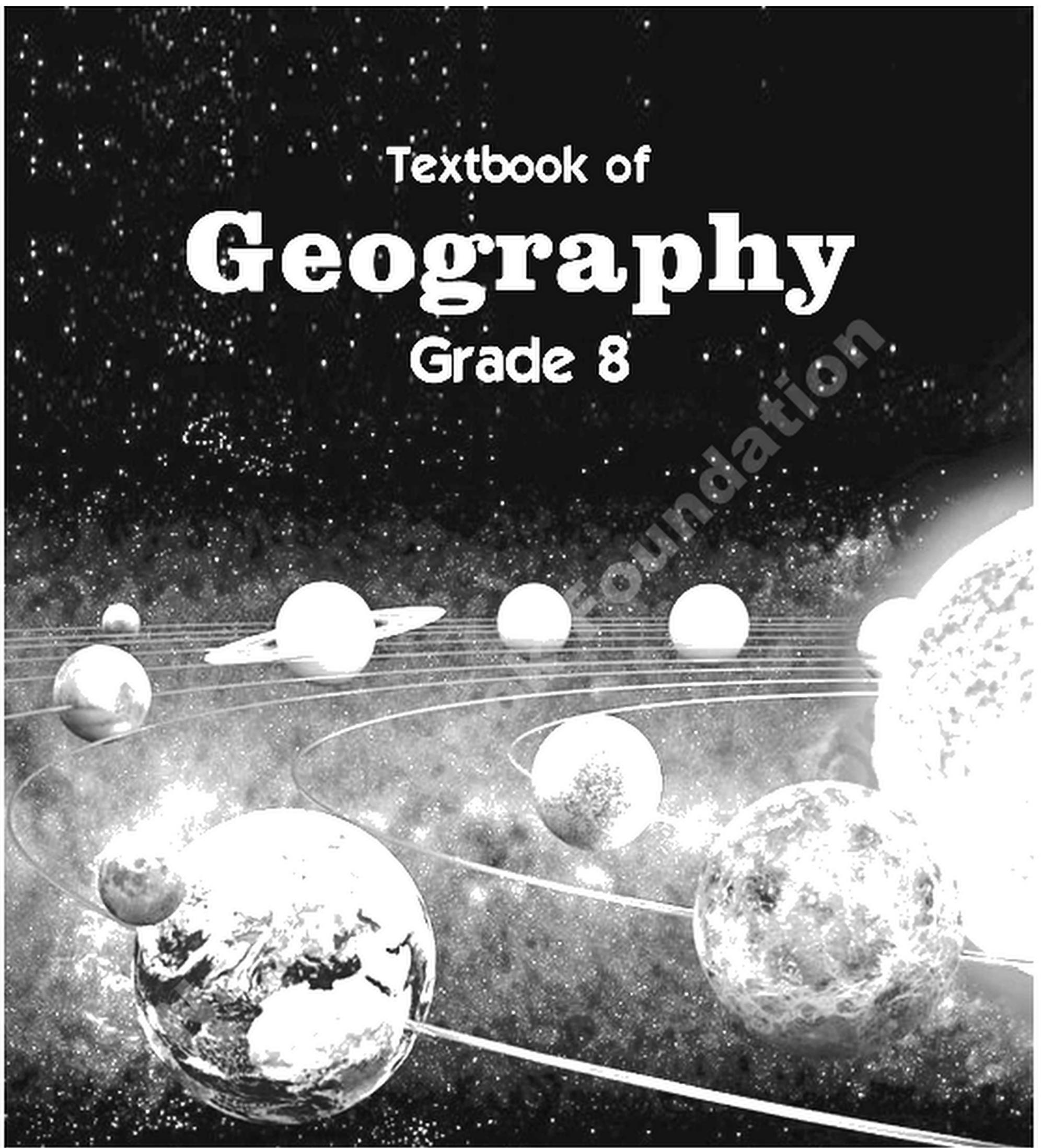


Textbook of
Geography
Grade 8



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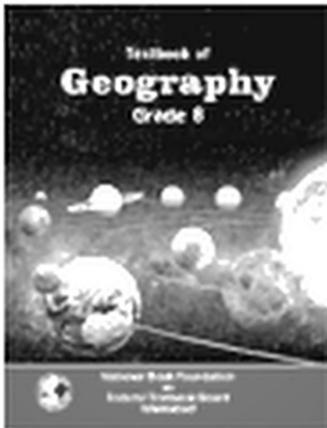
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OUR MOTTO

• Standards • Outcomes • Access • Style

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**Textbook of
Geography Grade - 8**



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Preface

GEOGRAPHY GRADE - 8 is developed according to the National Curriculum 2006 and National Style Guide. It is being published since 2014 and in 2015 it was presented under the new management and supervision of textbook development principles and guidelines with new design and layout.

In Grade-8, the prescribed Curriculum takes up some attractive and essential topics of present day Geography. It begins with a study of maps and diagrams, the two useful techniques of depiction. It ends up with an introduction to modern techniques in Geography with opening new views and prospect of mapping. In between, the concept of regions and a study of regions around Pakistan are elaborated with current topics of environmental hazards well acquainted of the students.

Each chapter begins with listing of Students Learning Outcomes. The text is supported by many coloured illustrations. Student Activities appear in the text as well as at the end of each chapter.

To fulfill learning needs, many of the illustrations are self-produced. Some are taken from suitable sources like Federal and Provincial Departments, Organizations of repute, and individuals. A proper acknowledgement of the sources appears at the end.

Our efforts are to make textbooks teachable with quality, i.e. maintaining of standards. It is a continuous effort and we will get feedback of the yearly feasibility reports and redesign the textbook every year. The test items given in the exercises are for learning reinforcement. The examination questions should be prepared according to the SLO's and the Bloom Taxonomy.

Like before, the National Book Foundation has made specific endeavours to publish the text and illustrations in much effective form. The meticulous effort of the team is acknowledged.

Quality of Standards, Pedagogical Outcomes, Taxonomy Access and Actualization of Style is our motto. With these elaborations this series of new development was presented for use. After educational feedback and necessary changes, the book is being published again.

National Book Foundation

Acknowledgments

For many an illustrative material used in this book, the authors are grateful to Wikipedia Commons. A special mention is made of opening pages of all chapters and illustrations in chapters 9 and 10. The four satellite images are from Google Earth. Fig.4.5 is from a release by National Aeronautics and Space Administration (NASA). Our indebtedness to them is respectfully acknowledged.

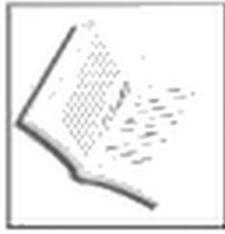
Some of the pictures have been modified, improved upon and produced afresh to meetup students' capabilities of Grade - 8. It is included suggestions from members of the Review Committee. Last but not the least, the authors specifically acknowledge the Computer graphics contributions of Mr. Muhammad Qayyum (late), Department of Geography, Punjab University, Lahore, and Hafiz Rafiuddin, National Book Foundation, Islamabad.



بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ
 شروع اللہ کے نام سے جو بڑا مہربان، نہایت رحم والا ہے۔

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1

MAPS AND DIAGRAMS



This is a 14 days lesson
(periods including homework)
**After completing this lesson,
you will be able to:**

- Discuss distribution maps.
- Explain techniques to draw different diagrams.
- Discuss the use of statistical data for diagrams.
- Construct Line Graph, Bar Graph and Pie Graph using statistical data.
- Evaluate merits and demerits of the diagrams.



Reading

Earlier, in Grade VI, we have learnt Maps as tools of Geographers. In fact **Maps** and **Diagrams** are important in everyday usage as well as for scientific learning. There are several types of maps and diagrams. Here we first learn some properties of Distribution Maps, and then take up making of some simple Diagrams.

1.1 DISTRIBUTION MAPS

A Distribution Map shows distribution of a commodity, product or occurrence over a specified area. The commodities include Wheat, Rice, Cotton, Gold, Iron, Tin, etc. The products are manufactured goods like Cloth, Yarn, Utensils, Machinery, Medicines etc. Occurrences include density of population, yield per acre, rainfall, temperature and much more.

Distribution maps are useful for general assessment of an area. Such maps sometime give comparisons between areas. More importantly Distribution Maps are useful for geographic studies like cause and effect of an incidence. One simple example from our areas is distribution of rainfall in summer months and occurrence of malaria in a district. This incidence is related to warm damp weather.

(i) Dot Method

Dot Method is a much simple method of showing distribution of commodities



displays distribution of a commodity or product, as per its geographic location. A map showing towns and cities of a country is simply a dot map. Here we look at the use of Dot Method in maps.

Example: A Dot Map

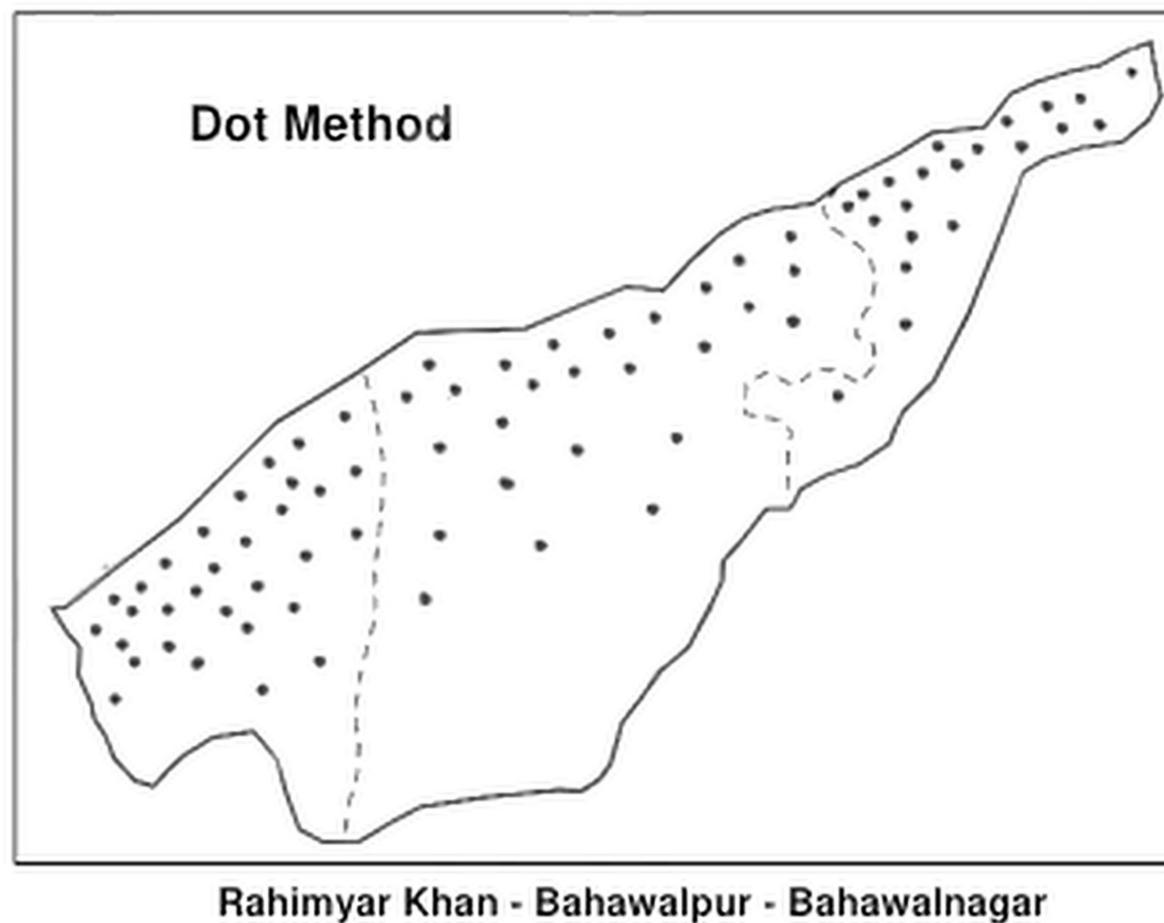
The given data (Table 1.1) relates to 1998 population of three districts of Pakistan, namely Bahawalnagar, Bahawalpur and Rahimyar Khan.

1	2	3
District	Population	Density of Population
Bahawalnagar	2,061,447	232 persons per sq. km.
Bahawalpur	2,433,091	98
Rahimyar Khan	3,141,053	264

(Source: Pakistan Statistical Pocket Book 2006 p.30)

Table 1.1: Distribution of Population (1998): Bahawalnagar, Bahawalpur and Rahimyar Khan districts.

Map 1.1 below depicts the population of the 3 districts as in column 2 above.



Map 1.1: Dot Method showing Distribution of Population (1998): Bahawalnagar, Bahawalpur and Rahimyar Khan Districts



Brief Study: There is a concentration of dots on the Northern side of the three districts. The dots are further away towards the middle parts; while these have much space in between, towards the southern borders. This distribution of dots is a true illustration of the density here. We know River Sutlej flows along the northern side of the three districts. Lands on this side are irrigated through canals. On the other hand, on the southern side of these districts lies the Cholistan desert. Simple enough, more people live in the northern parts, while population in the southern parts is scanty.

(ii) Choropleth Method

Choropleth Method is used to show distribution, in general, over a specified area. In other words its data primarily relates to physical phenomena such as climate, or human characteristics such as population density. The Choropleth Method is based on the use of different shades of the same colour. In this method a range of data is assigned a shade or pattern in rising order. Hence a low range is given light shade, whereas a higher range gets dark shade. Sometimes in place of shades varying patterns of lines are used to illustrate the differences.

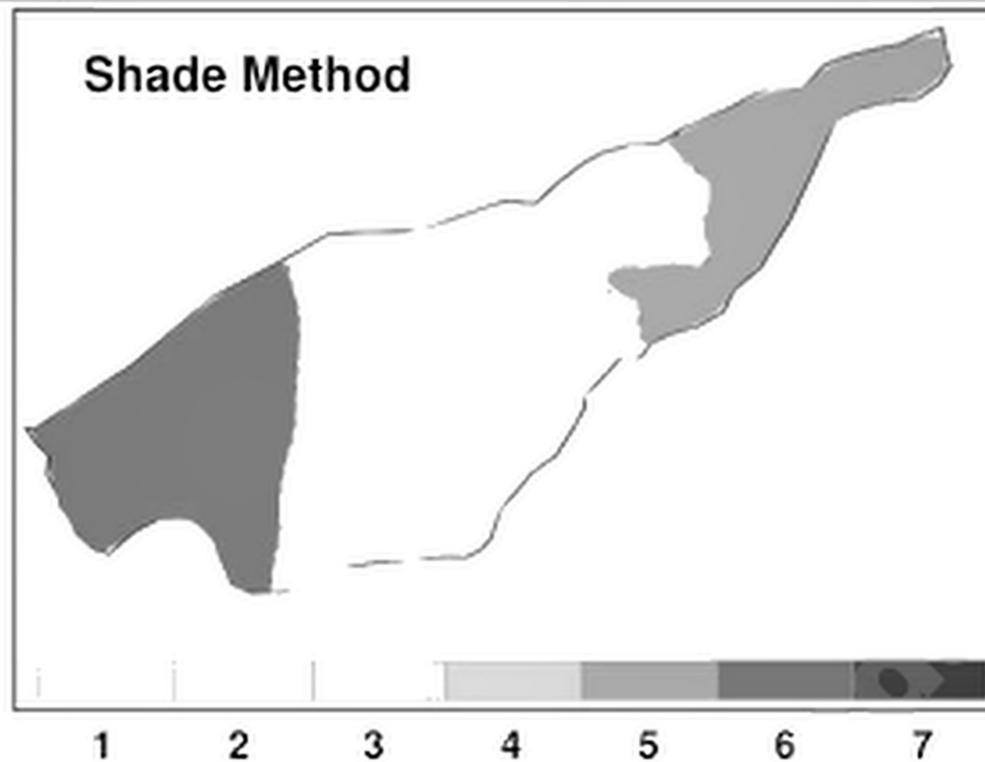
Let us glance at maps employing Choropleth Method for Population Density of the above known areas.

Example: A Choropleth Map

The available data in Table 1.1 gives population percentage per sq.km.in column 3. Here a set of 7 varying shades, with an interval of 50, covers the whole sample as indicated below.

1. Up to 50,	2. 51 to 100,	3. 101 to 150,
4. 151 to 200,	5. 201 to 250,	6. 251 to 300,
7. 301 to 350.		

The resultant Map 1.2 illustrates the varying population percentage of the three districts. Here shade 2 is for Bahawalpur, shade 5 is for Bahawalnagar and shade 6 is for Rahim Yar Khan.



Map 1.2: Distribution of Population (1998) in Rahim Yar Khan, Bahawalpur and Bahawalnagar districts.

Distribution Maps are useful for three Purposes.

- i. Distribution Maps provide specific information about particular locations.
- ii. They provide general information about spatial patterns.
- iii. They are suitable to compare pattern on two or more maps of a given area.

1.2 DIAGRAMS

Diagrams are pictorial representation of **data**. Diagrams enable us to know about quantities and relationships more clearly and, at the same time much quickly. Diagrams are used for learning and analyzing facts and tendencies. These are useful in everyday affairs. Here we learn about 3 Types of Diagrams that are much used in Geography. Such Diagrams are also popular in Mathematics, and readily used for everyday marketing of products by wise business firms.

Use of a **Graph paper** facilitates making of a diagram. It also ensures making as well as reading of a diagram correctly. Choose a graph paper on which every 10th line is drawn as bold.

(i) Line Graph

Line Graph is the most commonly used diagram. A line graph is primarily used to indicate variations over intervals of time—days, weeks, months or years. Indication of monthly variation in temperature of a place is its most common use in



Geography. The rise or fall of a graph line, over different months, is a good indication of fluctuation of weather and climate at a place.

Human Temperature Graph: Doctors use a line graph to keep record of variations of human temperature (usually taken at every six hours) for a patient. It enables a doctor to determine type of fever or gives clue to the ailment of the patient. The normal human body temperature is 37°C (98.6°F).

A Line Graph is equally useful for showing data related to Population, Transport, and Trade etc. It better depicts distribution, with variation over time.

Table 1.2 below gives mean monthly temperature (both maximum and minimum) and precipitation of **Islamabad**, for drawing a Line Graph. One such graph will show us variation in average maximum and average minimum temperature for the whole year.

Month	Mean Temperature $^{\circ}\text{C}$		Precipitation (mm)
	Max.	Min.	
January	16.3	2.7	79
February	20.1	4.8	48
March	23.6	10.3	74
April	29.7	14.6	33
May	35.5	20.2	28
June	39.7	24.4	32
July	35.5	24.9	202
August	33.2	23.8	237
September	33.5	21.8	132
October	29.8	14.4	39
November	24.2	7.2	23
December	19.1	3.4	41

Table 1.2: Mean monthly temperature (both maximum and minimum) and precipitation of the Federal Capital, **Islamabad**



Example: A Line Graph

As an example to learn, we take the first set of data from Table 1.2 here. Hence a Line Graph showing average monthly *maximum temperature* and *minimum temperature* of Islamabad is drawn as an example here. Note the steps.

1. We demarcate 12 months along X-axis (horizontal line) at equal distance.
2. Now we have to fix a *Scale* for monthly temperature (both maximum & minimum) along Y-axis. In order to show the highest temperature, we need a provision of below 50° C. Accordingly we choose a scale 1 cm = 5° C.
3. As per this scale, we plot points of *maximum temperature* for each month individually.
4. Joining the 12 points, we get a line that indicates rise and fall in average monthly *maximum temperature* of Islamabad.
5. Now for *minimum temperature* we repeat step 3 and 4, and get a line that indicates rise and fall in monthly *minimum temperature* of Islamabad.

Note: The X-axis (horizontal line) is taken to show intervals of time; days, months, years etc. The Y-axis (vertical line) is divided equally as per scale, for proportional quantities.

