unit of money is exchanged in a given period of time is known as the velocity of circulation of money. An increase in the velocity of circulation money indicates an acceleration in economic growth, while a decrease in the velocity of circulation money indicates a slowdown in economic growth. In the economies where growth rate is high, producers and consumers have more chances to spend money, while in the economies where growth rate is low, producers and consumers have limited chances to spend money.

As mentioned, banks and financial institutions play a major role in facilitating money transactions and also in regulating the economic activities. Every country has its own banking system. Let's get acquainted with the banking system in India.

Money and the Central Bank

What is the source of currencies and coins in circulation in our country? Who is the ultimate authority of all this money?

In each country, the respective central banks will be the ultimate authority of this money. The Reserve Bank of India (RBI) is

the central bank of India and it is headed by its Governor. It was established on 1 April 1935 in Kolkata under the Reserve Bank of India Act, 1934. In 1937, the headquarters of the Reserve Bank was shifted to Mumbai. It was nationalized in 1949.

Fig 5.8

The central bank regulates and coordinates the activities of banks and non-banking financial institutions in the economy. Let's see the functions of the Reserve Bank of India.

Functions of the Reserve Bank of India

Printing and Issuing Currency

As per the Reserve Bank of India Act 1934, only the Reserve Bank of India has the power to print and issue all currencies except coins and one rupee notes. The coins and one rupee notes are printed and issued by the Ministry of Finance, Government of India. The Reserve Bank of India is responsible for designing, incorporating the security features, printing, and distributing the currency. Currency notes are printed at the Government of India's printing presses at Nasik (Maharashtra) and Dewas (Madhya Pradesh). It is also printed at two presses at Mysore (Karnataka) and Salboni (West Bengal) by Bharatiya Reserve Bank Note Mudran Limited (BRBNML), owned by RBI. Coins are minted at the Government of India's mints at Mumbai, Hyderabad, Kolkata and Noida. Based on the government's instructions, the Reserve Bank of India can withdraw the currency notes in circulation. This is known as demonetization.



Fig 5.9

Demonetization

The most recent demonetization was implemented in India was effected on 8 November 2016. The aim was to prevent corruption, black money, terrorism, and counterfeit currencies. The existing currency notes of Rs 500 and Rs 1,000 were declared as no longer legal tender. New currency notes of Rs 500 and Rs 2,000 were printed. The public had the opportunity to deposit old currency notes, without declaration till 31 December 2016 in banks and with declaration till 31 March 2017 in the RBI.

Who prints one rupee note and coins?

Before 1835, the rupee, coins and other forms of money were used in India.

There are historical reasons why the Government of India prints one rupee note and coins. The historical convention of 1835 allowed the East India Company, on the basis of Paper Currency Act of 1835, to print paper currency in British India. The intention was to facilitate trade and commerce. The Coinage Act of 1906 and the Coinage Act of 2011 gave the central government the power to mint coins. The Government of India retains this power and therefore prints one rupee note and coins.

Bankers' Bank

The Reserve Bank acts as the bankers' bank. It provides emergency loans to banks in the times of crisis, maintains the reserves of banks, and helps to settle transactions between banks.

Controls the supply of money and credit

When the supply of money increases and the production of goods and services does not increase proportionately, there arises a situation where there are fewer goods and services and more money in the economy. This causes the prices of goods and services to rise. An increase in the general price level of goods and services is known as inflation.

Inflation in India is measured using the Consumer Price Index (CPI), which is prepared by the National Statistical Office under the Ministry of Statistics and Programme Implementation (MOSPI).

National Statistical Office

Government of India
Ministry of Statistics and Programme Implementation

Fig 5.10

Find some news stories related to inflation and present them before the class. List the causes mentioned in each news story.

If inflation increases in the economy without any control, it causes a decrease in the purchasing power of money. It adversely affects economic growth and production. Therefore, inflation must be controlled. One of the reasons behind inflation is the increase in the quantity of money supply.

Inflation based on the General Consumer Price Index in August 2023 and September 2023 is given below.

