🌍 Class 9 Social Science – Chapter 3 Notes

☁️ Atmosphere and Climate

📖 **Textbook:** *Understanding Society: India and Beyond – Grade 9, Part 1*
🌍 **Subject:** Social Science – Geography
📌 **Chapter:** 3
📅 **Academic Session:** 2026–27

🌎 1. What Is the Atmosphere?

The **atmosphere** is the blanket of air surrounding the Earth. It is held around the Earth by **gravity** and consists of a mixture of gases in different proportions.

The atmosphere is essential for life because it:

- 🌱 Supports living organisms
- ☀️ Shields Earth from harmful solar radiation
- 🌡️ Helps regulate Earth's temperature
- ☁️ Plays an important role in weather and climate
- 💧 Contains water vapour and other gases

The atmosphere influences important conditions such as **temperature, humidity and air pressure**.

🧪 2. Composition of the Atmosphere

The atmosphere contains a mixture of different gases.

🌬️ Major Components

- 🟦 **Nitrogen**
- 🟩 **Oxygen**

- 🟨 **Argon**
- 🌫️ **Carbon dioxide**
- 💧 **Water vapour**
- ✨ Other gases and suspended particles

📌 Remember

The atmosphere is not made up of just one gas. It is a **mixture of gases** that work together to support life and regulate Earth's environment.

🏔️ 3. Layers of the Atmosphere

The atmosphere is divided into several layers based mainly on changes in temperature with altitude.

The major layers are:

1. 🌍 **Troposphere**
2. ☀️ **Stratosphere**
3. ☄️ **Mesosphere**
4. 🔥 **Thermosphere**
5. 🚀 **Exosphere**

The textbook illustrates these layers and their changing characteristics.

🌧️ 3.1 Troposphere

The **troposphere** is the lowest and most important layer of the atmosphere.

Important features:

- 📏 Average height: about **12 km**
- 🌡️ Temperature generally decreases with increasing altitude
- 🌬️ Contains the air we breathe
- 💧 Contains most atmospheric water vapour
- ☁️ Contains most clouds
- 🌧️ Almost all weather phenomena occur here

Examples include:

- 🌧️ Rainfall
- 🌫️ Fog
- 🧊 Hail

The boundary between the troposphere and stratosphere is called the **tropopause**.

☀️ 3.2 Stratosphere

The **stratosphere** lies above the troposphere.

It contains the **ozone layer**, which absorbs much of the harmful ultraviolet radiation from the Sun.

The boundary between the stratosphere and mesosphere is called the **stratopause**.

☄️ 3.3 Mesosphere

The **mesosphere** lies above the stratosphere.

It is one of the upper atmospheric layers and is associated with the region where many meteors burn up as they enter the atmosphere.

🔥 3.4 Thermosphere

The **thermosphere** lies above the mesosphere.

It is characterised by very high temperatures and contains regions associated with phenomena such as **auroras**.

🚀 3.5 Exosphere

The **exosphere** is the uppermost layer of the atmosphere.

It has extremely thin air.

Light gases such as:

- 💨 Helium
- 💨 Hydrogen

can escape into space because the gravitational pull is weak at these heights.

⚖️ 4. Atmospheric Pressure

The air surrounding us has **weight** and therefore exerts pressure.

🌬️ Atmospheric Pressure

Atmospheric pressure is the pressure exerted by the weight of air.

You normally do not feel this pressure because:

➡️ Air presses on your body from all directions
➡️ The pressure inside your body balances the pressure outside

Therefore, the two pressures largely cancel each other out.

🌦️ 5. Weather and Climate

🌤️ What Is Weather?

Weather refers to the **hour-to-hour and day-to-day conditions of the atmosphere**.

For example:

- ☀️ Sunny
- 🌧️ Rainy
- 🌬️ Windy
- ☁️ Cloudy
- 🌡️ Hot
- 🥶 Cold

Weather can change significantly from one day to another.

🌍 What Is Climate?

Climate refers to the average weather conditions and variations of a place over a **long period of time**, generally **30 years or more**.

Easy Difference

🌤️ Weather	🌍 Climate
Short-term	Long-term
Changes frequently	Shows general patterns
Hour-to-hour or day-to-day	Usually studied over 30 years or more

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🌡️ 6. Elements of Weather and Climate

The major elements are:

🌡️ Temperature

The degree of hotness or coldness of the atmosphere.

💧 Humidity

The amount of water vapour present in the air.

🌧️ Precipitation

Water falling from the atmosphere to Earth's surface, such as rain.

🌬️ Wind

Moving air.

⚖️ Atmospheric Pressure

Pressure exerted by the weight of air.

These elements influence weather and climate and can vary under different conditions.

☀️ 7. Temperature and Insolation

☀️ Insolation

Insolation means the incoming solar energy from the Sun that is intercepted by the Earth.