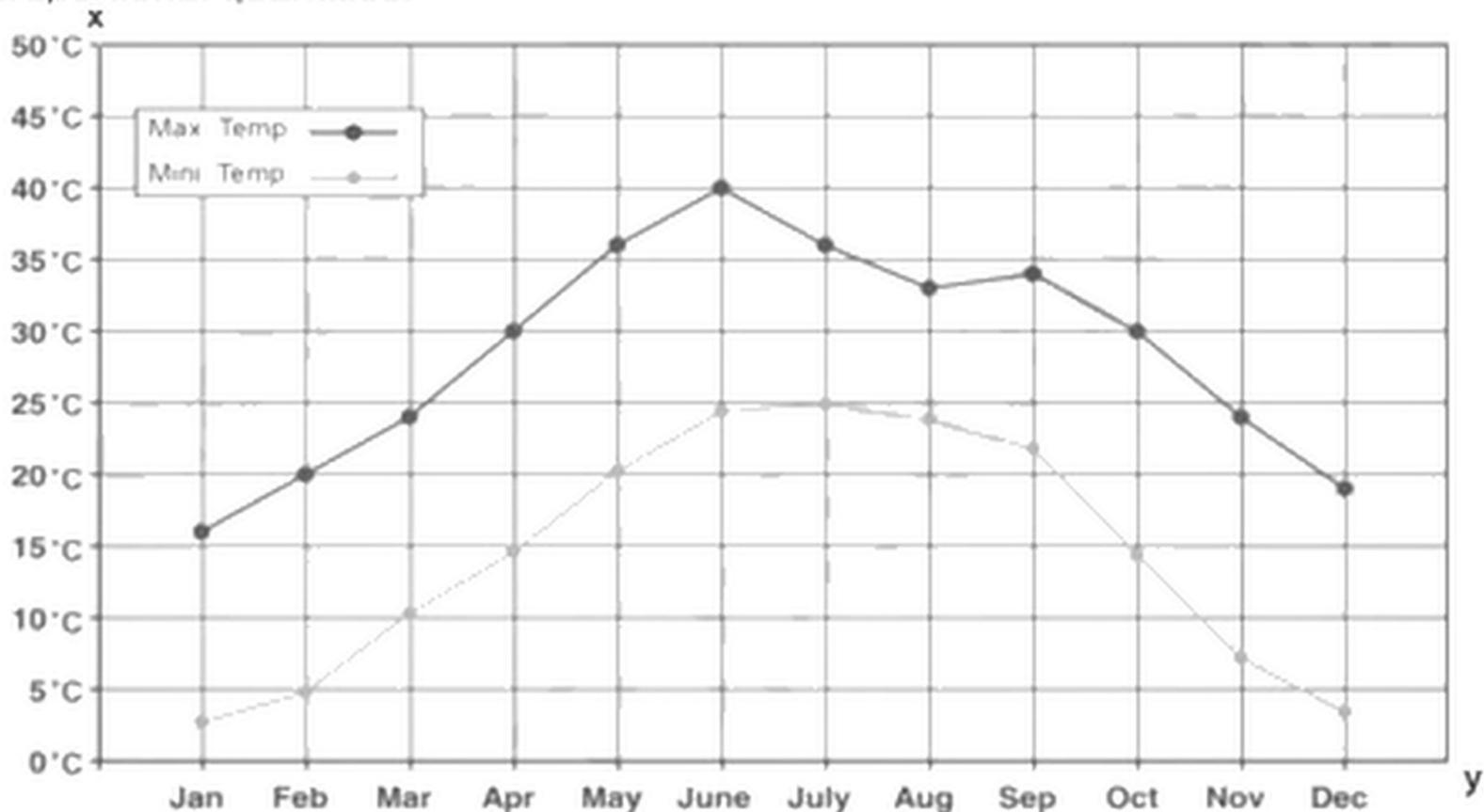


Fig. 4.4: Islamabad Monthly Max and Min Temperature



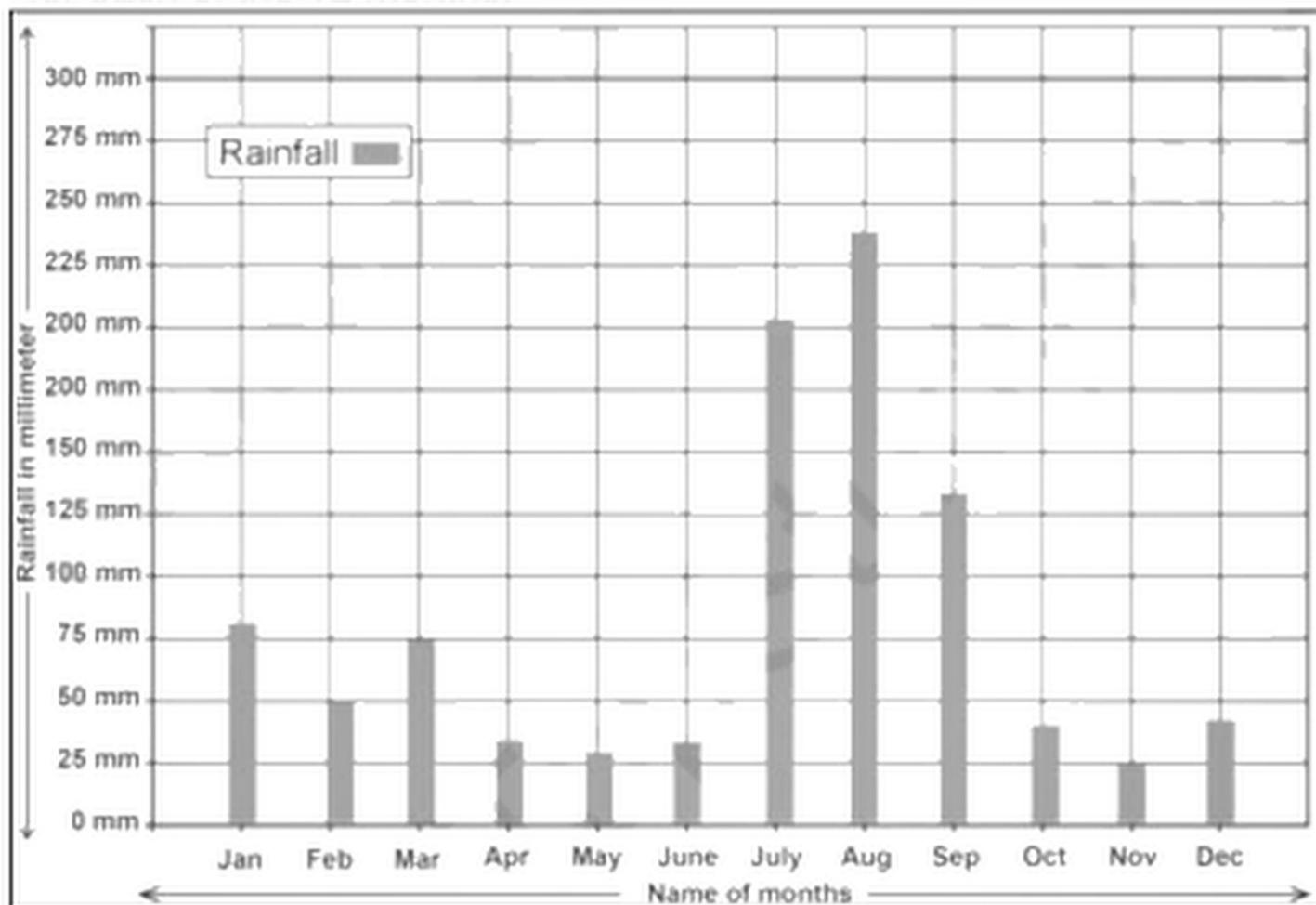
(ii) Bar Graph

A **Bar Graph** is usually drawn to depict quantities over intervals of time. In Geography it is commonly used for depicting Rainfall at a place. Bar graph is equally useful to show comparison between different items, or variations of the same item, over different intervals of time.

Example: A Bar Graph

Here we draw a Bar Graph to show rainfall over different months in Islamabad. Note the steps.

1. Demarcate 12 months along X-axis, as in the above example.
2. Now we have to fix a scale for monthly average rainfall along Y-axis. In order to show highest amount of rainfall in a month, we need a provision below 300mm. Accordingly we choose a scale 1 cm = 25 mm.
3. As per this scale, we fix rainfall heights for individual months.
4. Now we draw thick perpendicular bars up to the fixed heights to depict rainfall for each of the 12 months.





Bar graphs better depict actual quantities for a given period spread over days, months, years etc. Beside climatic data, bar graphs are commonly used for indicating crop production and trade over the years.

(iii) Pie Graph

A **Pie Graph** consists of a circle (**pie**), with demarcation of proportional parts or sectors (pieces of the pie). A Pie graph gives us relationship of areas/quantities to each other, and to the whole. It is therefore much suitable for quick comparisons.

Here we draw a Pie Graph to show comparison between areas of the major landmasses, that is the continents. The actual area of each continent is given in Table 1.3 here. Note the steps.

Continent	Area sq. km.	Continent	Area sq. km.
Asia	44,500,000	Antarctica	14,245,000
Africa	30,300,000	Europe	10,500,000
N. America	24,100,000	Australia	8,500,000
S. America	17,800,000		
Total land area says 150 million sq.km. or		Total Land Area	149,900,000

Table 1.3: Area of the Continents (sq. km.)

Step 1: We know there are 360° in a circle. In order to show proportional divisions for each continent, we divide the total area among 360° of the circle. ($150,000,000 \div 360 = 416,666.66$; or one degree representing 417,000 sq.km. approximately).

$$\text{Angle for continent} = \frac{360}{\text{Total Area}} \times \text{Area of Continent} .$$

Step 2: Now dividing area of each continent by 417,000 we get the following shares (angles) for each continent.

Continent	Area angle	Continent	Area angle
Asia	107°	Antarctica	34°
Africa	73°	Europe	25°
N. America	58°	Australia	20°
S. America	43°		

Table 1.4: Calculated angles for each Continent.



Step 3: We draw a circle and divide it into pie pieces. It is done in clockwise direction, taking the North line as zero. Angles are measured for each of the continent individually. Asia, the largest appears first, and Australia the smallest continent appears last.

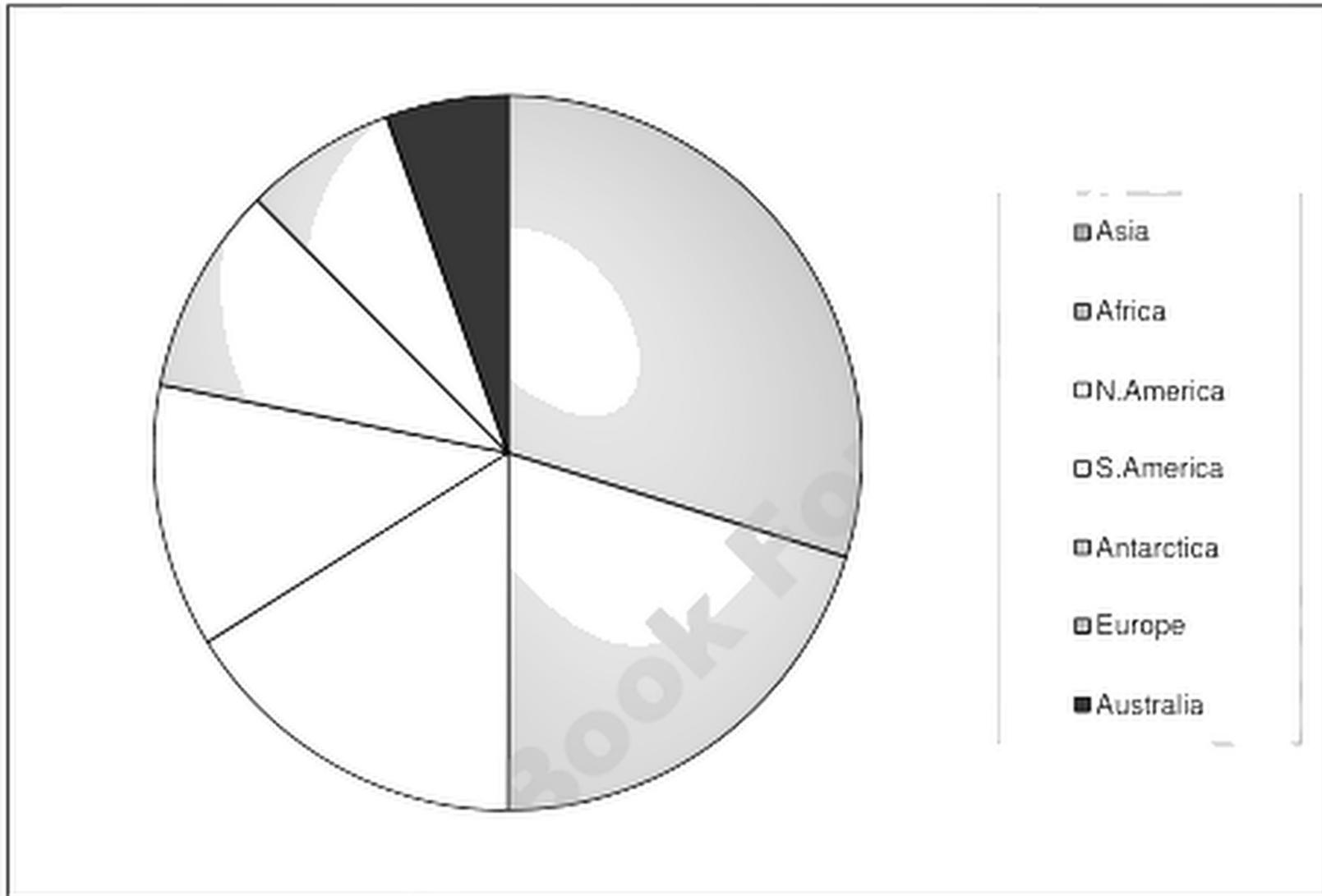


Fig 1.3: A Pie Graph showing Area of the Continents

(iv) Merits and Demerits of Diagrams

Diagrams are pictorial representation of data. Among these **Line Graph** is the most commonly used diagram. A rise and fall of a Line is a good indication of fluctuations over a given period.

A **Bar Graph** is drawn to depict quantities of Production, Population Trade etc. Bar Graph is useful for showing comparisons between different years or different items for the same year.

A **Pie Graph** is better used for showing proportional values of an important item. It may include Area, Population, Production or Trade. It may be used to compare a single item for different years, or from different countries.

**Exercise****Q 1. Write detailed answers to the following questions:-**

- i. Define Distribution Maps and give their uses of for any two purposes.
- ii. Write about use of the Dot Method in making Distribution Maps.
- iii. Write the procedure to draw a Line Graph.
- iv. Briefly highlight the use of Choropleth Method in making maps.
- v. Write merits and demerits of two types of graphs.

Q2. Write short answers to the following questions:-

- i. What method of making maps suits showing population density of an area?
- ii. What is the use of Choropleth method in drawing maps?
- iii. Describe the first step for drawing a Pie Graph.
- iv. What is the use of a Bar Graph?

Q 3. Select the appropriate option among the following:-

- i. A Distribution map shows

A. Relief Features	B. Rivers
C. Quantities	D. Qualities
- ii. With Dot Method we show distribution of

A. Rainfall	B. Temperature
C. Mountain Peaks	D. Population
- iii. A Line Graph shows quantities

A. Actual	B. Proportional
C. Variations	D. Absolute
- iv. Bar Graph is used to show

A. Proportional share	B. Absolute number
C. Divided number	D. Square root

Q 4. Fill in the blanks with appropriate words.

- i. Distribution maps are _____ for a general assessment of an area.
- ii. Divisions of time/period are shown along _____ in a Line Graph.
- iii. Quantity for each unit of _____ is shown in a Bar Graph.



Q.5 Mark the following statements as True or False:-

- i. Dots nearer to each other show a dense population. **(True / False)**
- ii. Choropleth Method shows even distribution over an area. **(True / False)**
- iii. Distribution Maps are not suitable for making comparisons between areas. **(True / False)**
- iv. A Line Graph shows spread of roads in a country. **(True / False)**

Q. 6. Match the statement in column A with related phrase in column B.

A	B
i. Sparse Population is shown by	a Pie Graph
ii. Dense Population is shown by	a Bar Graph
iii. Proportional share of an item is shown in	a dark shade
iv. Quantities are shown in	a few dots



Activities

Draw coloured chart showing (as per Table 1.2)

- a) Monthly Maximum and Minimum Temperature in Islamabad.
- b) Average Monthly Temperature. Display it in the Class.
- c) Rainfall in Islamabad.
- d) Draw a Line Graph to show Maximum and Minimum Temperature of Islamabad. (Use Table 1.2)
- e) Draw a Bar Graph to show monthly Precipitation in Islamabad. (Use Table 1.2)
- f) Draw a Pie Graph showing the proportional areas of major Administrative Units of Pakistan. (Total Area 7, 96,096 Sq. Km)

KPK	74,521	FATA	27,220
Punjab	2,05,345	Sindh	1,40,914
Balochistan	3,47,190	Islamabad	906



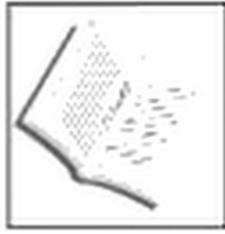
Glossary

CHOROPLETH	Mapping in which similar areas or regions are highlighted in the same way, such as many shades of a colour or colour-coding etc.
DATA	A series of observations, measurements or facts
DENSITY	Quantity per unit area
INCIDENCE	Regularity of rate, event, amount
PRECIPITATION	Deposition of the moisture on the surface of the earth; it includes rain, snow, sleet, dew
TENDENCY	General inclination, leaning (<i>jhukaou</i>)



Teacher's Points

- Invite attention to the many uses of maps in Geography, other sciences, as well as everyday life. Elaborate importance of Distribution Maps and explain, the use of Dot Method and Choropleth Method.
- Describe the use of (a) Line Graph, (b) Bar Graph and (c) Pie Graph for showing (a) fluctuations during a given period of time, (b) for comparisons and (c) for proportional values.



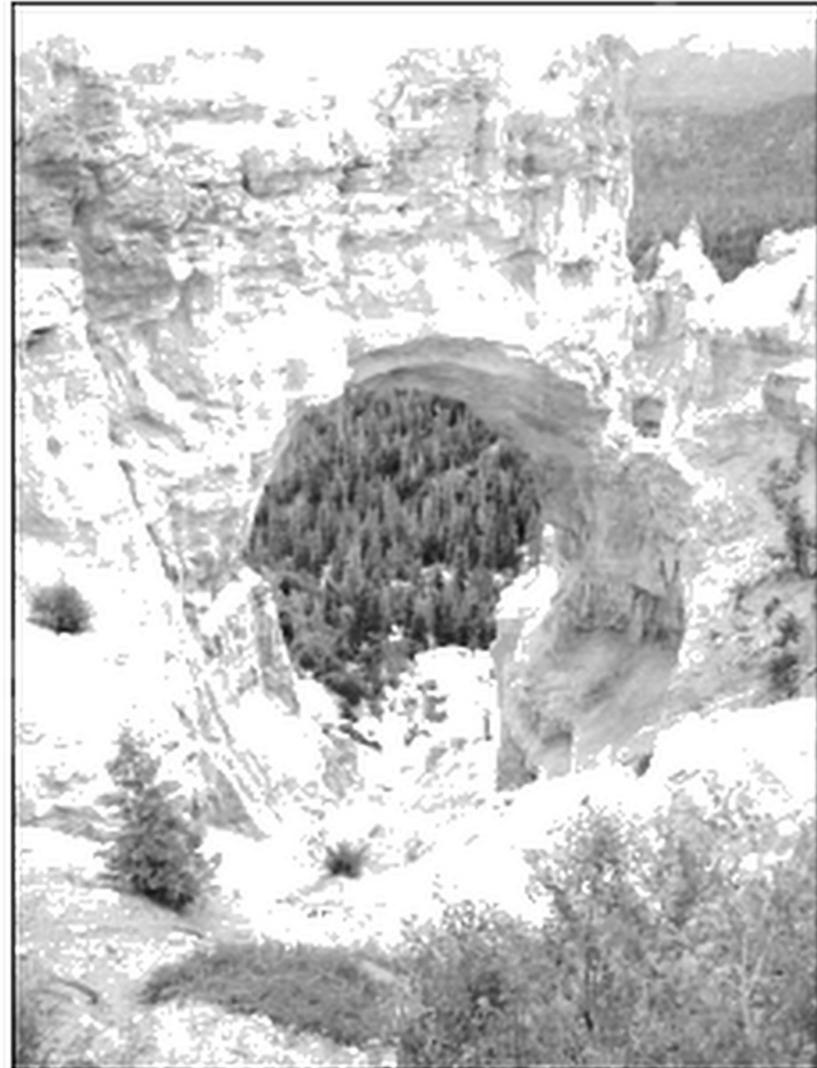
2

AGENTS OF LANDFORM CHANGE



This is a 12 days lesson
(periods including home work)
**After completing this lesson,
you will be able to:**

- Describe functions performed by different agencies responsible for Micro-relief features.
- Describe the features made by Wind.
- Describe the work of Rivers and Landforms made by Rivers.
- Describe Glacier and its types.
- Differentiate between the landforms made by Continental and Alpine Glaciers.
- Recognize Wind as an agent of Landform change in the desert Climate.
- Recognize features formed by any of these agencies with special reference to Pakistan.
- Identify the Waves as an agent of Landform change over the coastal Area.