	August 2023			September 2023		
	Urban	Rural	Total	Urban	Rural	Total
India	7.02	6.59	6.83	5.33	4.65	5.02
Kerala	6.40	6.08	6.26	4.59	4.93	4.72

Source: Kerala Economic Review 2023

- What was the change in inflation in September 2023 compared to the inflation rate in August 2023?

Have you ever wondered what will be the total amount of money in an economy? Wouldn't it be the total amount of money held by the public and the money held by banks and non-banking financial institutions in an economy?

The Reserve Bank sees the total amount of money in our economy in the form of M1, M2, M3 and M4. Let's see what they are.

M1 = Coins and currency notes held by the public and the savings deposits in commercial banks

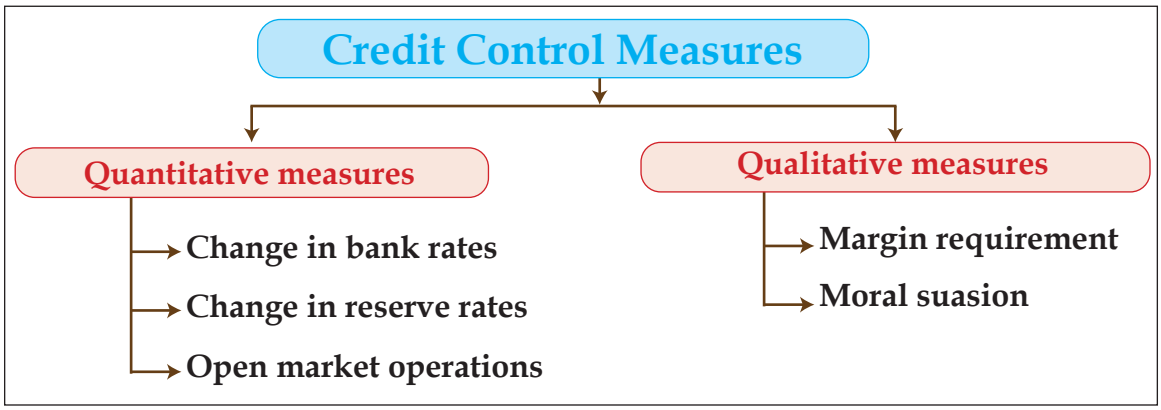
M2 = M1 + savings deposits in post office savings banks

M3 = M1 + net fixed deposits in commercial banks

M4 = M3 + total deposits in post offices (excluding National Savings Certificates)

where M1 and M2 are known as narrow money and M3 and M4 are known as broad money.

Uncontrolled lending by banks leads to the increase in the money supply in the economy and also inflation. This needs to be controlled. RBI uses quantitative and qualitative measures to control credit.



Let's see how inflation is controlled by changing bank rates and changing the reserve ratio, by RBI. The important bank rates are the repo rate and the reverse repo.

Repo Rate
The rate of interest charged by the Reserve Bank of India on the loans taken by commercial banks from the RBI.

Reverse Repo Rate
The rate of interest given by the Reserve Bank of India on the deposits by the commercial banks.

For example when inflation increases unchecked, RBI increases repo rate and reverse repo rate.