Temperature varies:

- 🌞 Between day and night
- 🌦️ Between seasons
- 🌍 From one region to another

The distribution of temperature is strongly influenced by the amount of solar energy received by different parts of Earth.

💧 8. Humidity and Precipitation

💧 Humidity

Humidity refers to the amount of **water vapour present in the atmosphere**.

Water vapour is important because it contributes to:

- ☁️ Cloud formation
- 🌧️ Rainfall
- 🌦️ Other forms of precipitation

🌧️ Precipitation

Precipitation occurs when water from the atmosphere falls to Earth's surface.

Examples include:

- 🌧️ Rain
- ❄️ Snow
- 🧊 Hail

🌬️ 9. Wind

Wind is moving air.

Wind movement is influenced by differences in **air pressure**.

Remember:

🌡️ Unequal heating → ⚖️ Pressure differences → 🌬️ Movement of air

Winds play a major role in distributing heat and moisture around the Earth.

🇮🇳 10. Seasons in India

India's climate is broadly classified as a **tropical monsoon climate**.

The Indian Meteorological Department (IMD) recognises four distinct seasons in India.

❄️ 1. Winter Season

Generally:

December – early April

The coldest months are generally **December and January**.

☀️ 2. Summer / Pre-Monsoon Season

Generally:

April – June

In north-western India, it may extend into July.

Temperatures rise considerably during this period.

🌧️ 3. Monsoon / Rainy Season

Generally:

June – September

This season is dominated by the humid **south-west summer monsoon**.

The monsoon gradually spreads across the country.

🍂 4. Post-Monsoon / Retreating Monsoon

Generally:

October – December

During this period, the monsoon begins to withdraw.

In north-western India, October and November are generally cloudless.

🏔️ Himalayan Region

The Himalayan states, because of their more temperate climate, experience two additional seasons:

- 🍂 Autumn
- 🌸 Spring

🌧️ 11. What Is Monsoon?

The word **monsoon** refers to the **seasonal reversal of wind direction during the year**.

The term comes from the Arabic word **mausim**, meaning **season**.

India's climate is strongly influenced by monsoon winds.

🌊 12. South-West Monsoon

The **south-west monsoon** is also known as the **summer monsoon**.

It generally occurs between:

June – September

During summer:

☀️ Indian landmass heats faster
⬇️
📉 Low pressure develops over the land
🌊 Ocean remains relatively cooler
⬆️
📈 Higher pressure exists over the ocean
🌬️
Winds move from high pressure to low pressure
⬇️
🌧️ Moist winds move from sea to land
⬇️
🌧️ Rainfall occurs

The south-west monsoon accounts for **most of India's annual rainfall**.

🌬️ 13. North-East Monsoon

The **north-east monsoon**, also called the **winter monsoon**, occurs mainly from:

October – February

During winter:

🥶 Land cools faster
⬇️
📈 High pressure develops over land
🌊 Seas remain relatively warmer
⬇️
📉 Lower pressure exists over the seas
🌬️
Winds move from land towards the sea

This seasonal reversal is an important part of India's monsoon system.

🌧️ 14. Monsoon and Indian Life

Monsoon rainfall is extremely important for India.

It affects:

- 🌾 Agriculture
- 💧 Water availability
- 🏘️ Settlements
- 💼 Economic activities
- 🌱 Food production
- 🌊 River systems

Historically, farmers developed methods to predict rainfall.

The textbook mentions **Kṛiṣhiparāśhara** and **Bṛihatsaṁhitā**, which describe traditional methods of predicting seasonal rainfall.

🌧️ 15. Distribution of Rainfall in India

Rainfall is not evenly distributed across India.

Different regions receive different amounts of rainfall because of factors such as:

- 🌬️ Monsoon winds
- 🏔️ Relief
- 🌊 Distance from the sea
- 🗺️ Location
- 🌡️ Temperature and pressure conditions

The textbook uses rainfall and temperature data from different Indian stations to help students understand the diversity of India's climate.

🌊 16. Floods

Heavy rainfall can sometimes result in **flooding**.

The textbook discusses the **2025 Punjab floods** as a case study.

🌧️ Natural factors included:

- Heavy monsoon rainfall
- Western disturbances
- High river levels
- Rainfall in neighbouring Himalayan regions

🏗️ Human-made factors included:

- Weak or old river embankments
- Construction of homes and farms too close to rivers
- Silt accumulation
- Reduced river and dam capacity
- Late or unclear flood warnings

🛡️ Lesson

Flood management requires:

- ⚠️ Better warnings
- 🏗️ Strong infrastructure
- 🌊 Proper river management
- 👥 Community preparedness

🌡️ 17. Climate Change

Climate change refers to long-term changes in weather patterns.