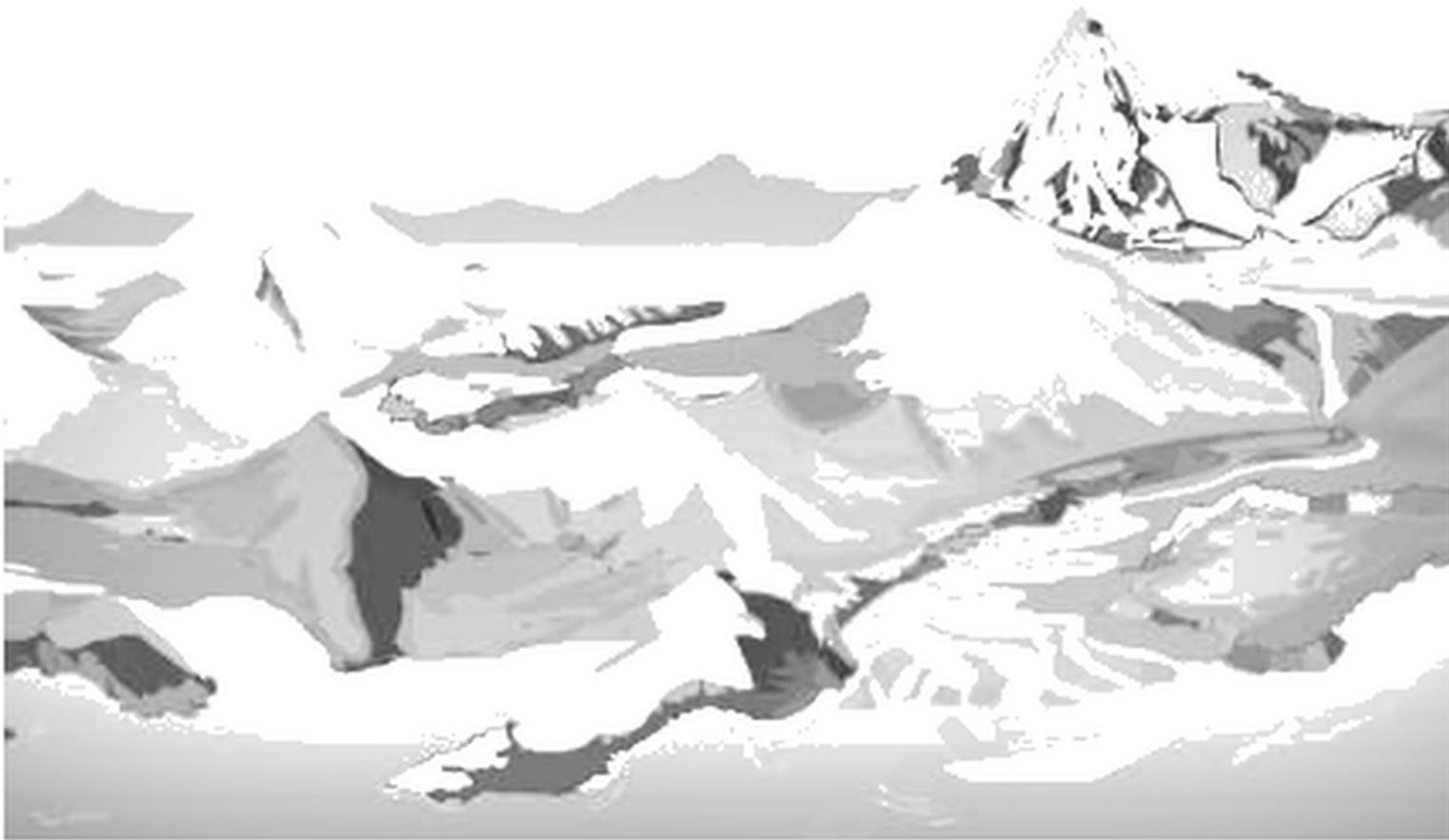


Reading

All Landforms, large or small, continuously change and get new shapes. There are four major **Agents of Landform Change**: 1) Rivers, 2) Glaciers, 3) Winds and 4) Waves. We study the work of these agents, and look at making of micro-relief features by each of these natural agents.

2.1 LANDFORMS MADE BY RIVERS

As water falls on the earth surface much of it runs off on the ground. Soon it gathers as a **stream**. With the joining-in of smaller streams the flow increases to



Different Landforms

Work of Rivers

A river undertakes three works as an agent of Land Form Change. **Erosion**, that is wearing away of rock materials. It is an important work of moving water. A river acts as an agent of **Transportation** as load of eroded materials is carried down-stream. The amount of material transported by the river depends on the



Deposition takes place when there is a decrease in the slope. As a river deposits its load, it sorts out the materials. Larger and coarse materials are deposited earlier, followed by fine materials that are spread at far off places.

From its source to the sea, a river has three stages:

1. the Upper or **Mountain Stage**,
2. the Middle or **Plain Stage** and
3. the Lower or **Delta Stage**.

Typical landforms are made by a river at each of these stages.

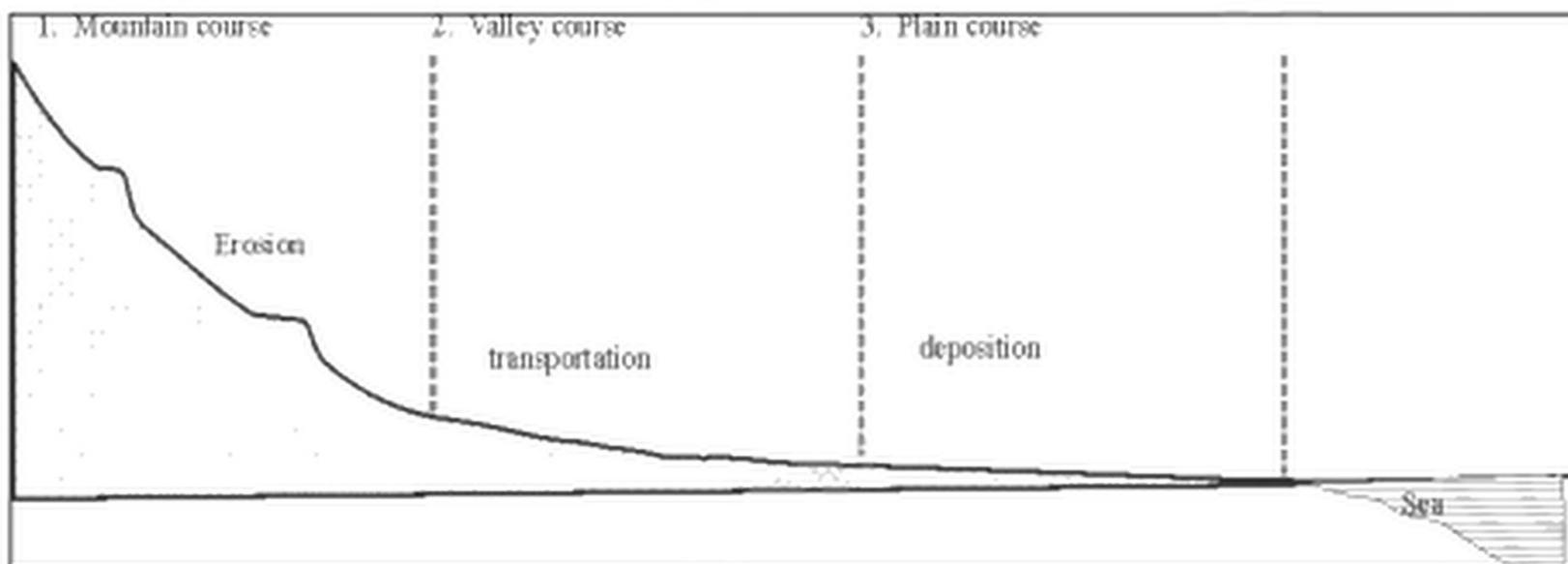


Fig. 2.1: The 3 Stages of a River

(i) Landforms of the Mountain Stage

At the mountain stage a river is more active as an **agent of erosion**. Hence a number of typical features are carved out here.

i. **V-Shaped Valley**: On the valley slopes, a rapidly flowing river cuts the bottom rocks deeper than it cuts rocks at the two banks. Soon the valley appears in shape like the alphabet **V**.

ii. **Gorge**: In areas where a river flows over much harder rocks, it cuts a narrow channel with steep sides. In areas of low rain there is less cutting along the slopes; and the river cuts deep into the valley floor making a **gorge**. In such cases the sides become sharp where water flows at the bottom. In the United States, such sharp sided gorges are called **Canyons**.



iii. **Waterfalls:** In case a hard rock lies across a river course, the soft rock that lies immediately after it is swiftly eroded away. A sudden edge of the hard rock appears. It causes the water to plunge down from some height.

In many a cases the water falling from height causes a deep cut (making a pool) onto the bed of the river. It is called a **Plunge Pool**.

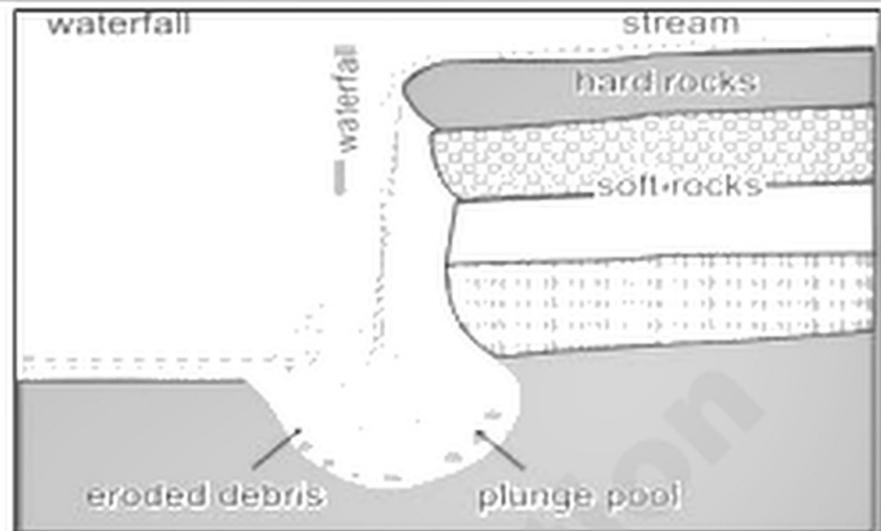


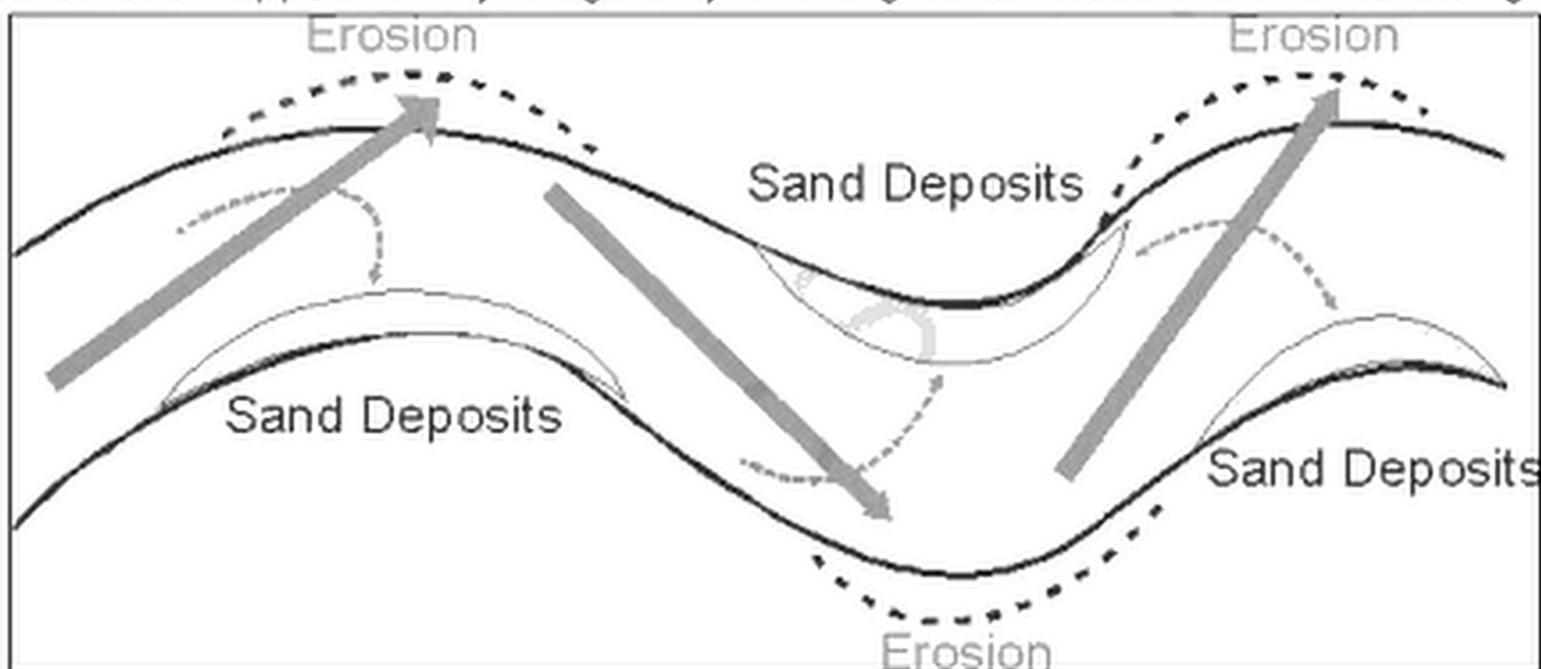
Fig. 2.2: A Waterfall with Plunge Pool

(ii) Landforms of the Plain Stage

At the Plain Stage the force of the flow is reduced because of lowering of the slope. Hence a river's ability to **erode** the rocks of the bed is reduced. Here work of the river is mainly **transportation**. Some **deposition** is made at places. Following micro-relief features appear at the Plain Stage:

i. **Gently-sloping Valley:** The river course over the plain becomes wide with gentle slope. Heavier materials like **pebbles** and **gravel** are deposited soon on entering the Plain Stage. Lighter materials like **sand** and **silt** are however still carried to greater distances.

ii. **Meanders:** On a plain of lesser slope, water seldom flows straight. A winding course soon appears. Any irregularity of the ground forces the river to swing in





loops. Here erosion takes place at the outer bank and deposition along the inner bank. The simple mechanism of flow of water through loops leads to formation of *meanders*. This is illustrated in Figure 2.3

iii. **Ox-bow Lake:** Sometimes a meander becomes much large. The outside bend of the bank is rapidly eroded making the river to become almost a complete circle. Soon after, the river cuts through the narrow neck of the loop. The river thus begins to flow straight again; leaving the loop filled with shallow water. It is called an Ox-bow Lake. (Fig. 2.4)

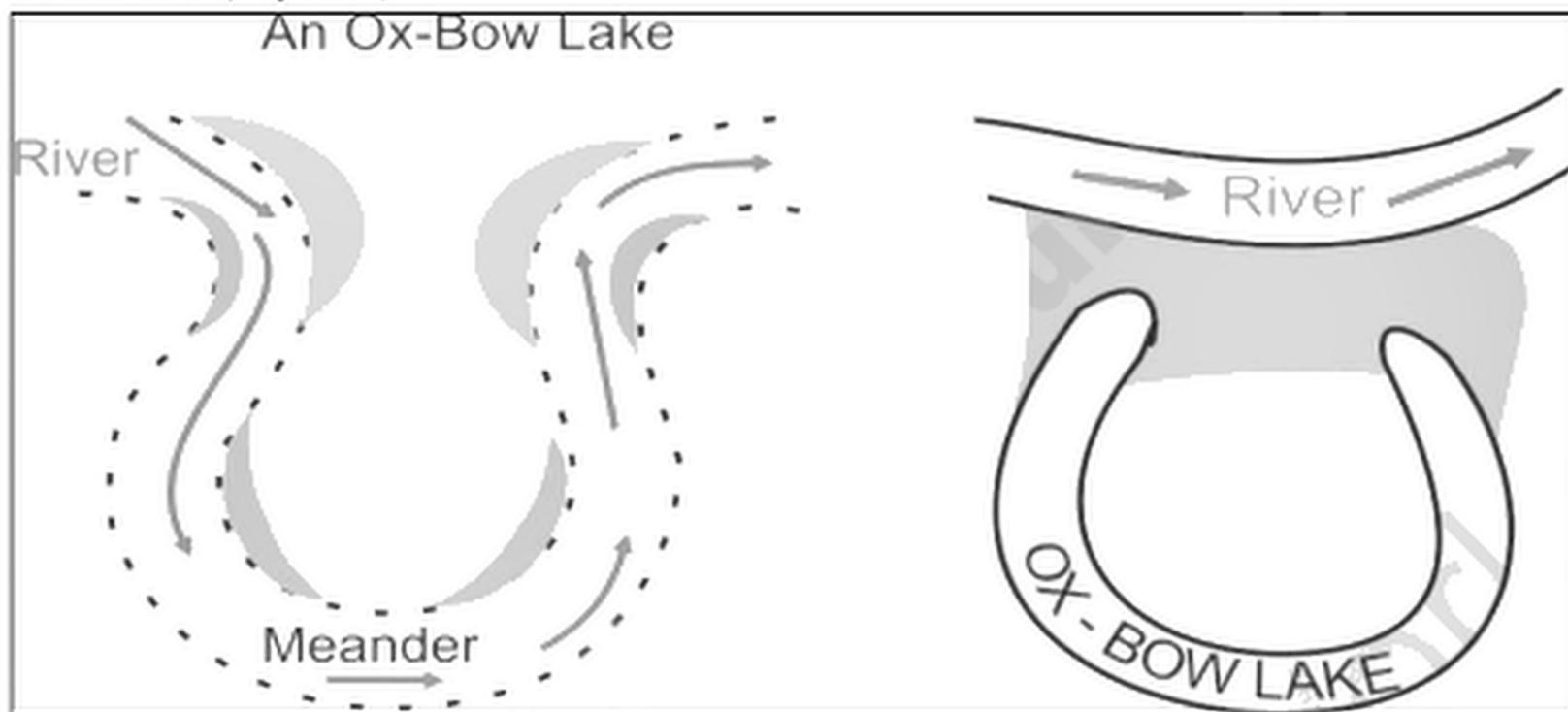


Fig. 2.4 Formation of an Ox-bow Lake

iii. **Flood Plain:** Many a rivers carry large amount of sediments (sand and mud) in the Plain Stage. In case of heavy rains, floods occur and river water spreads over to nearby low-lying areas. As flood water recedes slowly, a layer of sediments is deposited over the affected areas. Gradually a *flood-plain* appears over the affected area.

iv. **Levees:** Over gentle plains, when the river flows within the normal channel, some material is deposited over the bed; and some is deposited on the sides giving rise to raised banks. Such raised banks are called *levees*.

(iii) Landforms of the Delta Stage

As a river reaches its final stage, nearer to the sea, its force comes almost to a halt. The materials, still carried by slow moving waters, are deposited down



on the ground. The formal water course gradually becomes obstructed. The water now flows out through small channels called **distributaries**. With the passage of time as more water carrying silt (fine materials) arrives, obstructions lead to appearance of further distributaries at the mouth. Thus emerges a typical landform much in shape with Greek letter Δ called *delta*. (Fig. 2.5)

River Made Features in Pakistan

We are familiar with river Indus and its tributaries. The Indus has a prominent Mountain Stage, a large Plain Stage, and a famous Delta Stage. A reference to smaller land forms made by the rivers here (and looking at them while traveling; in pictures and documentaries), helps us in recognizing the processes and features effectively. These illustrations here are camera-images from *Google Earth*.

Similar features like meanders appear along other rivers of Pakistan, especially along the Sullej River.