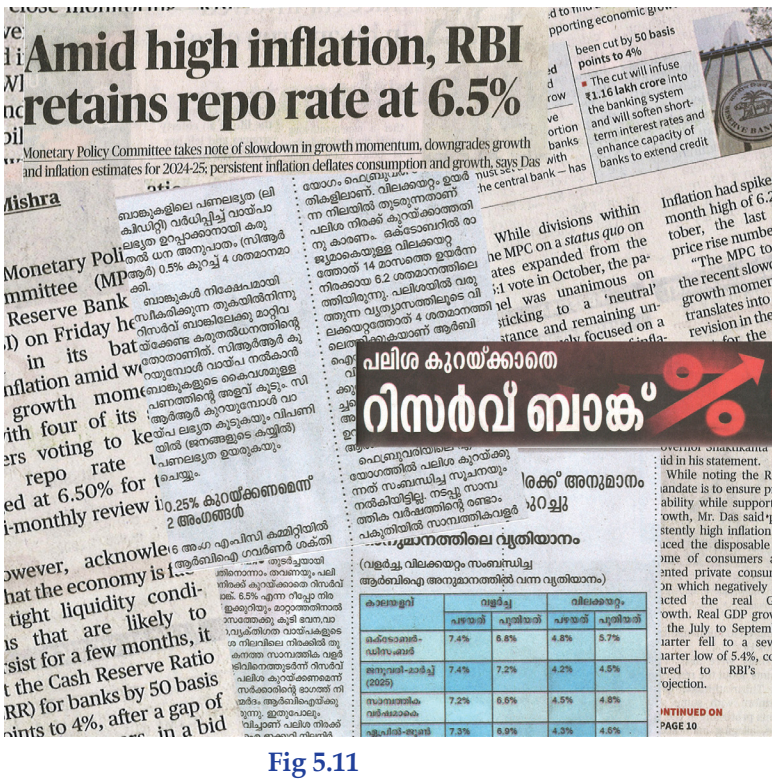
When RBI increases these rates, the commercial banks also change these rates. When these rates are increased, the money available with the commercial banks for lending fall because at a higher rate of interest the commercial banks will take less loans from RBI and deposit more in the RBI. In the same way the loan taken by the public will also be less. So the money available in the economy also would be less. When the rate of interest is high, people will prefer to save more money rather than spend, because the reward for not consuming is greater. The money held by the public flows to commercial banks and from there to the Reserve Bank. The amount of money in the economy decreases and the inflation comes under control.

The repo rates for different periods are given below

June	2022	4.90%
December	2022	6.25%
September	2023	6.50%

- Find out the trend in the repo rate.
- Discuss how the repo rate affected the credit and savings in the period from June 2022 to December 2022.

Reserve Bank of India controls the credit and supply of money by changing the Cash Reserve Ratio (CRR). This is the amount of money the banks must keep as reserves with the Reserve Bank out of the money they receive as deposits. When the reserve ratio decreases, the amount of money available with banks to lend increases and the availability of credit increases. This increases the money available with the people. However, when the reserve ratio increases, amount of money available with banks to lend will decrease. This reduces the availability of credit and reduces the amount of money people have.


Amid high inflation, RBI retains repo rate at 6.5%

Monetary Policy Committee takes note of slowdown in growth momentum, downgrades growth and inflation estimates for 2024-25; persistent inflation deflates consumption and growth, says Das

been cut by 50 basis points to 4%

The cut will infuse ₹1.16 lakh crore into the banking system and will soften short-term interest rates and enhance capacity of banks to extend credit

പലിശ കുറയ്ക്കാതെ

റിസർവ് ബാങ്ക്

Fig 5.11

Acts as the government's bank

The Reserve Bank of India is responsible for maintaining government accounts, providing banking services, and implementing financial management. It also advises the government on matters such as fiscal and monetary policy.

Fiscal policy

Fiscal policy is the policy regarding taxation and government spending.

Monetary policy

Monetary policy is the policy regarding the supply of money and the rate of interest.

Visit the Reserve Bank of India website and find out the current repo rate, reverse repo rate, and cash reserve ratio and present them in the class.

Custodian of foreign exchange reserves

The foreign exchange reserves of our economy are the sum total of foreign currencies and gold reserves. RBI is the custodian of all these.

Fig 5.12

Publication of Reports

RBI publishes various reports at different periods such as Banking Trends in India, Monetary Policy Reports, Consumer Surveys, RBI Bulletin and Statistical Supplements.

Analyze the functions of the Reserve Bank and explain how it regulates economic activities in India.

Fig 5.13

Banks and Non-Banking Financial Institutions

Banks and non-banking financial institutions are institutions that provide financial services to individuals, organizations, and businesses in the economy. Banks can be broadly classified into commercial banks and cooperative banks.

While the operations of commercial banks are controlled by shareholders, the ownership of cooperative banks is vested with the members of the cooperative societies. Kerala Bank is an example of a cooperative bank.

Commercial banks

Commercial banks are licensed by the RBI to provide banking services and are included in the Second Schedule of the RBI Act, 1934. Public sector banks, private sector banks, small finance banks, payment banks, specialized banks, regional rural banks, and foreign banks are some examples of commercial banks.