The textbook explains that modern climate change is caused mainly by human activities such as:

- ⛽ Burning fossil fuels
- 🌳 Deforestation
- 🏭 Industrial pollution

These activities increase greenhouse gases such as:

- 🌫️ Carbon dioxide
- 💨 Methane
- 🌫️ Nitrous oxide
- 💧 Water vapour

These gases trap heat in the atmosphere and contribute to rising global temperatures.

🌍 18. Effects of Climate Change

Climate change is associated with:

- 🌊 More frequent floods
- ☀️ Droughts
- 🧊 Melting glaciers
- 🌊 Rising sea levels
- 🐾 Loss of biodiversity
- 🏥 Impacts on human health
- 🌾 Effects on agriculture
- 💼 Effects on livelihoods

Climate change therefore affects both **ecosystems and human societies**.

♻️ 19. Reducing Our Carbon Footprint

🌱 What Is a Carbon Footprint?

A **carbon footprint** is the total amount of greenhouse gases released as a result of human activities such as:

- ⚡ Energy use
- 🚗 Transportation
- 🏭 Production of goods and services

🌍 Ways to Reduce It

We can:

- 💡 Save electricity
- 🚶 Walk or cycle when possible
- 🚌 Use public transport
- 🚗 Carpool
- 🌳 Plant and protect trees
- ☀️ Use renewable energy

- 💧 Use water carefully
- ♻️ Adopt sustainable lifestyles

The textbook emphasises that **collective efforts and individual actions both matter**.

⚡ Quick Revision

🌈 Topic	📌 Key Point
🌍 Atmosphere	Blanket of gases surrounding Earth
🧪 Composition	Mixture of gases in different proportions
🌧️ Troposphere	Lowest layer; almost all weather occurs here
☀️ Stratosphere	Contains the ozone layer
☄️ Mesosphere	Upper atmospheric layer
🔥 Thermosphere	Very high temperatures; auroras occur in this region
🚀 Exosphere	Uppermost atmospheric layer
⚖️ Atmospheric Pressure	Pressure exerted by the weight of air
🌦️ Weather	Short-term atmospheric conditions
🌍 Climate	Long-term average weather conditions
☀️ Insolation	Incoming solar energy received by Earth
🌧️ Monsoon	Seasonal reversal of wind direction
🌧️ South-West Monsoon	Summer monsoon, generally June–September
🌬️ North-East Monsoon	Winter monsoon, generally October–February
🌡️ Climate Change	Long-term changes in weather patterns
🌍 Carbon Footprint	Greenhouse gases released due to human activities

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📚 Important Terms to Remember

🌍 **Atmosphere**
🧪 **Composition of Atmosphere**
🏔️ **Altitude**
🌧️ **Troposphere**
☀️ **Stratosphere**
☄️ **Mesosphere**
🔥 **Thermosphere**
🚀 **Exosphere**
⚖️ **Atmospheric Pressure**
🌦️ **Weather**
🌍 **Climate**
☀️ **Insolation**
💧 **Humidity**
🌧️ **Precipitation**
🌬️ **Wind**
🌧️ **Monsoon**
🌊 **South-West Monsoon**
🌬️ **North-East Monsoon**
🌡️ **Climate Change**
🌱 **Carbon Footprint**

✏️ Important Practice Questions

1️⃣

What is the atmosphere? Explain its composition with the help of a pie diagram.

2️⃣

Draw a **labelled diagram of the structure of the atmosphere**.

3️⃣

Which are the **four main seasons of India**?

4️⃣

Why do we not feel the pressure of the atmosphere?

5️⃣

In which layer of the atmosphere do aeroplanes fly and why?

6️⃣

Differentiate between:

- 🌧️ **Troposphere and Stratosphere**
- 🌊 **South-West Monsoon and North-East Monsoon**

7️⃣

Study temperature and rainfall data of different Indian stations and represent the information through graphs.

8️⃣

Why does **Shillong receive more rainfall than Kolkata?**

9️⃣

Why does **Delhi receive more rainfall than Jodhpur?**

These questions and activities are based on the end-of-chapter exercises in the official textbook.

🎯 Chapter 3 Exam Focus

Before your exam, make sure you can:

✅ Explain the **composition of the atmosphere**
✅ Draw and label the **layers of the atmosphere**
✅ Differentiate between **weather and climate**
✅ Explain the **four seasons of India**
✅ Explain the **mechanism of monsoon**
✅ Differentiate between **South-West and North-East Monsoon**

✅ Explain **climate change**
✅ Define **carbon footprint**
✅ Suggest ways to **reduce carbon footprint**
✅ Analyse **temperature and rainfall graphs**

🌟 Remember

☀️ Sun → 🌡️ Unequal Heating → ⚖️ Pressure Differences → 🌬️ Winds → 🌧️ Monsoon → 🌾 Agriculture & Indian Life

The chapter's four guiding questions are: **composition of the atmosphere, effects of atmospheric layers, mechanism of monsoon, and ways to reduce our carbon footprint.**