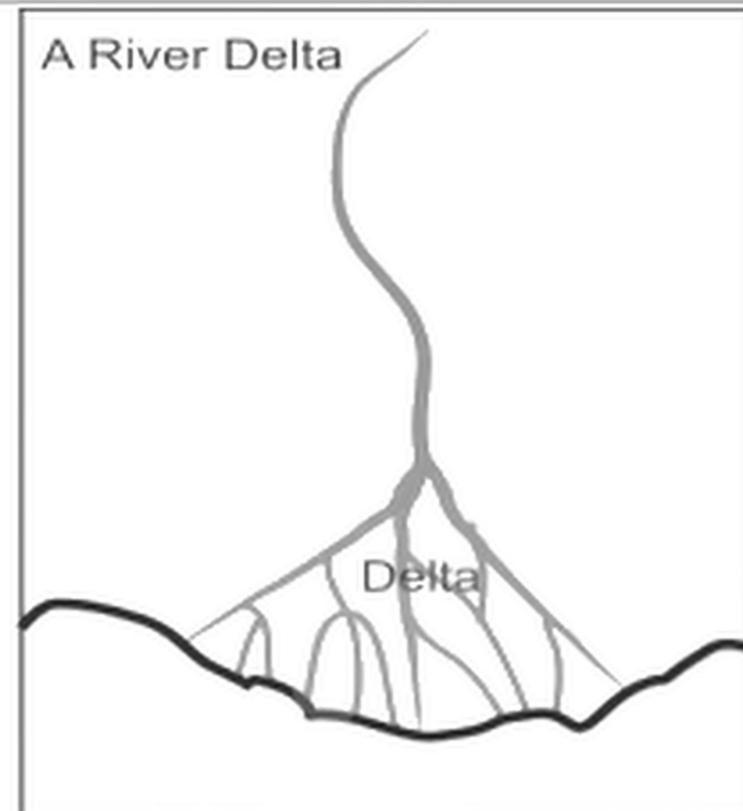


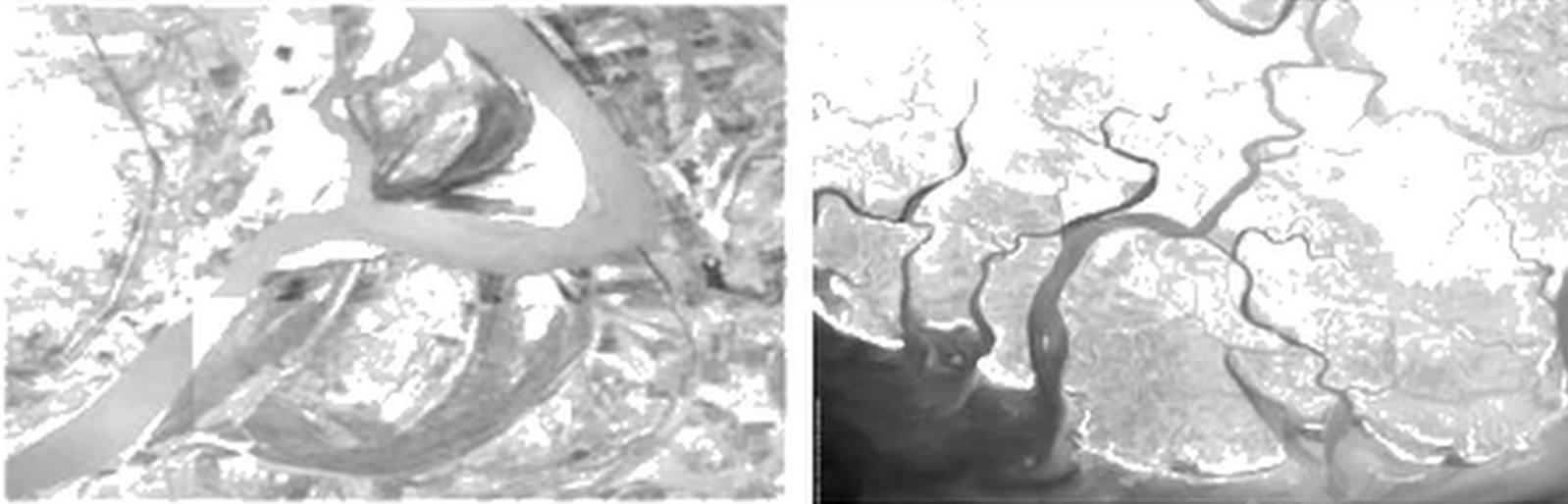
Fig. 2.5 River Delta



1. Attock Gorge (Attock to Mari Indus) from where the Indus Enters the plains.



2. From Kalabagh downward the Indus opens up its Flood Plain.



3. East of Pataro (North of Hyderabad)

4. Indus Delta

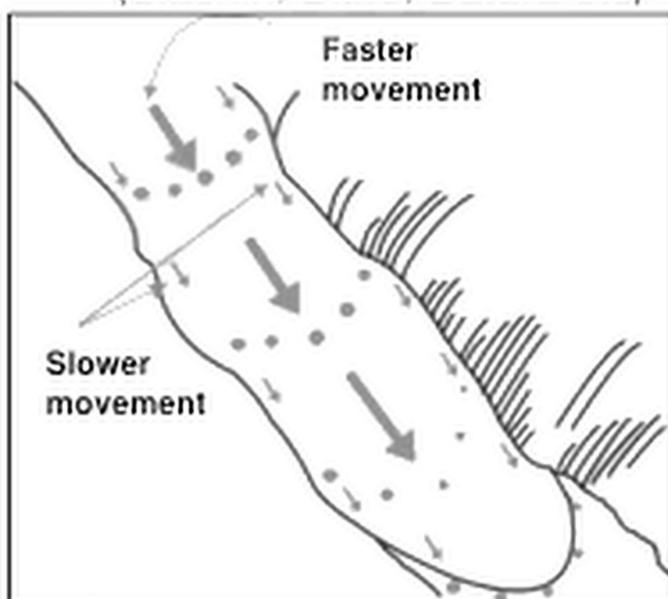
Fig. 2. 6: Satellite Images of River Indus with Meanders Oxbow Lakes and Delta.

2.2 LANDFORMS MADE BY GLACIERS

Snow falls in many mountain areas of Pakistan in winter season. Over the years, the addition of snow from fresh fall causes the mass of the ice to move down from the edge of the snow-field. This moving ice is called a **Glacier**.

There are two broad types of glaciers:

- a) **Continental Glaciers.** These are much large, and spread over wide area of a continent. In the past, that is in the Glacial Period of the Earth (over 30,000 years ago); many areas of the continents were covered with thick ice-sheets. Now the continent of Antarctica and Greenland are the only areas left with such large glaciers.
- b) **Valley Glaciers:** These are found in higher mountain areas of the world. These comprise heaps of ice moving down-hill along the valleys. Many important valley glaciers are found in Karakoram mountain areas of Pakistan (Siachin, Biafo, Batura etc)



A glacier, being a "river of ice", carries heavier load, cuts hard rocks, and leaves heaps of materials. In carrying its work of Erosion, Transportation and Deposition a glacier gives rise to impressive **erosional** features in the highland areas, and **depositional** features in the lowland areas.

(i) Erosional Landforms

As a glacier moves, its rate of movement is faster at the middle. as there is less



obstruction here. Ice at its sides and bottom is held back by friction with the valley sides and the valley floor. Thus a curve appears at the front side of a glacier. Thus its lower parts are tongue-shaped.

Some important micro-relief features carved out by glacial erosion are as under.

i. **Cirque:** At the head of a valley, a glacier cuts its base deeper, where as walls at the side remain

steep. Thus appears a semi-circular hollow, known as **cirque**. Cirque is a French word. In Scotland (UK), this small feature is called a **corrie**. When the glacier melts, water remains collected in the hollow to form a small lake known as **tarn**.

ii. **U-Shaped Valley:** A glacier moving down from the heights erodes the sides and floor. Its weight and force grinds the bedrocks and removes any standing spurs. With the passage of time there appears a flat floor with very steep slopes. Here it very much looks like alphabet U. Hence a valley formed by a glacier is known as U-Shaped Valley.

iii. **Hanging Valley:** In mountainous areas, the main glacier cuts its valley much deeper than the tributary glaciers. As the main glacier reaches lower slopes it begins to melt. Thus it recedes back, leaving the valley without ice. Now the bed of a tributary glacier valley that was not cut deep, appears hanging over from the side of the main valley.

iv. **Fiord:** In mountain areas that are near to sea coast, a glacier continues cutting its valley onto the sea-bed. Soon it causes formation of a steep-sided inlet of the sea. It is called a **fiord** in Sweden. (In Norse language—language of Norway it is called and written as fjord).

(ii) Depositional Landforms

A glacier carries much heavier, and also lighter materials to greater distances. This material is deposited as a glacier melts or recedes. There were wide areas of land in the northern hemisphere that experienced advance of large

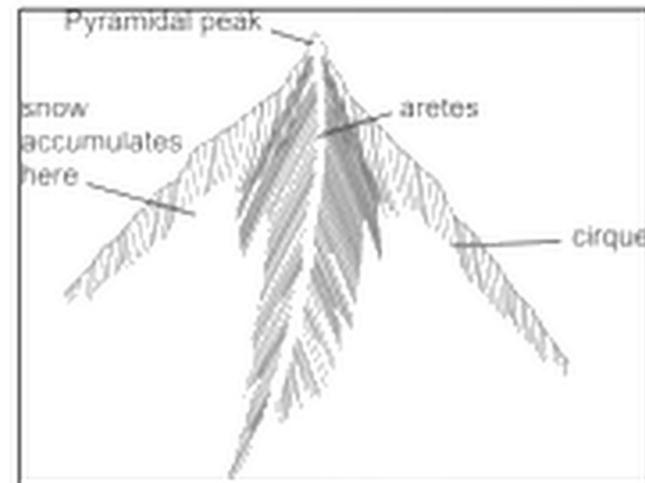


Fig. 2.8: Glacial features along mountain slopes



ice-sheets during the Ice-Age (over 30,000 years ago). A large variety of depositional landforms, left by advancing and receding glaciers is found in the countries of Europe and North America. While identifying such features; we also note some well known areas of their occurrence.

i. **Erratics:** A massive ice-sheet (glacier) advancing in the Ice-Age carried much large lumps of rocks, known as boulders; and left these scattered over wide areas, while receding. These **erratics** are large, rounded and different from the surrounding material. At places (especially in England) these erratics are made up of granite (hard igneous rock).

ii. **Till:** A mixed variety of glacier - left material is known as **till**. It is made up of clay and sand that also contains large and small stones. In many areas of England till contains chalk and granitic stones.



Fig. 2.9: Moraines

iii. **Moraines:** A glacier moving over mountain slopes carries much rock materials--called **moraines**. Rock material that falls on the side of a glacier is called **lateral moraines**. Where such material belongs to two merging glaciers, it is termed as **medial moraines**. On the end melting of a glacier, much rock material is left wide

spread on the floor of the valley. It is termed as **terminal moraines**.

iv. **Drumlins:** In some areas an ice sheet leaves its material in small heaps of sand-clay mixture—called **drumlins**. These heaps are hardly a kilometer in length and some 60-70 meters high. These are found in Northern Ireland, Midland Valley of Scotland and near Lancaster in England.

v. **Icebergs:** When a glacier flows right down to a sea, it drops its load of moraines in the sea. Here its end piece breaks off from the main glacier forming an iceberg. Icebergs— (masses of ice broken from glaciers) along with transported material, float a while in the cold seas. On reaching warmer waters icebergs melt depositing the load on sea floor.



Over mountain ranges of **Karakorams, Himalayas and Hindu Kush** there are more than 5000 glaciers on the mountain slopes and in the valleys. Many of these are much small, but some are more than 70 km long. Beside glaciers there are around 2000 glacial lakes in this area.

2.3 LANDFORMS MADE BY WINDS

We regularly observe that wind holds tiny earth particles in suspension; where they move creeping and leaping gently. Such moving particles hit other particles and push them further ahead. An upward current of air supports the suspended particles for some time. Such particles are then scattered around as **dust**.

Dust carrying winds are an active agent of landform change, especially in the desert areas. In the absence of vegetation cover in the desert areas, rock particles from weathering are easily carried by winds. Heavier sand, even small pebbles are rolled along the ground depending on the force of the blowing wind.

(i) Landforms Shaped by Wind Erosion

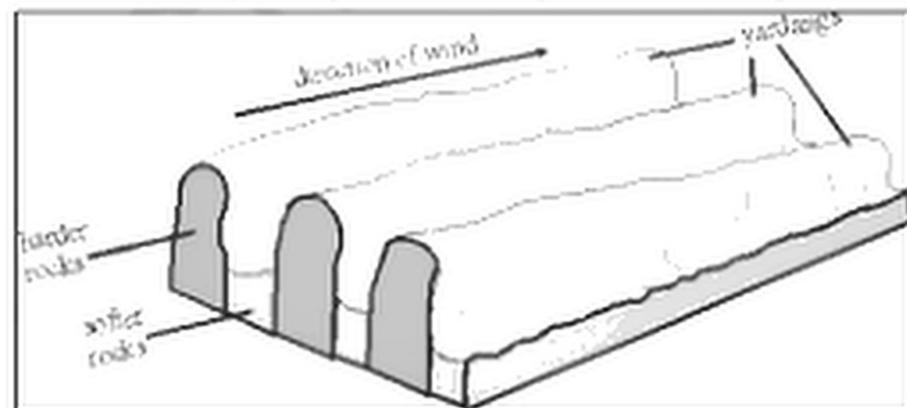
Landforms shaped by Wind Erosion are commonly seen in dry areas. Important among these are the following.

i. **Rock pedestals:** Softer layers of a rising rock mass are swiftly worn away by blows of sand laden winds as compared to harder layers. Thus rock mass projected above the plain, and cut at the base appear delicately balanced upon their stems. Such awkward looking rock pillars are called **rock pedestals**.

ii. **Yardangs:** Sometimes bands of hard and soft rocks lie parallel to the direction of regularly blowing winds. As softer bands are quickly eroded by the blowing wind, 'groove' like deepening of strata between hard standing rock bands appear. Such features showing 'ridge and furrow' are called **yardangs**.



Fig. 2.10: A rock Pedestal





Deposits by Winds





iv. **Messas and Buttes:** In certain dry areas (like Colorado State, USA) river erosion has already shaped deep gorges and canyons. The plateau sides are steep and cliff-like. Here winds erode lower strata while top hard layers remain in flat tabular form. Such relief features are known as **messas**. In case the existing tabular rock strata are small, the sloping sides are much sharp. This feature is called a **butte**.

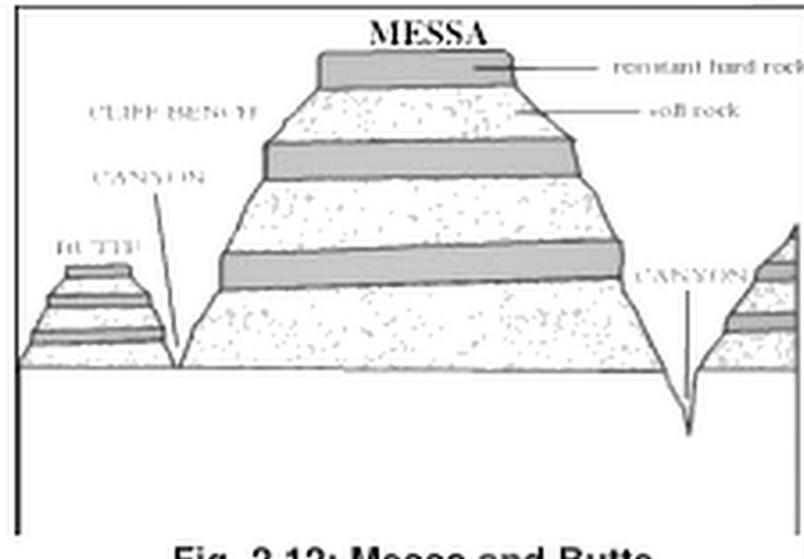


Fig. 2.12: Mesa and Butte

(ii) Landforms Shaped by Wind Deposition

i. **Dunes:** A sand dune is a mound of sand piled up by the action of the wind. It appears commonly in deserts and is also seen along the sea coast. In drier areas, small obstacle (like a plant, a tree or even a pebble) quickly traps the wind blown sand. Thus sand grains accumulate; and soon a dune (small mound) appears at such a place.

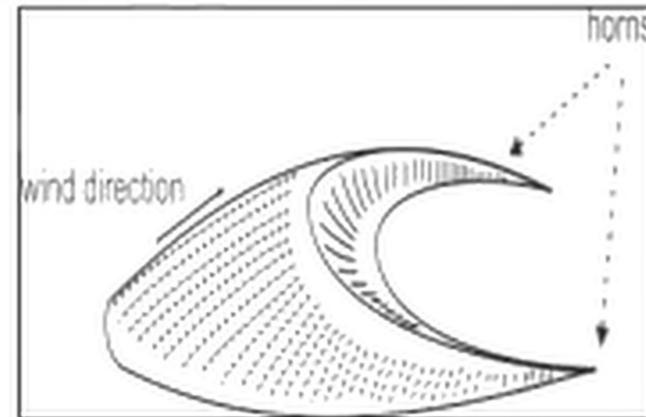


Fig. 2.13: Barchan Dune

The blowing wind starts to affect such newly formed sand dune. Uplifting sand particles from the windward side, the wind drops them on the leeward side. Soon this action causes the dune to 'move ahead'. Piling of more sand on the moving dune leads to its growth in size.

Sand dunes occur in a variety of places and have peculiar shapes. They have negative effects as they move nearer, or even over to human habitat. There is much variety in the shape of sand dunes. The following two shapes of the sand-dunes are much prominent.

- a. **Barchan Dunes:** Sand dunes that are formed by constantly blowing over a shrub or tree, soon assume a crescent like shape. Barchans are formed slanting to the direction of the blowing wind. The windward side is convex;



Seif (سيف) as we know is an Arabic word, that means sword. In Arabian peninsula a vast area known as 'Rub' al Khali' (ربيع الخالي) has large seif dunes, that rise to over 300 m.

and has a gentle slope. The side ends are lower and curved due to greater push of the winds on the sides.

b. **Seif Dunes:** Sand dunes that are formed parallel to the direction of blowing wind are known as **seif dunes**. Continued winds

blow along the sides of the formed dunes. The crest-line (top) of such dunes shows regular ups and downs like the teeth of a saw.

ii. **Loess:** A fine dust, blown to outer lands from a desert area, is known as **loess**.

Loess is in fact a fine depositional material that is much porous. As water sinks easily, the surface is always dry. Herein streams have cut deep valleys and the resultant feature is known as **badland topography**. We notice, near to Islamabad vast loess deposits and the so called badlands are a part of Pothowar Plateau.

Loess is generally yellowish in colour, and very fertile.

The most extensive loess deposits are found in **Huang hu** basin of north-west China. In Mid-western parts of USA loess deposits are termed **adobe**.

2.4 LANDFORMS MADE BY WAVES

Waves are formed by winds on the surface of large water bodies. As a wave comes onshore, its **crest** (top part of the wave) curls over and it 'breaks'. The water is pushed up the **beach**.

(i) Landforms Shaped by Wave Erosion

i. **Sea Cliff, Wave cut Platform:** When waves strike a rising piece of hard rock continuously, its parts are torn down. The rock piece thus gets a steeper face. This is simply a **sea cliff**. As rock pieces are broken mostly from the base of the rock surface, the base gradually becomes enlarged. The cliff is gradually worn back; leaving behind a flat area. This is known as a **wave-cut platform**.

ii. **Bays, Headlands:** At places the waves advance on an area of soft and hard rocks. The soft rocks are eroded earlier. Thus appear **bays** (sea inlets). The hard rocks on the other hand remain extended out in to the sea. These are known as **headlands**.

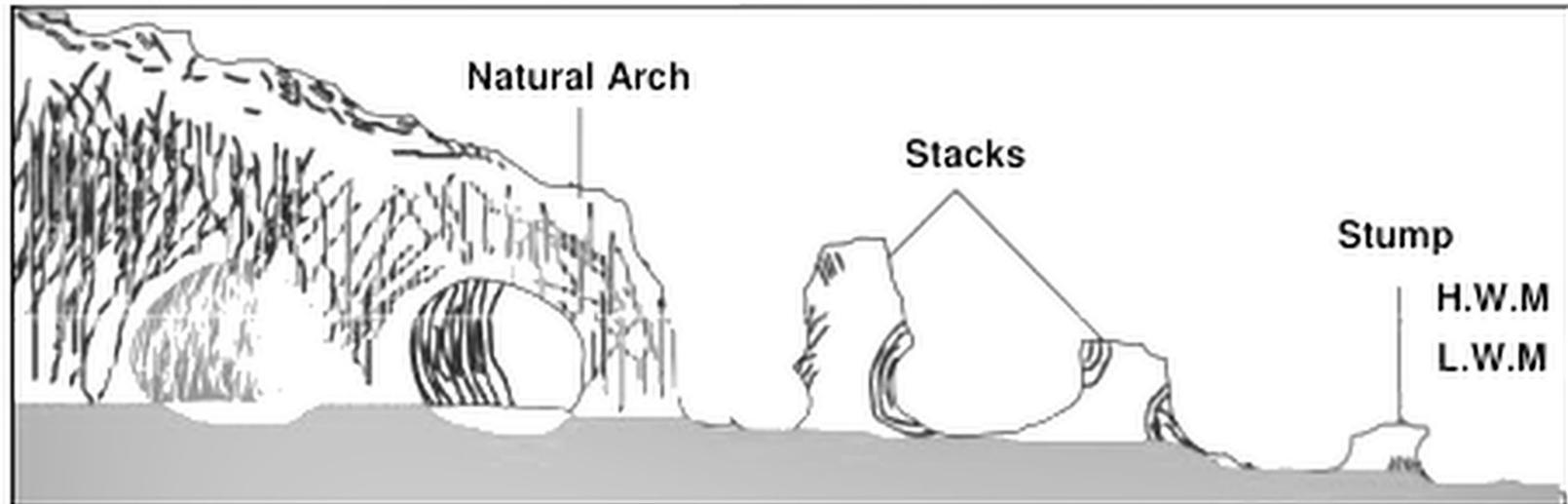


Fig. 2. 14: Caves, Arches, Stacks and Stump made by Waves at Sea Shore



The arch (now broken) and stack at Hawkes Bay, Karachi are an enjoyable picnic point. Do visit as and when you get a chance.



iii. **Caves, Arches and Stacks:** We know that even hard rocks have faults and cracks. The continued erosion of such rock surfaces leads to formation of a **cave**. When two caves are cut from different sides, their ultimate joining makes an **arch**. With the passage of time the arch falls, and side rock remains standing as a pillar. This is called a **stack**. As erosion continues, sides of a stack are broken down and what remains standing is called a **stump**.

(ii) Landforms shaped by Wave Deposition



Fig. 2.15: A Beach



Fig. 2.16: A Sandspit

i. **Beaches:** In a shallow coastal area, deposition is main activity of the waves. Here rock materials eroded from the landside are deposited to form a **beach**. Coarser material (like pebbles) is left on the inner part of the beach. Light material (like sand) is carried back and deposited farther down. In areas where the coast is much gentle, long sandy beaches appear.

ii. **Spits, Bars:** In an area where the sea coast has indents (inside cuttings) the wave pushes the eroded material along, for a while. As the wave force

drops, the rock material is ultimately dropped. Here soon emerges a **sandspit**. A spit is thus a low, narrow bar of sand and gravel, joined with the land at one end. The other end leads into the sea. In certain cases a spit appears across the bay. Here it is known as a **bar**.



Exercise

Q 1. Write detailed answers to the following questions:-

- i. Describe the work of a River at 3 stages: Mountain, Plain and Delta.
- ii. Write about the Wind as an agent of Landform Change in a desert.
- iii. Give details of Erosional and Depositional landforms formed by a Glacier.