Fig 5.14

Commercial banks that were allowed to operate in India after the financial reforms of the 1990s are known as new generation banks. Examples include Axis Bank, Mahindra Bank, Yes Bank and Indus Bank.

Find out which banks operate in your area and list the category they fall into.

Functions of Commercial Banks

The main functions of commercial banks are to accept deposits from the public and to provide loans. Banks act as a safe haven for savings. They are able to convert the money deposited in banks into various types of loans and make them available to entrepreneurs.

Accepting Deposits

Let's get acquainted with the various types of deposit accounts offered to the public by commercial banks.

- **Savings Deposit:** This is a deposit that instills the habit of saving in individuals and allows them to withdraw money according to their needs. The depositor has the opportunity to withdraw money from such deposits, subject to restrictions. The number of times money can be withdrawn within a period and the limit on the amount that can be withdrawn varies from bank to bank. Banks often offer low interest rates on savings deposits.
- **Current Deposit:** A current account is an account intended for business transactions. There is no limit to the number of transactions that can be made from such accounts in a single day. Banks do not pay interest on the money in this account. Overdraft facility is provided for this account. An overdraft is a system that allows you to withdraw more than the amount in the current account within a predetermined limit.
- **Term Deposit or Fixed Deposit Account:** Money that is not needed to be withdrawn immediately can be deposited in such accounts. Banks pay more interest on such deposits than on money in a savings bank account. If money is withdrawn from these deposits before the maturity period, the interest rate received by the depositors may be reduced. The interest can be withdrawn upon maturity along with the deposits, or at various periods determined by the depositor.
- **Recurring Deposits:** Recurring deposits are deposits of a fixed amount of money at regular intervals for a specific period of time. Such deposits earn higher interest rates than savings deposits. However, they are lower than the interest

rates on fixed deposits. At the end of the tenure, the accumulated amount can be withdrawn along with interest.

Why do banks offer higher interest rates on fixed deposits than on savings deposits?

Anu and Manu are students of Class 9. Anu won a prize of Rs. 25,000 in a state-level elocution competition. Manu receives National Merit-cum-Means Scholarship of Rs. 12,000 every year from Class 9 to 12. Both of them want to deposit this money in a bank for their higher education. Which bank accounts would you suggest for Anu and Manu to deposit this money?

Lending Loans

It is the Commercial banks that provide various loans to individuals and institutions for various financial activities. Commercial banks act as intermediaries between depositors and borrowers. Banks keep a portion of the deposits received as reserves and lend the rest to entrepreneurs. Commercial banks charge interest on the various loans they provide to their customers.

The interest rate charged to borrowers is higher than the interest rate paid to depositors. The difference between the interest paid to depositors and the interest charged from borrowers is the income of banks. This is known as the spread. Banks provide loans by accepting various collaterals. They accept gold, land documents, salary certificates, etc. as collateral.

Identify and prepare notes on various loans offered by commercial banks.

Other functions

- Providing various services

Commercial banks provide various banking services to the public.

- Credit Card ,Debit Card
- ATM Services
- Locker Facility

Visit three banks in your area and find out the rates they charge as interest for various loans and complete the table.

Item	Bank Name	Bank Name	Bank Name
	.....	.....	.....
Home Loan			
Agricultural Loan			
Personal Loan			

- Identify the type of loan for which banks charge the lowest rate of interest.
- List the collateral that the banks accept for various loans.

How do commercial banks influence economic activity?

Banks and Technology

Technology is helpful in increasing the speed of transactions. With the advent of mobile banking and online banking, customers have been able to access various banking services using smartphones and computers. Online banking is a system where bank transactions are available through the internet. Banking services that were available only at certain times and days are now available 365 days a year, anywhere in the world, due to the intervention of technology. Let's get acquainted with some of the payment systems that have emerged in the banking sector as a result of technology.

- **National Electronic Fund Transfer System (NEFT)**

This is a system introduced by the Reserve Bank of India to make bank transactions between account holders easier and faster. Funds are transferred using the Indian Financial System Code (IFSC).

- **Real Time Gross Settlement (RTGS)**

RTGS is a system introduced by the RBI to transfer large amounts of money between account holders. The feature

of this is that transactions can be completed in a very short time.