Q2. Write short answers to the following questions:-

- i. Identify two land features in coastal areas and tell how these are formed by Waves.
- ii. Write how an Ox-bow lake is formed by a River.
- iii. Which agent of landform change makes moraines? Give example of an area where moraines are spread over the surface.
- iv. How a 'barchans' is shaped in a desert?
- v. Which features appear as a result of wave action at the sea coast made up of hard rocks?

Q 3. Select the appropriate option among the following:-

- i. A Plunge-pool is formed by
A. a River B. a Glacier C. Fast blowing Wind D. high Waves.
- ii. A Hanging Valley is formed on the
A. Plain. B. High Mountains C. Delta D. Sea shore
- iii. Cirques are formed by
A. River action B. Wave action C. Wind action D. Glacial action
- iv. Barchans are found in
A. Low mountains B. Narrow plains C. Sea cliff D. Desert area

Q 4. Fill in the blanks with appropriate words.

- i. In case of heavy _____, floods occur over vast areas.
- ii. Loess is a _____ dust.
- iii. Rock materials eroded by _____ are deposited to form a beach.



Q.5 Mark the following statements as True or False:-

- i. A V-shaped valley is formed by fast blowing wind. (True / False)
- ii. Agents of landform change cause formation of micro-relief features. (True / False)
- iii. Glaciers spread over small areas are known as Continental Glaciers. (True / False)
- iv. A Fjord is a continuation of a glacial valley cut on to the sea-bed. (True / False)

Q. 6. Match the following related column by drawing a line:-

A	B
River-falls may cause formation of	a delta
Many large rivers form	a canyon
A gorge in USA is called	a plunge pool
A barchans is	a typical sand dune



Activities

- i. Draw an outline of 3 features made by Glaciers.
- ii. Draw an outline of a Meander and an Oxbow Lake.
- iii. Using Plaster of Paris make a model of a Sea Arch, a Stack and a Stump.
(Use blue colour to show the sea)
- iv. When visiting Karachi do enjoy its Clifton Beach and Sandspit along Manora.

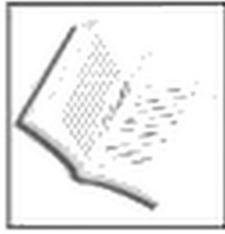


Glossary

BOULDER	Smooth, rounded rock/stone shaped and carried away by erosion
CORRIE	Arm chair-shaped hollow high on a hillside, eroded by ice
DRUMLIN	Mound of boulder clay which has been deposited by a glacier
ERRATICS	Large boulders deposited by glacier in an area which has a different rock type
MOUND	A raised mass of earth; debris; a small natural hill
STACK	Rock left standing out at sea after wave erosion



- Physical change (wear and tear) of surface features is much in evidence in and around Islamabad; especially in the Pothowar area. Take up a few individual features like a meander, an ox bow lake, a moraine deposit, a sand dune etc and illustrate its shaping by an Agent of Change, on the board using coloured chalk.
- Encourage of collection of illustrations/photographs of micro-relief features, as these appear in newspapers and magazines



3

OCEANS



This is a 12 days lesson
(periods including home work)
**After completing this lesson,
you will be able to:**

- Describe the main characteristics of major oceans and Seas.
- Describe the configuration of ocean floor.
- Describe the nature and causes of various Oceanic movements.
- Differentiate between Waves, Currents and Tides.
- Define the following features.
 - Sea
 - Gulf
 - Bay
 - Bight
 - Channel/Strait
 - Peninsula
 - Island
 - Isthmus



Reading

Surface of the earth has been covered with large landmasses and vast water bodies. Landmasses are known as continents and vast water bodies are identified as oceans and seas.

3.1 OCEANS AND SEAS

Total area of the surface of the earth covered by the water is 71 %. This portion of water area is further sub divided into five oceans. Oceans are huge bodies of salt water surrounding the continents. Oceans attach great importance to themselves because they are source of food i.e. fish, lobster, shrimp .Valuable minerals like natural gas and crude oil are also obtained from ocean beds, they also provide cheapest mean of transportation moreover earth's climate is also affected by them.

Seas are partially enclosed margins of the oceans; a large landlocked lake can also be termed as a sea. Almost all the oceans have a number of seas along



their coast lines, yet there are large water bodies found in the interiors of the continents which are termed as seas.

(i) Main Characteristics of Major Oceans

According to the location, size, and average depth each ocean has its own distinct characteristics.

i. **Pacific Ocean:** Pacific Ocean is the largest ocean of the world. It covers an area of 156 million square kilometers. It is bordered by North and South America, Asia and Australia and Southern Ocean. Its average depth is approximately 4000 meters. Its deepest part is located near Mariana Islands, which is named as Mariana trench. Mariana trench is 10,924 meters deep. Thousands of islands of different sizes are located in Pacific Ocean.

ii. **Atlantic Ocean:** Atlantic Ocean is the second largest ocean of the world. It covers an area of about 77 million square kilometers. It is bounded by Europe and Africa in the east and by North and South America in the west, in the south it is bordered by the Southern Ocean. Its average depth is 4000 meters. Its deepest point is Puerto Rico trench. It is 8600 meters deep.

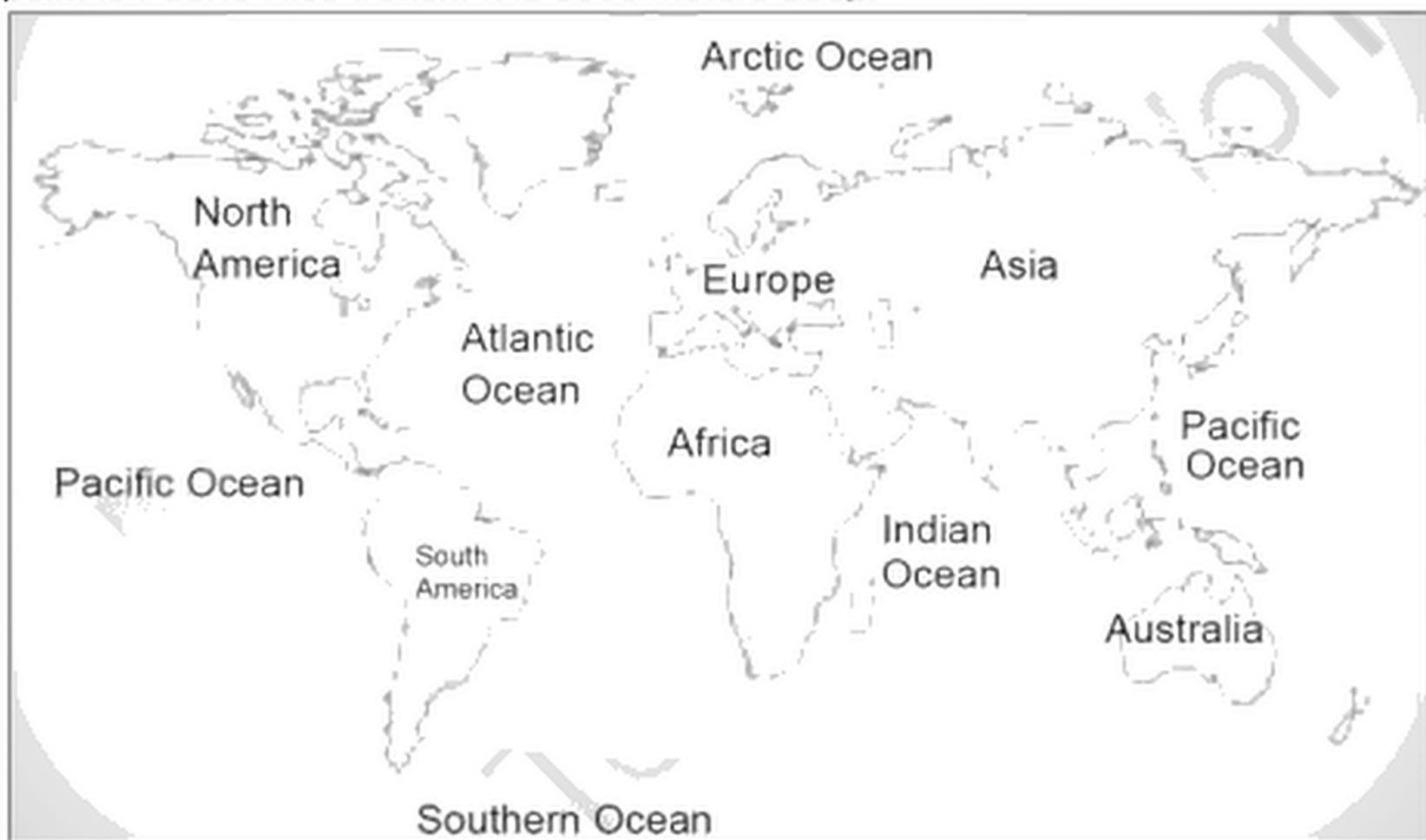


Fig. 2.1: World Oceans



iii. **Indian Ocean:** It is the third largest ocean of the world. It covers an area of about 69 million square kilometers. It is situated between Africa, Asia, Australia and the Southern Ocean. Its average depth is 3900 meters, and its deepest point is Java Trench about 300 km off the coast of Sumatra, Indonesia. It is 7258 meters deep.

iv. **Southern Ocean:** The southern ocean is the fourth largest ocean of the world. It occupies the area between 60 degree southern latitude and the coast of Antarctica. Its total surface area is 20 million square kilometers. Its average depth is 4500 meters its deepest point is about 7235 meters deep.

v. **Arctic Ocean:** Arctic Ocean is the smallest of the world oceans. It is covering an area of 14 million square kilometers. It is situated around the North Pole and is bounded by Europe, Asia and North America. It has an average depth of 1200 meters and its deepest point is named as Fram Basin, which is 4665 meters deep.

(ii) Main Characteristics of Major Seas

Major seas are important because they provide easy passages for trade, some of them are important because they gave birth to rich civilizations, and some gain their significance due to their enormous size. Main characteristics of major seas are as under.





i. **Mediterranean Sea:** Mediterranean Sea is located between Europe, Africa and Asia. It is attached to Atlantic Ocean in the west. It covers an area of 2.5 million square kilometers. It has an average depth of 1500 meters. Mediterranean Sea has the distinction of flourishing the civilizations in Greece, Rome and Egypt.

ii. **Caribbean Sea:** Caribbean Sea is bounded by West Indies Islands in the North and East, its Southern and Western margins embrace the coasts of South America and Central America respectively. Its extent is about 2.7 million square kilometers and it has an average depth of 2,647 meters.

iii. **Black sea:** Black sea is a land locked sea, located in the North of Turkey. It is also linked to the Mediterranean Sea. Its total surface area is 436,400 square kilometers. Its average depth is 1253 meters.

iv. **Arabian Sea:** Arabian Sea is the north western part of the Indian Ocean. Saudi Arabia, Iran, Pakistan and India are its bordering regions. Its surface area is 3,862,000 square kilometers. Its average depth is 2734 meters.

v. **Caspian Sea:** It is the largest water body found in the interior of the continents. Total surface area of Caspian Sea is 371,000 square kilometers. It is surrounded by Russia, Azerbaijan, Iran, Turkmenistan and Kazakhstan. Its average depth is 211 meters.

(iii) Features Related to Oceans and Seas

Sea: Seas are partially enclosed margins of the oceans; a large landlocked lake can also be termed as a sea e.g. Arabian Sea, Caspian Sea.

Gulf: Gulf is a portion of the sea surrounded by the land e.g. Gulf of Aden and Gulf of Mexico. Gulf of Aden is a Gulf of the Arabian Sea surrounded by the Horn of Africa and the Arabian Peninsula. The Gulf of Mexico is an Atlantic Gulf bounded by the United States South coast and Eastern Mexico.

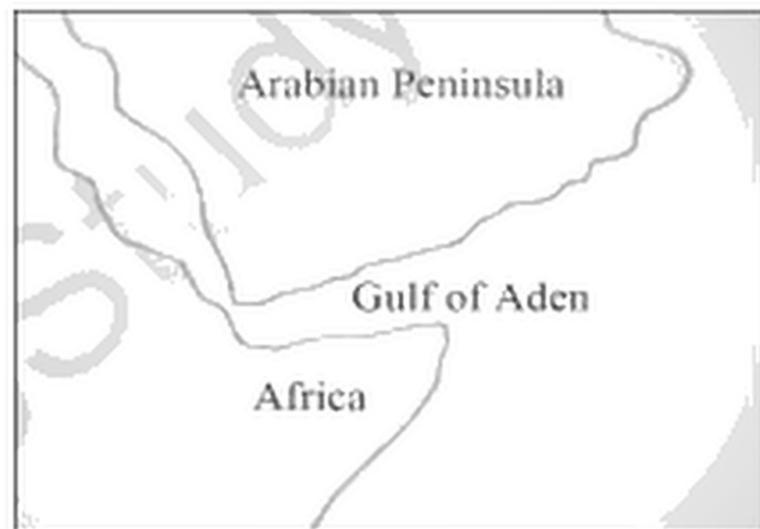


Fig. 3.3: Gulf of Aden



Fig.3.4: Bay of Bengal

Bay: Bay is a body of water partially enclosed by land but with a broad mouth e.g. Bay of Bengal and Bay of Biscay. Bay of Bengal is a North Eastern bay of the Indian Ocean bounded by India and South East Asia. Bay of Biscay is a bay of the Eastern Atlantic Ocean bordered by Spain and France.

Bight: Bight is a curve in a coastline e.g. Great Australian Bight



Fig.3.5: Great Australian Bight



Fig. 3.6: Korea Strait & Korean Peninsula

Channel/strait: Channel/strait is a narrow passage of water connecting two large water bodies e.g. Korea and Malacca straits. Korea Strait is a strait between South Korea and Japan it connects Sea of Japan and East China Sea. Malacca Strait is a strait between Malaysia and Sumatra (Indonesia); it links Indian Ocean and South China Sea.



Peninsula: Peninsula is a piece of land surrounded by water on three sides and connected to main land on one side e.g. Arabian Peninsula (South West Asia), Iberian Peninsula (South West Europe).

Island: An island is a piece of land surrounded by water on all sides e.g. Tasmania Island.

Isthmus: Isthmus is a narrow strip of land connecting two landmasses; it has water bodies on its either side e.g. Isthmus of Panama and Isthmus of Suez. Isthmus of Panama is a narrow strip of land between the Caribbean Sea and Pacific Ocean; it links North and South America. Isthmus of Suez is a narrow strip of land between the Red Sea and Mediterranean Sea; it links the continents of Asia and Africa.

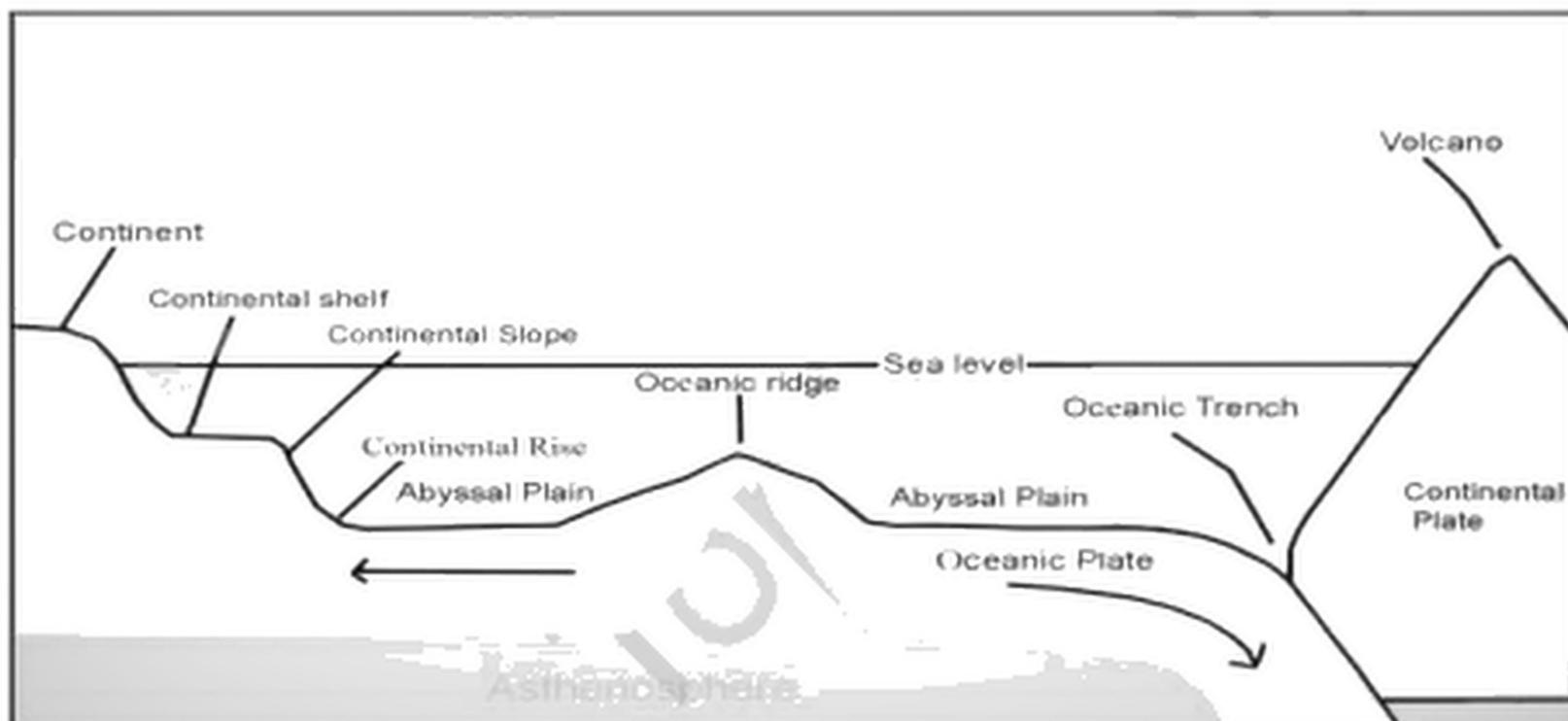


Fig.3.7: Isthmus of Panama

3.2 RELIEF OF OCEAN FLOOR

Surface under the oceans is not flat like plains, yet it is uneven and has variety of features. These features include the following;

- | | | |
|----------------------|-----------------------|-----------------------|
| i. Continental Shelf | ii. Continental Slope | iii. Continental Rise |
| iv. Abyssal Plain | v. Mid Oceanic Ridge | vi. Oceanic Trenches |





i. **Continental Shelf:** Continental shelf is seaward extension of the plains and is shallow region of the ocean. It is gently sloping towards the ocean. Its width varies in different regions. Along the hilly coastal region it is narrow and along plain coastal regions it is wide. Continental shelves possess vast deposits of sand, mud and gravels and it is also a major petroleum and fishery resource of the world. The edge of continental shelf occurs at an average depth of about 135 meters.

ii. **Continental Slope:** Towards the margin of the Continental shelf, slope begins to descend quickly this is the beginning of continental slope. The base of this steep continental slope occurs at a depth of 2000 meters. Continental slope is about 20 to 100 kilometers wide.

iii. **Continental Rise:** Continental rises are gently sloping, smooth surfaced features along the bottom end of the continental slope.

iv. **Abyssal Plain:** Beyond the end of the continental rise, lies the underwater plain known as abyssal plain. It is usually found at the depth of 3000 to 6000 meters.

v. **Mid Oceanic Ridge:** Mid oceanic ridges are the underwater mountain chains formed along spreading plate boundaries. Under the oceans spreading plate boundaries produce gaps which are filled by the materials from the asthenosphere (a semi molten layer of the mantle) to form mid oceanic ridges.

vi. **Oceanic Trenches:** Oceanic trenches are elongated depressions found on the ocean floors. They are the deepest parts of the oceans. Under the oceans they are formed along the convergent plate boundaries. Mariana Trench is the deepest oceanic trench with a depth of 10,911 meters.

3.3 MOVEMENT OF OCEAN WATER

Surface water of the oceans and seas do not remain calm and still. It experience different types of the movements. There are three types of movements of oceans and seas water.

1. Waves
2. Currents
3. Tides

(i) Waves

Waves are series of circular loop like motions of surface water of ocean. These motions are usually caused by winds.