- **Core Banking**

Core banking is a system that enables an account holder of a bank to carry out financial transactions from any of its branches. There is no need to go to the specific branch where the customer holds the account for the bank transactions. It is convenient for the customers.

- **Universal Payment Interface (UPI)**

UPI is a payment system developed by the National Payments Corporation of India (NPCI). It enables real-time money transfers between bank accounts. Users can connect their various bank accounts through a mobile application and make simple and secure transactions. Some of the popular UPI apps are Google Pay, Paytm, Phone Pay, BIM UPI, and Amazon Pay.

Fig 5.15

The use of cyber technology can help deliver personalized services and reduce costs, but it also poses significant challenges to security.

Organize an interview with a bank official to create awareness about the possible frauds that can occur while using banking services online and the steps we need to take against it. Prepare a questionnaire for this purpose.

Non-banking financial institutions

These are financial institutions that operate in the banking sector but perform only some of the functions of a bank. Unlike banks, non-banking financial institutions cannot accept savings and deposits from the public. Money cannot be withdrawn by using cheques from such financial institutions.

KSFE

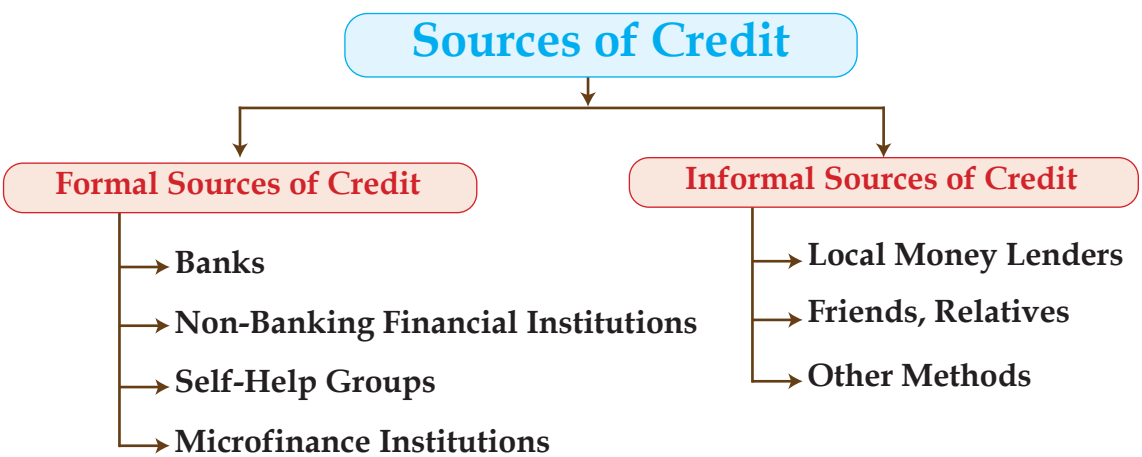
KSFE is a non-banking financial company in Kerala. It was established in 1969 to provide financial services to the people of Kerala. It provides various services like gold loans, personal loans, business loans, vehicle loans, housing loans, microfinance and chits. through its various branches. KSFE has a strong presence in Kerala through its network of branches and the strong support of its customers.

Non-banking financial institutions are regulated by institutions such as the Reserve Bank of India (RBI), Securities and Exchange Board of India (SEBI), Insurance Regulatory and Development Authority of India (IRDA), and National Housing Bank (NHB).

Insurance companies (e.g. LIC, GIC), mutual fund companies (e.g. UTI), and non-banking financial institutions (e.g. KSFE) are all examples of non-banking financial institutions.

Sources of Credit in India

Entrepreneurs need money to start new ventures, to expand existing ventures and to enable firms to adopt new technologies. A large percentage of this comes from banks and non-banking financial institutions. Credit can be considered as the main source for the financing of development activities. Sources of credit in India can be classified into formal and informal sources of credit. Formal sources of credit are the organized, institutionalized and regulated systems. Informal sources of credit are the unorganized and non-institutionalized systems. The mutual coexistence and operational success of both are necessary for the growth of the economy.