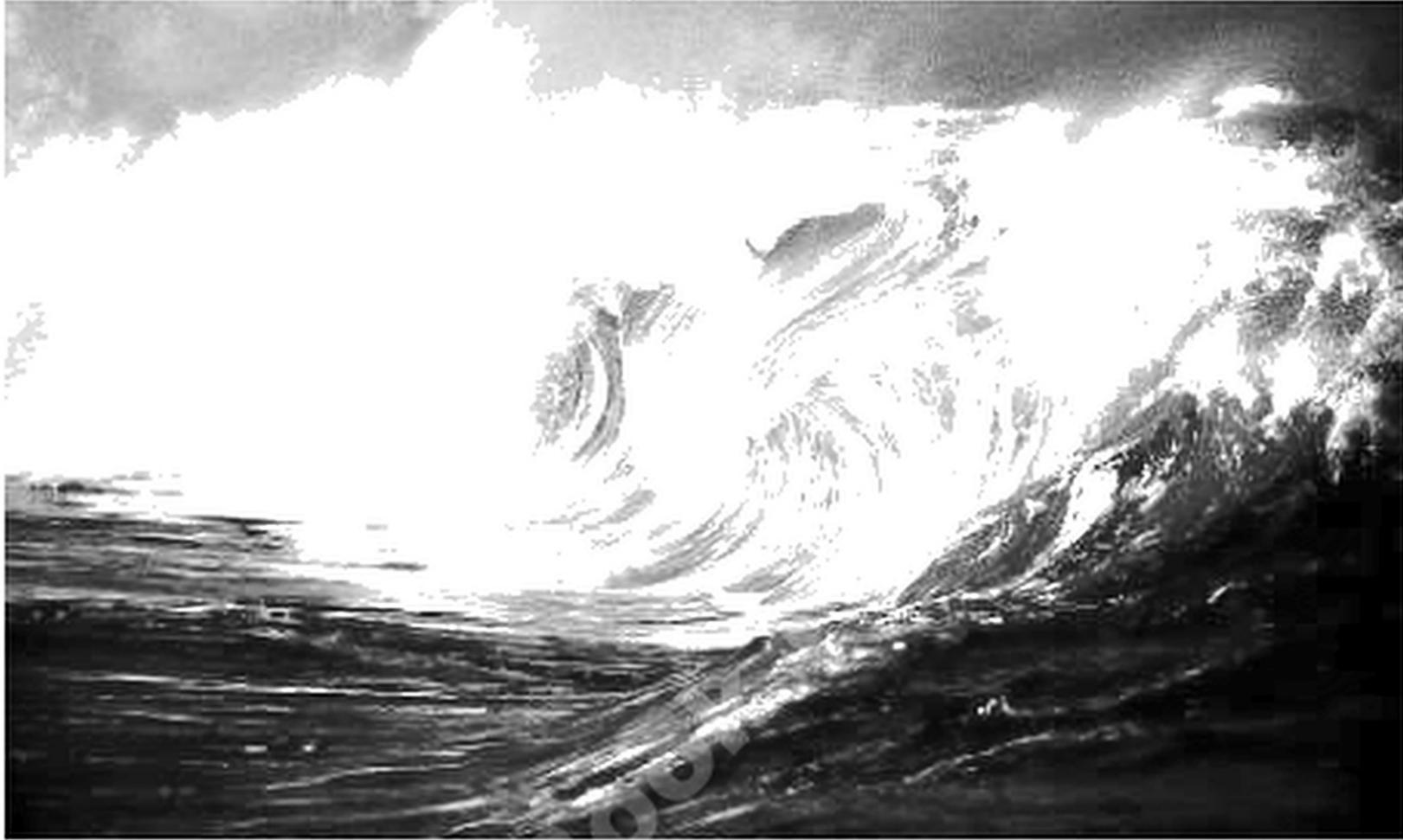


Fig. 3.9: Waves

Nature of Waves: Nature of waves refers to the types of waves. There are three types of waves i.e. wind waves, storm surges and tsunamis. Wind waves are surface waves of oceans and seas. They are born due to drifting affect of the winds. Wind waves get bigger with stronger winds. Storm surges are very high waves produced by a storm. Storm surges cause flooding in the coastal areas. Tsunamis are water waves generated by the occurrence of an earthquake under the ocean.

(ii) Currents

Surfaces of the oceans have regular channels of flowing water, which are termed as ocean currents. They also serve as channels for the movement of merchant ships across the oceans. Currents have been named after the coastal region along which they flow.

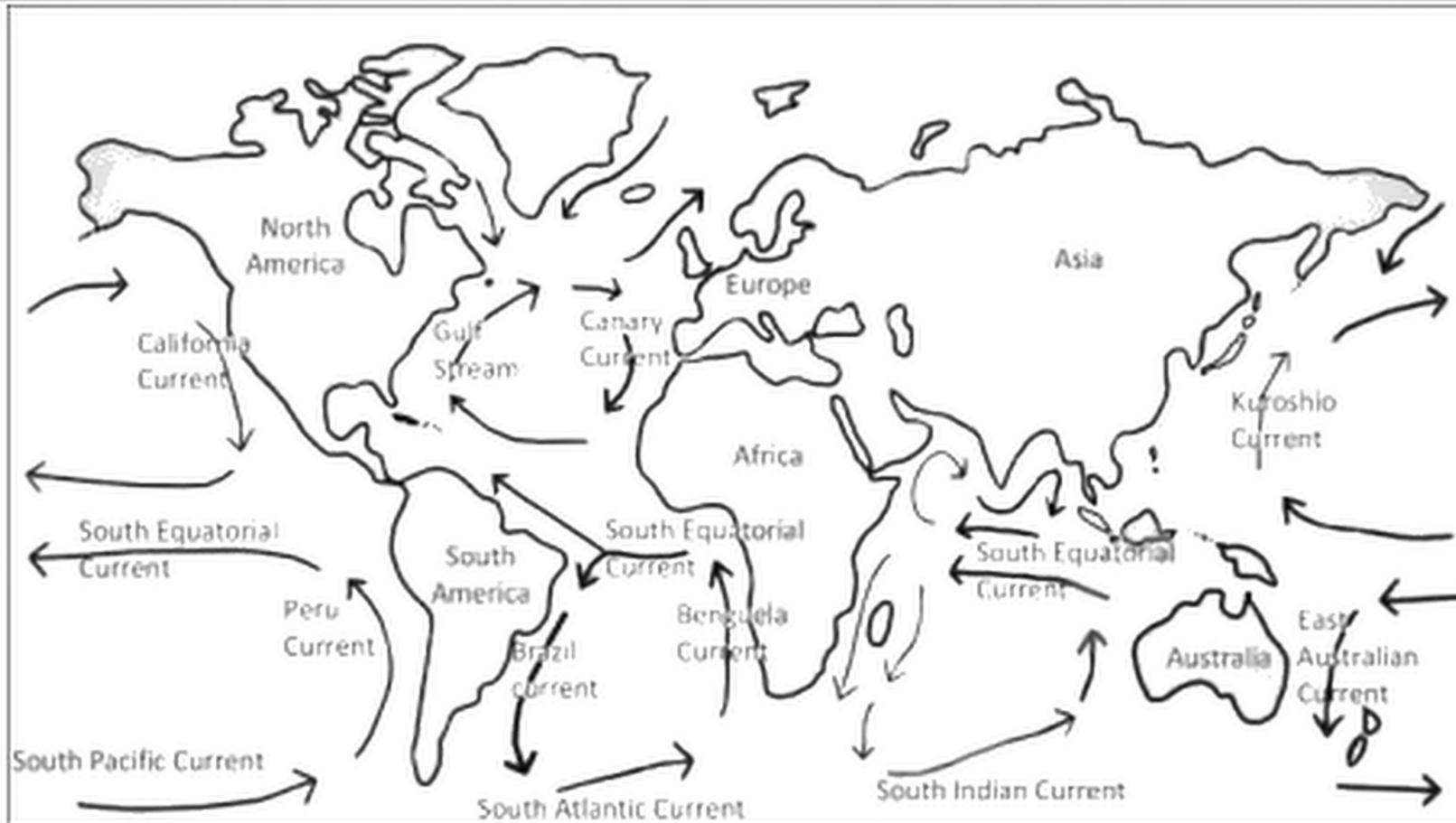


Fig. 3.10: Currents

i. **Nature of Currents:** On the basis of nature, currents can be divided into cold and warm currents:-Currents moving along the western coasts of the continents are termed as cold currents. They flow from Polar Regions towards the equator. Among the cold currents California current, Peru currents of the Pacific Ocean, Canary and Benguela current of the Atlantic Ocean are famous.

Majority of the currents moving along the eastern margins of the continents are warm currents. Warm currents move from warm equatorial regions to the cold polar area. Gulf Stream and Brazil currents are warm currents of the Atlantic Ocean whereas kuroshio and east Australian currents are major Pacific Ocean warm currents.

ii. **Causes of the Movement of Currents:** Following are the major factors which cause the ocean current movements.

- a. **Winds:** Continuous dragging affect of winds on the ocean waters tend to move water in certain directions in the form of currents i.e. in Tropical regions Easterlies drag the surface waters of the oceans to produce equatorial currents in Pacific, Atlantic and in Indian ocean.



- b. **Variation in Temperature of Ocean:** Temperature differences between polar and tropical regions of the oceans move warm tropical waters towards the Polar Regions and cold polar waters to the tropical regions in the form of currents.
- c. **Variations in Salts Concentration in Ocean Water:** There is a difference in concentration of salts in ocean water in different oceanic parts. Consequently water with high concentration of salts sinks and water with less concentration of salts rises.
- d. **Rotation of the Earth:** Rotation of the earth on its axis tends to change the direction of moving currents. In the northern hemisphere currents are deflected to their right and in the southern hemisphere they are deflected to their left due to the effect of rotation of the earth.
- e. **Continental Margins:** Continental margins are the edges of the continents. They change the direction of the approaching currents.

(iii) Tides

Tides are the rise and fall of the sea levels. Moon and Sun exert gravitational pull on the earth. This gravitational pull is easily recognizable by the rising of sea levels. Moon being a closer body to the earth has a stronger affect, than the sun.

i. **Nature of Tides:** There are four types of tides in general.

- a. Parts of the earth facing the moon and those opposite to them experience high tides. High tides occur twice a day.
- b. Low tides are located between two high tide areas. Low tides also occur twice a day.

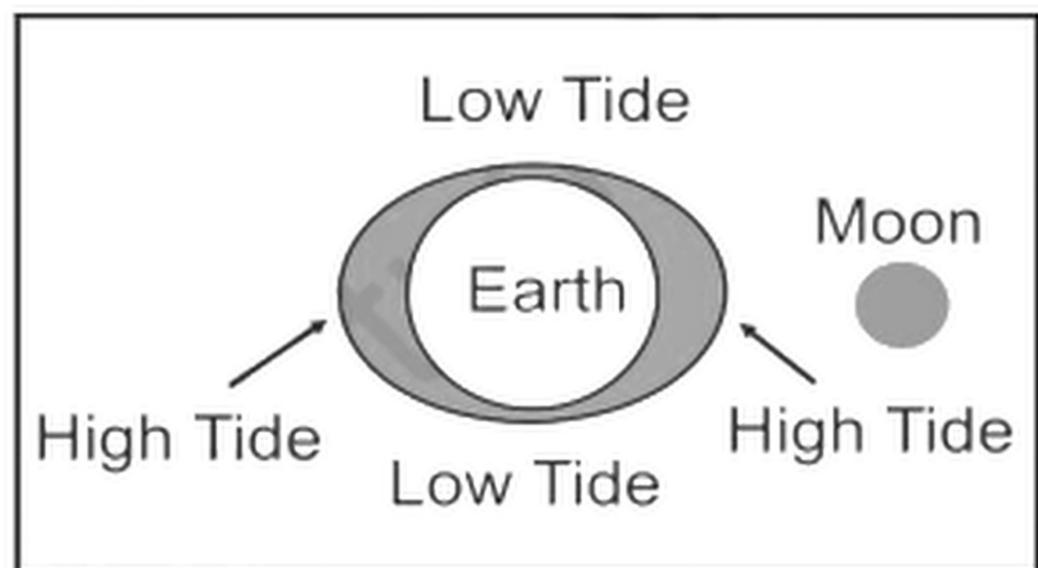


Fig 3.11: High and Low Tides



- c. Spring Tides are produced by the combined force of sun and moon at the time of full and new moon. Spring Tides have the highest of the high tide and the lowest of the low tide. The difference between high and low tides is maximum.

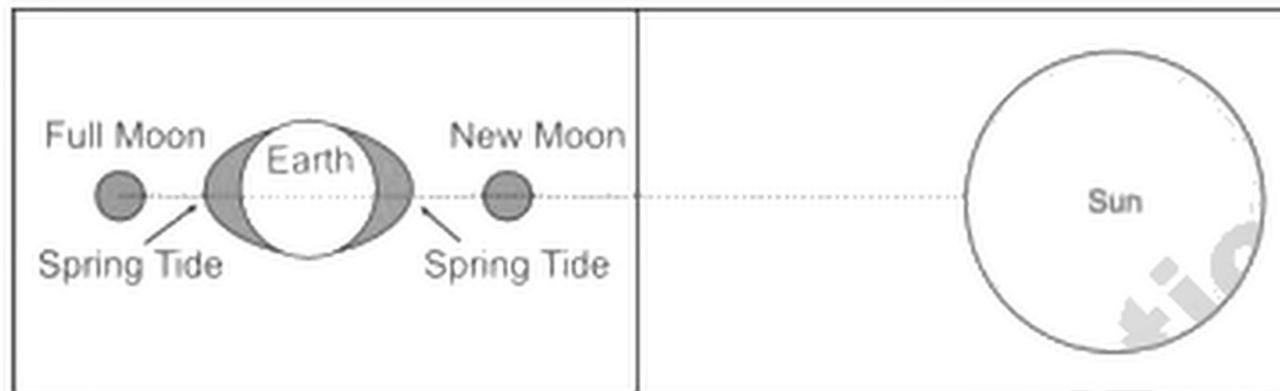


Fig. 3.12: Spring Tides

- d. Neap tides are produced when sun and moon are at right angles to each other e.g. at first and last quarter of the moon. Neap tides have lowest of the high tide and the highest of low tide. Difference between high and low tides is slightest.

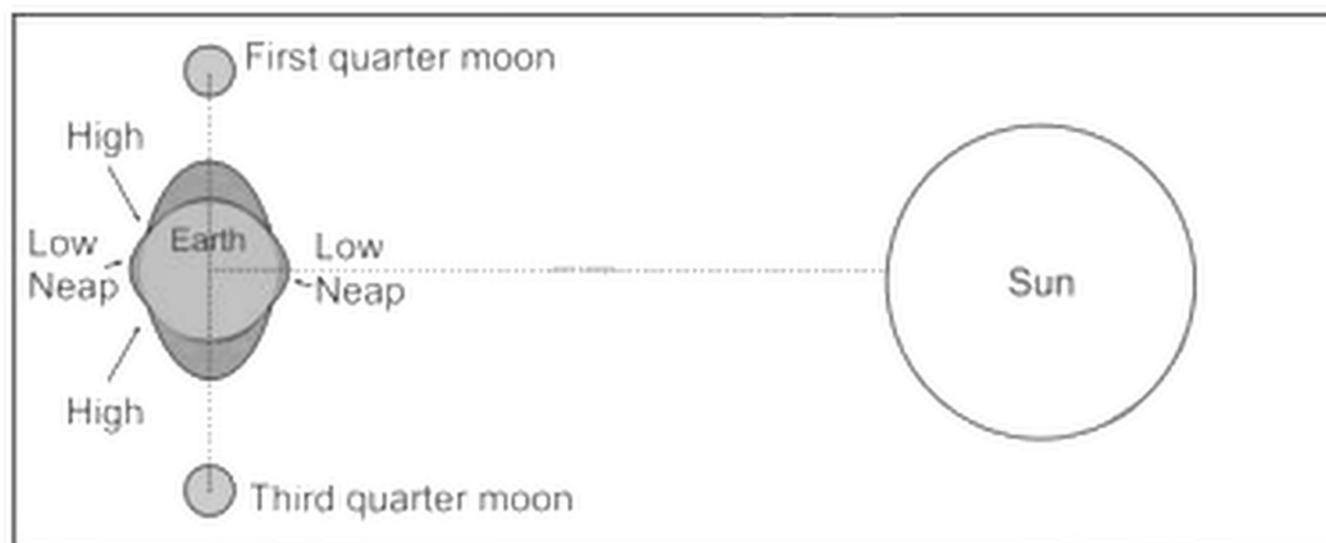


Fig. 3.13: Neap Tides

3.4 DIFFERENCE BETWEEN WAVES, CURRENTS AND TIDES

WAVES	CURRENTS	TIDES
<ul style="list-style-type: none"> Waves are series of circular loop like motions of surface water of ocean. They are produced by the winds, storms or earthquakes. 	<ul style="list-style-type: none"> Currents are the regular channels of flowing water on the surface of oceans. Currents are caused by the drifting effects of the winds along with temperature and salt concentration differences in ocean water. 	<ul style="list-style-type: none"> Tides are the rise and fall of sea levels. They are caused by the gravitational pull of the moon and sun.



Exercise

Q.1. Write answers of the following questions in detail:-

- i. Describes the main characteristics of the major oceans.
- ii. What is a sea? State some important characteristics of five major seas.
- iii. Write in detail about the relief of ocean floor.

Q.2 Give brief answers to the following questions:-

- i. What are the causes of the Ocean Currents?
- ii. What is the nature of the Ocean Currents?
- iii. What cause the Tides?
- iv. What are the Spring and Neap Tides?
- v. Differentiate among the Waves, Currents and Tides.

Q.3 Select most appropriate option among the following:-

- i. Total area of the surface of the earth covered by the water is:

A.71%	B. 72%
C.73%	D.74%
- ii. The largest ocean of the world is named as:

A. Pacific Ocean	B. Atlantic Ocean
C. Indian Ocean	D. Southern Ocean
- iii. The smallest ocean of the world is named as.

A. Atlantic Ocean	B. Pacific Ocean
C. Indian Ocean	D. Arctic Ocean
- iv. Which part of the Indian Ocean is termed as Arabian Sea?

A. North West	B. South East
C. North East	D. South West
- v. A piece of land surrounded by water on all sides is called

A. An Island.	B. A Bay.
---------------	-----------



Q. 4. Fill in the blanks with proper words.

- i. The deepest part of the Pacific Ocean is named as -----.
- ii. Average depth of Arctic Ocean is -----.
- iii. Black sea is located in North of -----.
- iv. Continental shelf is the seaward extension of -----.
- v. Mariana Trench is the deepest oceanic trench with a depth of ----- meters.

Q. 5. Mark the following statements as True or False:-

- i. Continental shelf is broad along the plain coastal regions. (True / False)
- ii. Underwater plain is termed as Abyssal Plain. (True / False)
- iii. Mid Oceanic ridges are formed along colliding plate boundaries. (True / False)
- iv. Isthmus is a wide strip of land connecting two land masses. (True / False)
- v. Spring Tides are produced by the combined force of the Sun and the Moon. (True / False)



Activities

- i. Prepare a chart to show world oceans and major seas.
- ii. Develop three dimensional ocean floor models by using clay or mud.

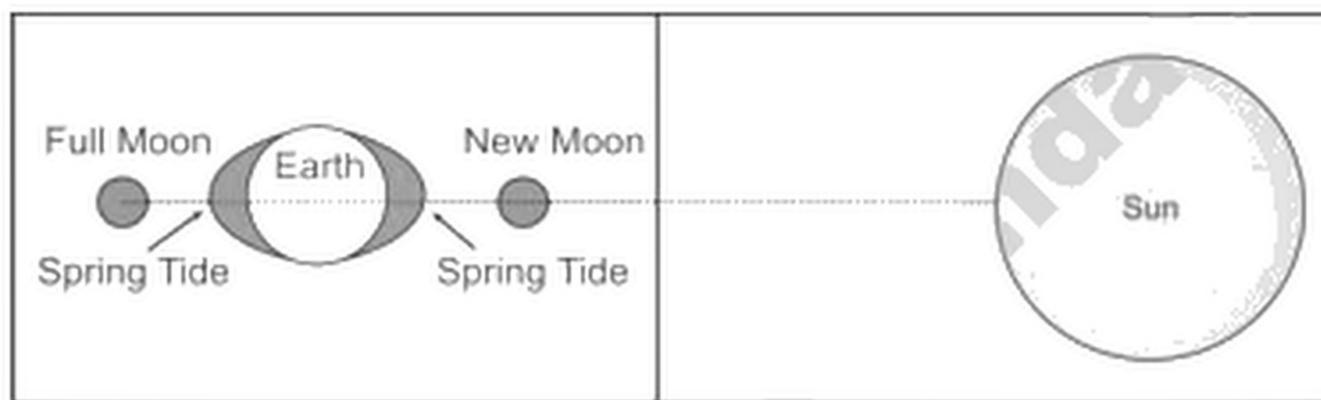


Glossary

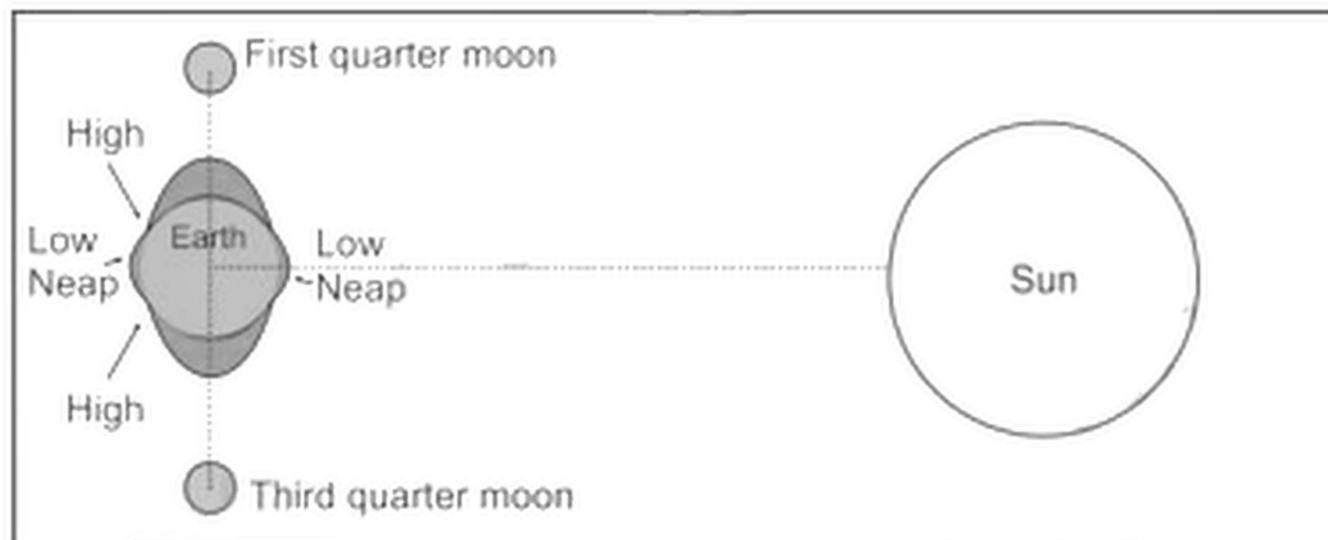
ABYSSAL PLAIN	Plain on the bed of the ocean
CONTINENT	Huge expanse of land
DESCEND	Move downward



GRAVITATIONAL PULL	Force of attraction between the bodies of the Universe
LANDMASS	Large body of land
MEDITERRANEAN	In the middle of the land
SHELF	Flat surface



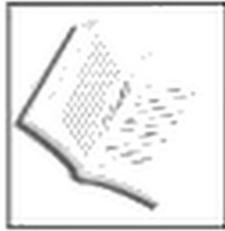
Spring Tides



Neap Tides



- For the sake of making the study of oceans meaningful, worthy teachers may use different kinds of wall maps of the world in addition to maps and figures provided in the text. World wall maps showing oceans and seas would be helping students to grasp the relative locations of oceans, seas and ocean currents. Use of Relief maps of the oceans will help students to learn about relief of ocean floor.