The sources of credit in Kerala during various periods are given in the table.

Source/Period	2019 January-April	2020 January-April	2021 January-April
Banks	68.55	48.77	44.51
Non-bank financial institutions, Microfinance institutions	6.29	21.8	13.33
Self-help groups	8.8	17.43	41.53
Local moneylenders	8.04	3.65	4.43
Friends, relatives	7.85	6.79	2.99

Source: Kerala Economy 2023 Vol.4 No.1

- Find out the reason for the decrease in loan share from banks and increase in loan share from SHGs during 2019-21.
- Discuss the influence of local moneylenders on the credit system in Kerala.

Credit Deposit Ratio

Credit Deposit Ratio measures the proportion of a bank's deposits that are used for loans. It is monitored by the RBI. A high credit deposit ratio indicates that banks have lent out a large portion of the deposits they have received. But what does a low credit deposit ratio indicate?

What are the different sources of credit in India?

Discuss in class how they function in the economy.

Credit deposit ratio in public sector banks in various states is given.

States	March 2021	March 2022	March 2023
Andhra Pradesh	136.20	145.62	155.40
Assam	37.69	42.98	47.27
Tamil Nadu	103.05	99.76	104.79
Kerala	64.74	65.85	72.05
Panjab	44.56	43.68	41.92

Source: Kerala Economic Review 2023

- Find out the reasons why the credit deposit ratio is high in some states and low in others.
- Examine the credit deposit ratio from March 2021 to March 2023.

Financial Inclusion

Have you noticed the steps taken by the country to bring benefits of functioning of money and financial institutions to everyone? Financial inclusion and inclusive economic growth accelerate when banking services reach the common man, the rural population and the marginalised people. Let's see what steps the government has taken for this.

Nationalization of Banks

In order to bring the functioning of banks to different parts of the country and to more people, 14 banks were nationalized in 1969 and 6 banks, in 1980. The main objectives of bank nationalization are given below.

- To expand banking facilities in rural areas
- To provide credit to farmers at lower rates
- To ensure equitable distribution of credit
- To prevent the concentration of economic power in a few people.

Co-operative Banking Systems

Co-operative banks play a crucial role in activating the rural economy by providing banking facilities to villagers and ordinary farmers. They operate on the principles of co-operation, self-help and mutual assistance. The objectives of co-operative banks are to inculcate the habit of saving among the villagers, to protect the common people from private moneylenders, and to provide low-cost loans to farmers and small businessmen.

Kerala Bank

The history of Kerala Bank starts with the registration of Thiruvananthapuram Central Co-operative Bank in 1915 through the Travancore co-operative society regulation act of His Highness Sree Moolam Thirunal in 1914. It started functioning as a bank on 18 January 1916. It was included in the Second Schedule of the Reserve Bank of India Act in July 1966. In 2019, the thirteen district co-operative banks of Kerala were merged into the Kerala State Co-operative Bank and became known as Kerala Bank. Kerala Bank operates in all 14 districts of Kerala with 823 branches.

The main objectives of Kerala Bank are to provide better banking services, ensure financial inclusion and to accelerate the economic development of the state.

Social commitment, rural development and providing support to the marginalized community are also the objectives of the bank. 40% of the bank's shares are held by the Government of Kerala, 30% by District Co-operative Bank and 30% by others. Kerala Bank provides many banking services to its beneficiaries. This includes accepting deposits, providing loans and making other monetary transactions. The bank provides many facilities to its customers with ATM services across Kerala, modern banking technology and digital platform.

Microfinance

Microfinance aims to provide financial services to low-income individuals, families, and businesses who do not have access to conventional banking services.

Poverty alleviation, empowerment of women and the marginalized, promotion of entrepreneurship and ensuring job creation, and improvement of quality of life are all goals set by microfinance.

The Grameen Bank, founded by Professor Muhammad Yunus in Bangladesh in 1983, is a good example of microfinance. Kudumbashree in Kerala works on the concept of microfinance. The work done by Kudumbashree in Kerala for poverty alleviation and women empowerment has repeatedly attracted world attention. These systems work by accepting small deposits through Neighborhood Groups and Self Help Groups (NHGS, SHGS) and by providing loans as per the need.

Jan Dhan Account

The Prime Minister Jan Dhan Account is a scheme to open an account for all those who do not have a bank account in the country. Its aim is to bring all the people of the country under the ambit of banking services. Zero minimum balance account is the special feature of this scheme. It also aims to provide financial services to the low-income group, promote financial literacy and inculcate the banking habit.

Digital currency has been the latest trend in financial transactions. The government is also promoting Aadhaar-based payment system, e-wallet and National Finance Switch to reduce the use of physical currencies and increase the use of digital currencies, thus moving towards a cashless economy.

Fig 5.16

What are the steps the government has taken to promote financial inclusion?

Money plays a vital role in enabling the economic activities of production, consumption and distribution. As money turned digital, the number and magnitude of the transactions also increased. New currencies are emerging, keeping in with the changes in the world order. Money channelled into the market for consumption goes directly to producers and distributors while money set aside for saving goes to the entrepreneurs as loans through banks and non-banking financial institutions. Banks and non-banking financial institutions play a significant role in accelerating economic growth rate by promoting transactions. The proliferation and use of technology has promoted cashless transactions and succeeded in bringing those remote areas that have hither to no access to banks into the banking network.

Extended Activities

1. Visit the website of Reserve Bank of India and prepare a class report on its various publications
2. Visit a commercial bank in your area and understand their various activities and services provided. Prepare a chart showing the credit deposit ratio, various loans and deposits and their interest rates.
3. Visit a production unit and prepare a report containing the following information.

- Operating sector (primary, secondary or tertiary)
- Services provided by the bank to this production unit
- Relation with other sectors

Notes

Notes

Notes

CONSTITUTION OF INDIA

Part IV A

FUNDAMENTAL DUTIES OF CITIZENS

ARTICLE 51 A

Fundamental Duties- It shall be the duty of every citizen of India:

(a) to abide by the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;

(b) to cherish and follow the noble ideals which inspired our national struggle for freedom;

(c) to uphold and protect the sovereignty, unity and integrity of India;

(d) to defend the country and render national service when called upon to do so;

(e) to promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity of women;

(f) to value and preserve the rich heritage of our composite culture;

(g) to protect and improve the natural environment including forests, lakes, rivers, wild life and to have compassion for living creatures;

(h) to develop the scientific temper, humanism and the spirit of inquiry and reform;

(i) to safeguard public property and to abjure violence;

(j) to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievements;

(k) who is a parent or guardian to provide opportunities for education to his child or, as the case may be, ward between age of six and fourteen years.

CHILDREN'S RIGHTS

Dear Children,

Wouldn't you like to know about your rights? Awareness about your rights will inspire and motivate you to ensure your protection and participation, thereby making social justice a reality. You may know that a commission for child rights is functioning in our state called the ***Kerala State Commission for Protection of Child Rights.***

Let's see what your rights are:

- Right to freedom of speech and expression.
- Right to life and liberty.
- Right to maximum survival and development.
- Right to be respected and accepted regardless of caste, creed and colour.
- Right to protection and care against physical, mental and sexual abuse.
- Right to participation.
- Protection from child labour and hazardous work.
- Protection against child marriage.
- Right to know one's culture and live accordingly.
- Protection against neglect.
- Right to free and compulsory education.
- Right to learn, rest and leisure.
- Right to parental and societal care, and protection.

Major Responsibilities

- Protect school and public facilities.
- Observe punctuality in learning and activities of the school.
- Accept and respect school authorities, teachers, parents and fellow students.
- Readiness to accept and respect others regardless of caste, creed or colour.

Contact Address:

Kerala State Commission for Protection of Child Rights

'Sree Ganesh', T. C. 14/2036, Vanross Junction

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Email: childrights.cpcr@kerala.gov.in, rte.cpcr@kerala.gov.in

Website : www.kescpcr.kerala.gov.in

Child Helpline - 1098, Crime Stopper - 1090, Nirbhaya - 1800 425 1400

Kerala Police Helpline - 0471 - 3243000/44000/45000

Online ***R. T. E Monitoring : www.nireekshana.org.in***