4

NATURAL DISASTERS



This is a 12 days lesson (periods including home work)
After completing this lesson, you will be able to:

- Discuss the natural phenomena that cause Disasters for mankind.
- Discuss the measures that can be taken to avoid desertification.
- Discuss main considerations in constructing buildings in Earthquake prone areas.
- Analyze the impact of various Natural Disasters with special reference to Pakistan.
- Examine the usual management practices including Forecast, Monitoring and Mitigation.
- List the safety measures that can be taken in case of Earthquake, Floods, Cyclones, Volcanism and Forest Fire.





Reading

Natural disasters refer to negative effects of naturally occurring phenomena. Naturally occurring phenomena affect human population, agriculture, roads and environment. Following are some of the naturally occurring phenomenon.

1. Volcanism
2. Landslides
3. Desertification
4. Floods
5. Cyclones
6. Earthquakes
7. Forest Fire

Above mentioned occurrences cause heavy losses in terms of life and property. Therefore the study of natural disasters is important for the sake of safety of human beings and their environment. In Pakistan National Disaster Management Authority (NADMA) has been mandated with the disaster management activities which include issuance of warnings, management, mitigation, prevention and provision of relief to the affected areas.

4.1 VOLCANISM

Ejection of molten rocks (lava), hot dry rock fragments and hot gases from a volcano is termed as volcanism. Different types of materials ejected during volcanism cause destructions in surrounding areas of a volcano.

Let us know the basic characteristics of volcanic materials.

- Lava flowing out of a vent of a volcano moves slowly and it can move to long distances.

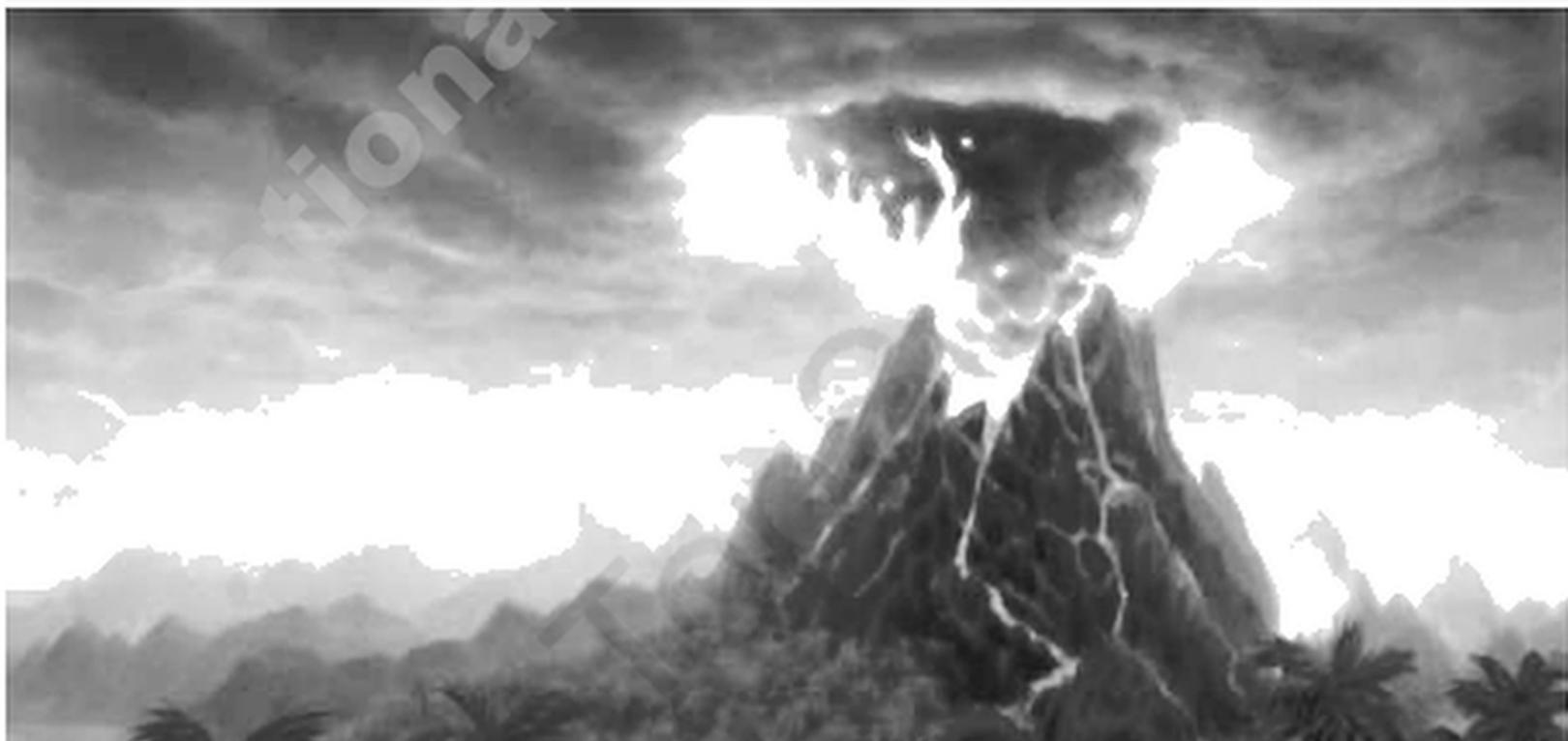




- Hot dry rocky fragments coming out of a vent of the volcano moves at a high speed.
- Fragments of lava and rocky material are termed as Tephra. During an explosive volcanic activity Tephra moves very high into the air.
- Very fine sized fragments of rocky material and lava are also blown into air during an explosive volcanic eruption. This type of material is known as Volcanic Ash; it remains suspended in the air before falling to the surface of the earth.
- Gases coming out of a volcano enter into the atmosphere.

(i) Impacts of Volcanism

Moving lava usually destroys everything coming in its way; its slow movement let people, get out of its way. Hot dry fragments move very fast, due to hotness they burn vegetation and houses. All structures and objects on the way are destroyed. Tephra endanger life and property by the force it fall to the surface of the earth. Automobile engines are damaged by volcanic ash because it can infiltrate into automobile engines. Mobility on ash covered roads become difficult in wet days. Gases added to the air by a volcanic activity cause difficulties in breathing. Impacts of volcanic activities are commonly observed in Japan, Philippines etc. However in Pakistan, volcanic activities are very rare.





(ii) Safety Measures

Following safety measures should be followed to save life and property in volcanic risk areas.

- Follow the instructions issued by the authorities.
- Avoid the areas suspecting the flow of lava.
- Stay indoor during a volcanic activity.
- Wear full sleeve shirts and protect eyes by putting on goggles.
- After a volcanic eruption keep your mouth and nose covered by a mask to protect the respiratory system from the volcanic ash.
- Immediately remove ash from house tops to avoid a house collapse.

4.2 LANDSLIDES

Landslide is down slope movement of large masses of rock and soil under the gravitational pull of the earth. This movement of material may take place in the form of fall, slide or flow.



Fig 4.2: A Landslide

Landslides are usually initiated by heavy rains, by an earthquake or by a volcanic activity. Human activities like cutting of rocks along the steep slopes for the sake of construction of roads and settlements also cause landslides.

Landslides are significant natural disasters in Northern and Western mountainous regions of Pakistan.



(i) Landslide Mitigation

Following measures are necessary to reduce the severity of the landslide effects.

- Construction must be discouraged in landslide areas particularly along the steep slopes.
- Surface drainage may be controlled.
- Retaining walls may be constructed along steep slopes to enhance stability of the slope.

(ii) Impacts of Landslides

A landslide usually affects everything coming under its way; particularly it affects roads and houses. Sometimes a landslide may block a stream to form a lake. They cause to damage roads, water channels and settlements particularly in rainy days. They are a threat to life and property.

(iii) Safety Measures

One should have sound information about landslide areas particularly before travelling into such areas. Knowledge of landslide symbols would be of good use. Avoid travelling in landslide areas before and after rain.

4.3 DESERTIFICATION

Desertification is the process by which soil become infertile. Productivity of soil is reduced and it becomes barren.



Fig 4.3: A Desert



(i) Causes of Desertification

Basic reasons of desertification include both climatic changes and human activities. Areas lying adjacent to the deserts having rainfall less than 500 mm have high chances of becoming desert. Other important reasons are overgrazing by the animals, removal of vegetation for fuel wood, construction material or human settlements.

(ii) Desertification in Pakistan

More than 80 % of Pakistan is arid, Pakistan largely depends on agriculture. Expanding settlements, flourishing industries and cutting of forests for agriculture increase the desertification.

(iii) Measures to Check Desertification in Pakistan

Pakistan is required to take some immediate steps to protect itself from the threat of desertification. Following measures can help to check the process of desertification.

- Over use of the soil must be stopped and crop rotation should be ensured to revive the strength of soil.
- Population increase must be controlled.
- Expansion of settlements should not be done at the cost of vegetative cover and cultivable land.

(iv) Impacts of Desertification

Desertification reduces the ability of soil to produce and support population. Plant cover is reduced and resultantly soil fall a victim to wind and water erosion. Most importantly rainfall is decreased.



4.4 FLOODS

Flood is an overflow of large amount of water beyond its normal limits; it submerges a normally dry area. Basic reasons of floods include excessive rains and overflowing of rivers. Moreover floods may be caused by earthquakes and tsunamis.

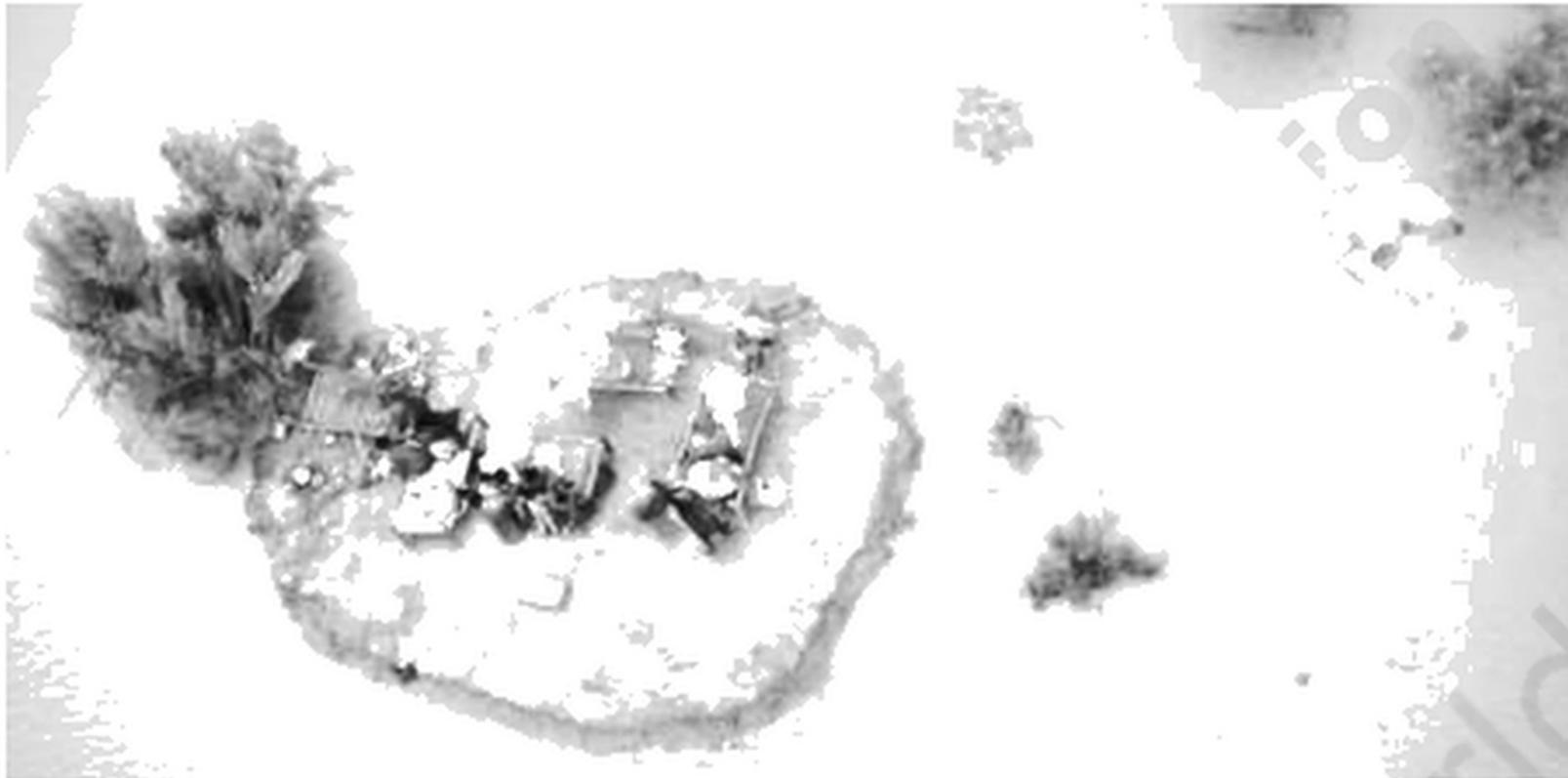


Fig.4.4: Flood

There are four types of floods with reference to nature of occurrence.

- i. **Flash Floods:** Flash flood is a sudden inundation of a normally dry area due to heavy rain or a dam / levee failure.
- ii. **Riverine Flooding:** Riverine floods are caused by spreading of river water out of its normal limits.
- iii. **Coastal Flooding:** Floods in a coastal area are caused by storm surges and tsunamis. A storm surge is rising of sea level due to a storm and a tsunami is a high sea wave caused by an earthquake.
- iv. **Urban Area Flooding:** Flooding in plain urban areas is caused by overflowing of drain-water during heavy rains.

(i) Impacts of Floods

Floods are the leading natural disaster in Pakistan. They occur almost every year and cause the loss of life and property in the country. They affect large



number of people but they cause less life losses than earthquakes. Life losses of both human beings and animals are due to drowning.

Flash floods are sudden and fast in nature therefore they destroy both life and infrastructure. Riverine floods move slowly. Riverine flood water weakens the foundations of the buildings. Other impacts of the Riverine floods include destruction of crops and widespread epidemics.

Heavy rains and riverine floods hit Pakistan in August 2013. National Disaster Management Authority (NDMA) on August 20, 2013 released figures which stated that August 2013 floods have killed 118 people and left another 812 injured across Pakistan. These floods have damaged 27,847 houses and 412,083 acres of ready crops. Moreover it stated that overall number of people and villages affected by these floods stood around 544,439 and 1,746 successively.

(ii) Prevention and Safety Measures

Following are the measures to prevent a flood and to protect life and property in case of a flood.

Measures to prevent a flood:-

- Construction of flood control dams, dikes and levees along the river channels.
- Plantation of trees on steep slopes would be helpful in controlling floods.
- Provision of better drainage facilities in urban areas to drain sewerage and rain water.

Measures to protect life and property:-

- In case of a flood warning immediately shift costly belongings to the higher places. Drinking water may be stored in suitable containers. Documents and medicines may also be secured. Electricity connections may be disconnected.
- During a flood never try to cross flowing water, find secure and high places for a shelter. Vacate low lying areas. Stay away from power lines. In case someone is drowning throw something like a tire or a wire to rescue him instead of jumping into water.



- After the flood is over do not return to the buildings until they are not declared safe by the authorities. Use sturdy shoes to protect feet from injury.

(iii) Management Practices

- Forecasting:** Flood forecasting is provision of advance information about the occurrence of excessive rains and overflowing of rivers. This information has a time span from few hours to few days.
- Monitoring:** Satellite images of flood areas help authorities to cope with the flood situation. Wide areas images obtained from the satellites provide information for proper monitoring of flood. It can be interpreted to know the intensity areas and areas going to come under the flood and those which are safe now.
- Mitigation:** Mitigation of floods involves the control of flood water and redirecting its movement through construction of flood gates or flood walls.

4.5 CYCLONES & HURRICANES

Cyclone is a wind system that revolves around a central low pressure area. Low pressure area originates due to intense air temperature and due to ascent of warm air above the ground. Winds from the surrounding high pressure areas rush towards the low pressure area and acquire a spiraling motion on account of rotation of the earth.

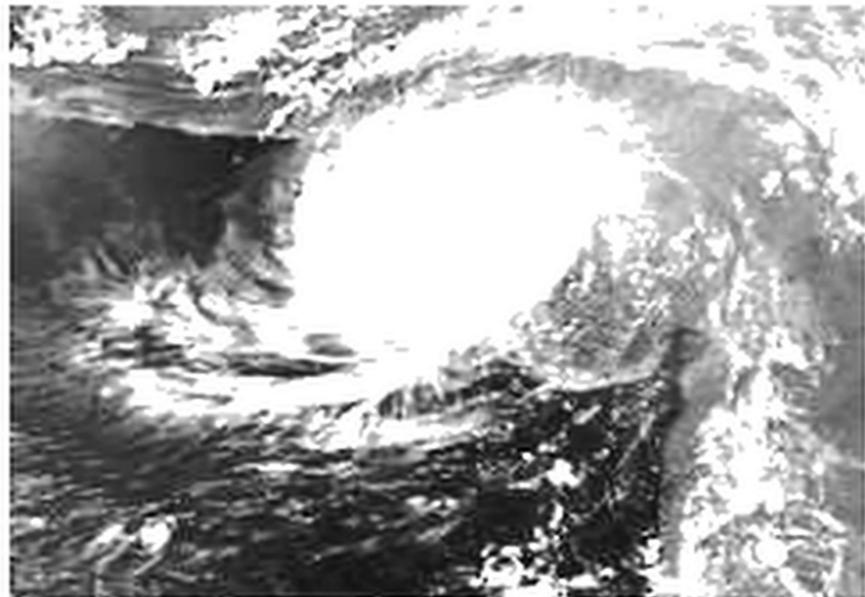


Fig. 4.5: A Cyclone

Thus a tropical cyclone is developed. Ascending air in the cyclone causes to produce heavy rains.

In the Northern Hemisphere system turns anti clock wise whereas it turns clockwise in Southern Hemisphere.

Cyclones and hurricanes are the same - just in different hemispheres - cyclone/southern - hurricane/northern: by convention cyclones get female names and hurricanes get male names.



(i) Impacts of Cyclones

Basic affects of the cyclones include heavy rains, stormy winds and large storm surges. Rains from the cyclones cause mud slides or landslides in hilly areas, whereas cyclonic rain disrupts transportation and communication system along with destruction of infrastructure.

Indian and Arabian oceans have witnessed three cyclones in 2014 including Nanak, Hudhud and Nilofar, But Nilofar is the one which affected a wider stretch of Pakistan's coast. The previous two caused only moderate showers in Balochistan's coastal belt, The name 'Nilofar' was suggested by Pakistan in 2010 during a regional meeting with India, Sri Lanka, Bangladesh, Myanmar and Thailand.

(ii) Safety Measures

- Before the approach of cyclone in your area, collect loose materials that can be blown up by the air and can hit anyone. Get to the safest part of the house. Switch off the electrical appliances.
- In case there is a chance of damage to the building due to intense cyclone cover yourself with mattress or rug and get under strong tables.

(iii) Management Practices

a. Forecasting: Forecasting provide advance information about the track of cyclone, intensity of rain, chances of storm surge and areas to be affected by the cyclone. Satellite imagery is used to know about the characteristics of the clouds in the cyclone and the rain they can yield.

b. Monitoring: Information from the satellites in form of satellite imageries help to monitor the track of the cyclone and to take appropriate measures to reduce the disastrous effects.

c. Mitigation: Mitigation means the measures taken in advance or before the strike of a cyclone to protect life and property. It particularly includes construction of such buildings which can withstand the stormy winds and storm surges.



4.6 EARTHQUAKES

Earthquake is shaking or vibration of the earth surface. This process usually takes place along the plate faults or lithospheric plate boundaries. Earthquakes are the kind of disasters that occur all of a sudden.



Fig.4.6: A View of Destruction caused by an Earthquake

(i) Impacts of Earthquakes

With respect to the natural disasters in Pakistan, earthquake occurrence is 2nd to the floods. Earthquakes cause less economic losses than floods, but they are leading natural disasters in terms of deaths.

DISASTERS	DEATHS	ECONOMIC LOSS
Earthquake 2005	75000	6 million US dollar
Flood 2010	About 2000	43 billion US dollar

Table: 4.1: Information about earthquake 2005 and Flood 2010 in Pakistan

Earthquakes cause heavy losses of both life and property. Sudden occurrence of earthquake damage the infrastructure, buildings and the people



caught inside the buildings face the fatal casualties and some time they cost lives. Destruction of buildings, roads, railway lines and communication network inflict heavy economic losses.

(ii) Safety Measures

During an earthquake following safety measures, help to save precious lives.

- If you are inside the home during an earthquake, then stay home and find some safe place like door frames, table or bench to take shelter.
- If intending to leave home do not use elevator.
- If you are out of the home at the time of an earthquake stay away from the buildings, walls or power lines.

(iii) Considerations in Constructing Buildings In Earthquake Prone Areas

Level and solid places must be chosen for construction of buildings. Buildings must be reinforced both horizontally and vertically. Roofs must be kept light weight and well connected with the infra structure.

(iv) Management Practices

a. **Forecasting:** Earthquake forecasting is not possible due to limited availability of the knowledge about the processes that cause Earthquake far below the surface of the Earth.

b. **Monitoring:** It involves the processes of locating the focus, epicenter and measuring the magnitude of an Earthquake with the help of seismic waves.

c. **Mitigation:** Mitigation is the strategy to take measures in advance to lessen the damages in the wake of an earthquake. Construction of buildings that can bear the shocking waves of an earthquake and educating the people how to react during and after an earthquake would be of great use in reducing the losses in case of an earthquake.



4.7 FOREST FIRE

Forest fire refers to the uncontrolled fire fueled by the natural vegetation.



Fig.4.7: A View of Forest Fire

Conducive conditions for the forest fires include high temperature and dry air. Human carelessness like throwing burning cigarette in fire risk area or lightning may initiate the forest fire.

Once forest fire is initiated it spreads because of the presence of dry leaves, branches and logs. High temperatures, dryness and absence of rain also cause it

to spread. Most of the time forest fires are initiated by human errors.

(i) Impacts of Forest Fire

Forest fires inflict a serious affect on environment and economy of a country in a variety of ways. During the forest fire huge amount of carbon dioxide is added to the air, this addition of carbon dioxide to the air is type of atmospheric pollution which leads to global warming. Absence of forests causes floods and soil erosion. Most of the forest animals are killed, many lose their habitats. Forest products like wood and medicinal plants become scarce. Tourism and recreational activities cease to exist.

Margalla, Murree and Nathia Gali forests in Pakistan remain susceptible to forest fire with the advent of summers in Pakistan. Forest Fires in these areas sometime burn very precious trees.

(ii) Safety Measures

Responsible behavior is required to be adopted to avoid the forest fires. Lighting fire in the fire risk area should be prohibited. Those who go for travelling, hiking, or camping in fire risk areas should be given special training. Dry materials like dry grass, logs and branches must be removed from such areas on regular basis.



Exercise

Q. 1. Write answers of the following questions in detail:-

- i. What are the various types of volcanic materials that cause widespread destruction?
- ii. What is a landslide? Discuss the measures to mitigate the landslide affects.
- iii. What is desertification? Discuss the measures to check desertification in Pakistan.

Q. 2. Give brief answers to the following questions:-

- i. What are flash and Riverine floods?
- ii. Give measures to prevent floods.
- iii. Which safety measures can help to save lives during an Earthquake?
- iv. Describe effects of floods in Pakistan.
- v. Mention some impacts of cyclones.

Q. 3. Select most appropriate option among the following:-

- i. Moving lava usually destroys

A. Only automobiles	B. Only buildings
C. Everything	D. Only trees
- ii. Landslide is down slope movement of

A. Large masses of rock	B. Air
C. Water	D. lava
- iii. Areas adjacent to deserts have high chances of

A. Floods	B. Desertification
C. Snowfall	D. Lava flows
- iv. Percentage of arid area in Pakistan is

A. 10 %	B. 30%
C. 80%	D. 60%



v. In terms of economic losses leading natural disasters in Pakistan are

- | | |
|----------------|---------------|
| A. Floods | B. Landslides |
| C. Earthquakes | D. Cyclones |

Q. 4. Fill in the blanks with proper words.

- i. Earthquakes occur all of a -----.
- ii. Forest fire refers to the uncontrolled fire fueled by the -----.
- iii. Most of the time forest fires are initiated by ----- errors.
- iv. Increase of carbon dioxide cause -----.
- vi. A storm surge is ----- of sea level due to a storm.

Q. 5. Mark the following statements as True or False.

- i. Gases coming out of a volcano enter into the atmosphere.
(True/False)
- ii. Do not cover your mouth and nose with mask after a volcanic activity.
(True/False)
- iii. In a flood condition water does not flow out of its normal range.
(True/False)
- iv. Basic affects of the cyclone include heavy rains, stormy winds and large storm surges.
(True/False)
- v. A tsunami is a high sea wave caused by an Earthquake (True/False)



Activities

- i. Gather newspaper cuttings stating the impacts of recent Flood in Pakistan.
- ii. Prepare charts highlighting safety measures for different Natural Disasters.

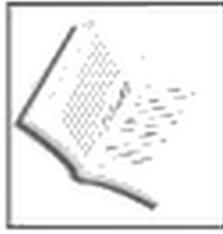


Glossary

DISASTERS	Events causing great damages
FRAGMENTS	Pieces
INFRASTRUCTURE	Basic physical structure
MONITORING	Keeping a check on something
MITIGATION	Action of reducing the severity of something
OVERGRAZING	Excessive grazing of plants
SETTLEMENT	A place where people establish a community
URBAN	Relating to a town or city



- Teacher may start the chapter with a discussion and narration of different Natural disasters experienced by him/her or by the students. This will involve the students in the topic; they will become interested in the Natural Disasters, their impacts and safety measures. Moreover a discussion about mountains, plains, deserts and forests will help students to identify the disasters occurring in different areas.



5

MAJOR ENVIRONMENTAL PROBLEMS



This is a 10 days lesson
(periods including home work)
**After completing this lesson,
you will be able to:**

- Define an Environmental Problem.
- Identify the causes for various Environmental Problems.
- Describe the impact of various Environmental Problems on life.
- Describe the nature and causes of Global Warming and evaluate its impact on life.
- Describe the Greenhouse Effect.
- Recommend solutions to avoid Environmental Pollution.



Reading

Wherever we live, our immediate natural or physical surrounding is our environment. It comprised of atmosphere (the gaseous portion), lithosphere (the solid portion), hydrosphere (the water portion) and people, plants and animals all live in a balance. This is our environment which affects us and is being affected by us since ages.

The Industrial Revolution began in 19th century with rapid industrial development in Europe and other parts of the world. This was followed by rapid growth of population. Its concentration in towns and cities led to development of industries, modernization of communication and transportation. Thus began a rapid use of earth resources



Environmental Problem

All living beings are using the resources of the earth. In doing so; in most cases they change or add something into the environment. Addition or change in the environment both by man and by nature, can cause direct or indirect danger to the life of humans, animals and plants. In other words, any addition of stuff by any means into the air, water, soil, food and to our immediate surroundings that threatens or harms the health and survival of living organisms, is known as an environmental problem.

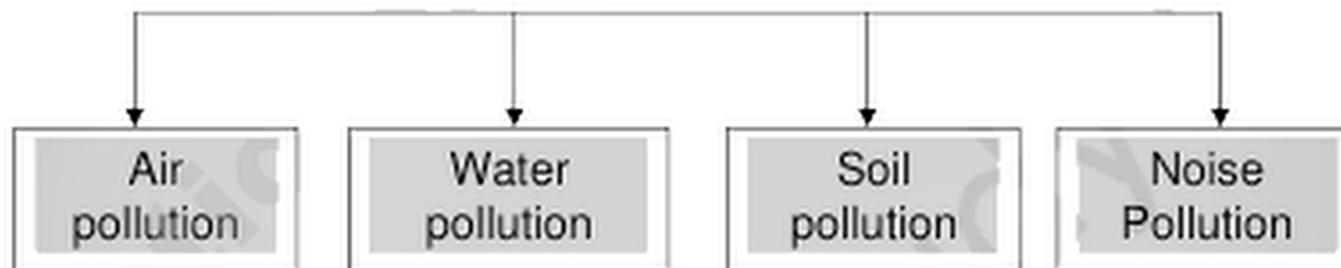
There are two major sets of environmental problems:

1. Pollution
2. Global Warming

5.1 POLLUTION

Pollution refers to all unhealthy changes that are occurring in our environment, and have a direct negative effect on life. Addition of anything which brings change in the quality of water, air, soil or food and threatens the health, survival or activities of man or other living organisms is called pollution. In other words impurity caused by human activities in the water, air, soil or food which directly or indirectly damage activities, health and survival of all living organisms is called pollution.

Following are the major types of pollutions and we shall study each separately:



i. Air Pollution

Definition: Due to human and natural actions air becomes un-clean, dirty, smoky and unhealthy for human breathing, having some unpleasant smell. It is called air pollution.

Air pollution is one of the most widespread forms of pollution in the world especially in developing countries like Pakistan. In Pakistan, air pollution as an



environmental problem, is present in cities like Karachi, Lahore, Faisalabad, Multan and Islamabad.

Causes: Air pollution can be caused by natural and human activities. In nature, during volcanic eruption, ash and various gases mix with the air. Similarly the forest



Fig.5.1: Smoke Rising from a Brick Kiln

fire is also responsible for the air pollution. Dust, soil particles and smoke are added in atmosphere and pollute the air.

Today, transportation and industries are major human sources of air pollution. Automobiles like, trucks, buses, cars, motorcycles, trains, ships and brick kilns (Fig.5.1) release significant quantities of

CO₂ and other harmful gases. Due to population growth more vehicles are used and smoke is released which ultimately become part of the city's environment. Similarly coal and petroleum products are also used in thermal electric power plants and industries which emit harmful gases in the air and pollute it (Fig.5.2).



Fig.5.2: Smoke from a Factory Chimney

Impacts: There are many harmful effects of air pollution in our atmosphere. Air pollutants are harmful for human, animals and plants. Air pollution directly and indirectly affects human health. It can cause diseases like asthma, sore eyes, bronchitis, lungs cancer, headache, dizziness, and cough. Air pollution also reduces visibility which could be

dangerous during driving. Similarly cigarette smoking pollutes the air and affects people's health.

Solutions/Measures: The following measures can be taken to reduce the impacts of air pollution;

- Factories should be constructed far away from the residential areas.



- Better use public transport and cycle for travelling.
- Planting more trees can be helpful to reduce air pollution. Trees bring balance by producing Oxygen and consuming Carbon dioxide.
- We should save fossil fuel energy resources to reduce air pollution.
- Environmental awareness campaigns should be launched.

ii. Water Pollution

Definition: Water pollution appears when there is a change in the physical, chemical or biological properties of water. This in turn brings change in the quality of water that makes it poisonous.

Causes: The major causes of water pollution are industries (Fig.5.3) and population increase. Almost all the industries use water in one way or the other during their production. Thus water disposed of by the industry is polluted water. Similarly sewage (waste water from drains, toilets, washing machines and showers) is also a major source of water pollution.

Other causes of water pollution are: (i) Soil erosion which adds mud into the water.(ii) Landslides are also responsible for water pollution in nearby river or lake.(iii). Pipes, sewers or ditches from factories or sewerage treatment plants discharge their waste in fresh water streams, lakes or rivers. (iv).Ground water pollution is due to irrigation, industrial waste. (v). Leakage of gasoline and septic tanks. (vi). Industrial waste also add poison to underground water table which pollutes drinking water.

Impacts: Water pollution causes many harmful diseases. Many people drinking impure drinking



Fig.5.3: Chemical are Added into Water



Fig.5.4: Polluted Water

The Indus River Dolphin is one of the world's rarest types of dolphin found in rivers. Its existence is in danger. The river water is getting polluted day by day. Government of Pakistan and WWF (Wild world Fund) staff is struggling to save this rare mammal.



water get diseases like cholera, diarrhoea and gastro-intestinal diseases, intestinal diseases. Pakistan is one of those developing countries where most of the population does not have clean drinking water. In industrial areas toxic water is



Fig.5.5: A dead Indus River Dolphin



Fig.5.6: A Seagull in Oil Polluted

released into nearby streams, wells, rivers, lakes and oceans. It kills aquatic life, fish, crabs and the Indus dolphin (Fig.5.5) etc.

Crops, vegetables, fruits and plants irrigated by these polluted streams or rivers become poisonous for human health. Polluted water creates gastro-intestinal disorder and skin problems. Addition of oil in an ocean immediately kills aquatic organisms. Oil floating at ocean surface coats the feathers of birds and fur of mammals. It ultimately kills them (Fig.5.6)

Solutions/Measures: Water pollution can be reduced in following ways:

- No factory be allowed to discharge its waste water into the streams/canal, rivers or in to the sea without treatment.
- There should be lesser use of pesticides and fertilizers on crops. This will reduce the runoff pollutant material into nearby water sources.
- Water should be conserved by turning off the tap when not required. This helps to reduce water shortages and minimize the amount of contaminated water that needs treatment.
- We should not throw litter into rivers, lakes or oceans. It is always good to throw the litter into bins.



iii. Soil Pollution

Definition: Any of the liquid, solid or gaseous material, which changes the quality of soil, its composition or appearance that affects plants, crops and micro-organisms is called soil pollution.

Causes: Soil pollution occurs when chemicals, both in solid or liquid forms are released from industries. In many cases the factories produce harmful chemicals as by products. This is thrown or dumped in nearby areas. Slowly it is added into the underlying soils. Agriculture chemicals, fertilizers and pesticides remain in the soil by seeping for many years. Any use of that defective soil can be dangerous for human beings.

Impacts: A number of soil pollutants entering into surface water, ground water and air, ultimately harms the human being in a number of ways.

The main soil pollutants are: salts, petroleum products, heavy metals, agricultural fertilizers, spray etc. There are other sources of soil pollution too. For example, spilling and leakage of underground storage tanks of harmful chemicals. Salinity also makes soil unfit for growing crops. With decrease in agriculture produce; humanity will suffer.

Solutions/Measures:

- There should be system of proper disposal of waste. One must not throw the litter on ground which ultimately pollutes the soil.
- Dumps of waste material should be far away from residential areas.
- There should be less use of pesticides and insecticides in agricultural activities.
- Environmental awareness campaigns make people, especially the farmers aware of harmful effects of soil pollution from harmful effects of soil pollution and chemicals thrown by factories.

iv. Noise Pollution

Definition: When any sound becomes loud, irritating to ears and harmful for functions and structure of ears, it is called noise pollution. The sound is one of the signs of life. When it becomes louder, it results in physical or mental harm to human



beings. There is a particular limit of sound, which is naturally bearable. When sound is too loud, it becomes noise and ultimately noise pollution.



Fig.5.7: Residences near an Airport Experience Noise Pollution.

Causes: All kind of vehicles like motorbikes, trains, trucks, rickshaws, buses are sources of noise pollution on the roads and for people living in nearby areas. People living near airports also face noise from flying jet planes (Fig.5.7). Similarly residents living near a railway track are also victim of noise pollution. At home, televisions and music system are responsible for noise pollution when the volume of sound is kept high.

Impacts: Noise pollution is actually a slow poisoning for human nerves. It has long lasting psychological impacts on human behaviour in the form of irritation, aggressive mood, anger and discomfort of sleep. It leads to deafness, hypertension, headache, increased heartbeat, nerves stress and tension.

Solutions/Measures:

- Proper noise silencers should be used in vehicles.
- There should be less use of horns especially near the residential areas.
- Industries, airports and major bus terminals should be constructed far away from the residential areas.
- Schools, colleges and university areas should be in silence zone.

5.2 GREEN HOUSE EFFECT

Atmosphere contains gases like carbon dioxide, methane, nitrous oxide and water vapour. They are termed as greenhouse gases. These greenhouse gases are transparent to some of the radiation from the sun to the earth but they block some radiations which are reflected from the Earth and retain them in the atmosphere by absorbing or diverting them. This absorption of radiation makes the



atmosphere warm. The process is termed as greenhouse effect. If greenhouse gases do not retain heat in the atmosphere, the earth would be a very cold planet. (fig.5.8).



Fig.5.8: The process of Green House Effect

5.3 GLOBAL WARMING

The term "Global Warming" refers to an increase in average global atmospheric temperature.

i. Nature and Causes of Global Warming

Global warming, that is an increase in normal atmospheric temperature is mainly caused by the increase in the amounts of greenhouse gases in the atmosphere. Human activities like forest cutting and burning of fossil fuels i.e Petroleum, Natural gas and Coal are responsible for their addition in the atmosphere.

Increase in greenhouse gases slows the natural heat outflow into the space, by retaining more amount of outgoing radiation than normal, causing increase of the atmospheric temperature. Global atmospheric temperature thus continues to rise from the normal, leading to global warming. Global warming has caused an increase of 0.8 degree Celsius in normal temperature during the last century.



Impacts of Global Warming: The Greenhouse effect has a number of impact son all of us. Some of these are noted below.

- The average temperature of the earth's surface will increase between 3°C to 5°C in a couple of decades, if the addition of greenhouse gases continues at the present rate.
- Ice will melt from the Antarctica as well as from valley glaciers of Himalayas, Karakorum and Hindu Kush mountains. It will increase the global sea level up to 20 cm by the year 2030. Due to increase in temperature more evaporation will take place and we are likely to have more rainfall in many parts of the world.
- Likewise many areas of the world will also experience less or even no rain at all. Thus cultivation of crops will be reduced.
- The plants and animals are more likely to be the victims of global warming. Due to rise in mean temperature on the earth's surface, some species (plants and animals) may get benefit and some might be at loss.
- Due to change in temperature many cropping areas will shift northward or southward in order to follow their needed temperatures.
- Some diseases/epidemics will spread among human population groups. Malaria and Dengue fever carried by mosquitoes may cause massive loss of human lives in new areas.

5.4 HOW TO AVOID ENVIRONMENTAL PROBLEMS?

All types of pollution and related issues are found around us. As an individual and a community; we can avoid or minimize the harmful impacts of environmental problems. For this, people should be educated about the types and forms of environmental problems through education and mass media campaign. Environment friendly and energy efficient vehicles should be used. Use bicycles and public transport must be promoted instead of personal cars to move within a city. Instead of using fossil fuels as energy resource, we should use other sources like solar, wind and hydroelectric power.



People should be encouraged to adopt the slogan "Drive less and Walk more". Tree should be planted where ever open/vacant land is available in order to reduce pollution. Also grow trees as noise barriers/sound shields along heavily travelled highways. One should always use filtered and properly boiled water for drinking. Drivers should restrict the use of pressure horns on busy city streets, sirens and other noisy devices to reduce noise pollution. People who do not follow or adopt the necessary measures should be fined or given punishment through legal ways.

**Exercise**

Q. 1. Write long answers of the following questions in detail:-

- i. What do you mean by an Environmental Problem?
- ii. Highlight various causes of Environmental problems?
- iii. Describe the causes of Global Warming and evaluate its impact on life.

Q. 2. Write short answers of the following questions:-

- i. What is air pollution?
- ii. Write a short note on water pollution.
- iii. How noise pollution affects our life, Explain briefly.

Q. 3. Select the appropriate option among the following:-

- i. The major cause of air pollution is
 - A. Burning of fuel
 - B. Planting trees
 - C. Winds
 - D. Rainfall
- ii. Asthma can be caused due to
 - A. Air pollution
 - B. Water pollution
 - C. Noise pollution
 - D. Soil Pollution
- iii. The major cause of global warming is
 - A. increase in CO₂
 - B. increase in Oxygen
 - C. increase in Nitrogen
 - D. increase in humidity



Glossary

AWARENESS	Having knowledge; informed of current developments
ENVIRONMENT	External conditions or surroundings: especially those in which people live or work; plants and animals live
GREENHOUSE EFFECT	Position or effect in which atmosphere near the surface of the Earth holds heat
SALINITY	Presence of salt in the water (harmful to cultivation)
TOXIC	Poisonous: harmful



- Students should be taken to a nearby area badly affected by any type of pollution i.e.; Air, Water, Noise and Soil and explain that problem to students and ask them to suggest remedy.
- Arrange a lecture in your school by a local doctor about the harmful effects of water pollution as an environmental problem.

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