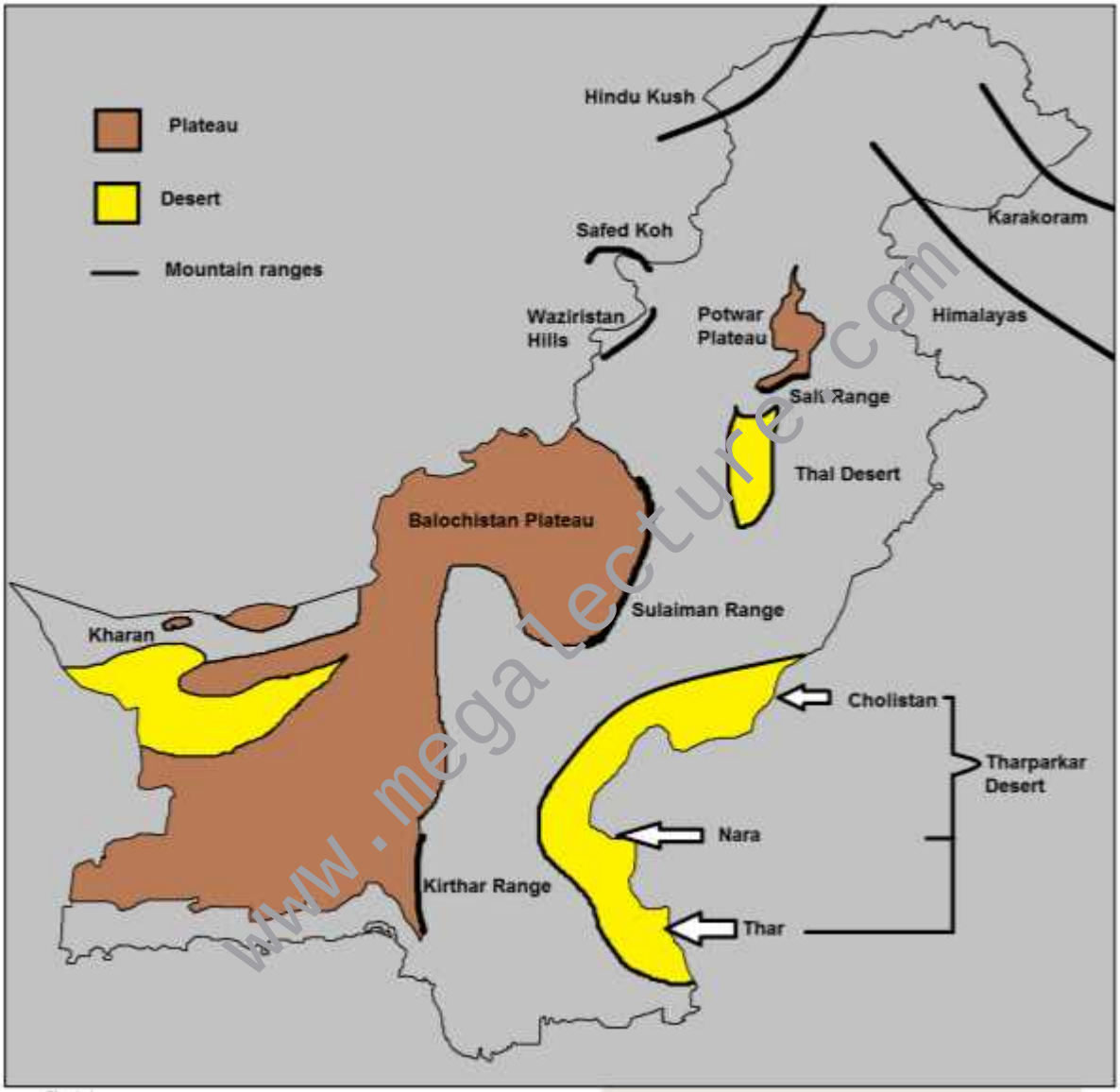
Chapter 1

"Topography of Pakistan"



Definitions:

Topography : it is the detailed study of the surface features of a region.

- Hills and Mountains: A Hill is generally considered to be an elevated piece of land less than 600 - 610 meters high, and a Mountain is an elevation of land that is more than 610m high. Some hills are called mountains while some mountains are referred to as hills.
- A Mountain Range is a succession of mountains which have the same direction, age and same causes of formation etc A snowfield is a huge permanent expanse of snow
- Relief/ topography: the condition of the land related to the rocks,ups and dowrs eroded and depositional features like valleys, rock type,passes etc
- Drainage :it is related to the eroded and depoditional! Features of the rivers like ox-low lake,meander,levees etc .all tyeps of river patterns including dendafric is part of drainage.
- Gorges :they are an irregular depression in a valley.
- Cirque : are regular depression made by the movment of glaciers.
- Valley: plain land between two mountains.
- Passes: a natural path which connects two areas in mountainous region.
- Snowfield : A plain field covered with snow usually above the snow line (4000m)
- Ravine :A deep narrow gorge with steep sides
- Gully : A revine formed by water activity
- Glaciers:Tongue shaped mass of ice moving slow down the valley
- Streams /Springs: Channels of water from snow capped mountains towards valley
- Cirque/corrie: A steep walled basin or a kind of lake .example :Lake saif ul mulook
- Serrated landscape: elevated mountain zone used for agriculture
- Bare rock:Rock without vegetation due to accumulation of snow
- Scree: Accumulation of loose rock debris
- Abrasion:The scraping of rock surface frozen into the moving ice
- Plucking: When ice freazes onto rocks surface and pulls off pieces or blocks of moving ice

Northern Mountains

The Northern Mountains are divided into three main mountain ranges;

- the Karakoram,
  - ➢ Average Altitude : 6000m
  - ➢ Highest peak : K2 (8610m)
  - ➢ Lifestyle :Nomadic agriculture and lifestock is practiced
  - ➢ Products:Apples Barly millets
  - ➢ Valleys : Gilgit Hunza Baltistan

- Himalayas
  - ➢ Average altitude:4000m lesser or lower Himalyas
  - ➢ Highest peak :Naanga parbat (8126m)
  - ➢ Lifestyle :Nomadic
  - ➢ Economic activity : Tourism/ agriculture and lifestock is practiced
  - ➢ Important locations :Murree Nathya Gali Ghora Gali
  - ➢ VALLEYS : Murri gullies and Naran Kaghan

- the Hindu Kush.
  - ➢ Average Altitude: 5000m
  - ➢ Highest peak :TirichMir (7690m)
  - ➢ Historical Importance: Alexander Timurlane Mughals Ghazni and Ghauris passed it to attack India
  - ➢ Important locations :Sawat Kohistan Chitral Dir
  - ➢ Products: Rice apples apricots tobacco
  - ➢ Valleys:sawat chitrAL DIR

These three have a dominating physical presence in the northern areas of Pakistan Topography The Karakoram runs from South East to North-West. They have an average height of 6000m. The Himalayas run from South-East to North-West and have an average height of 4000m. The Hindu Kush runs from North East to South West with an average height of 5000m.

Physical features

These mountain ranges have deep narrow valleys such as Gilgit and Chitral.

· Mountains are snow capped (like K2) and have steep sided slopes

· The peaks are conically shaped;

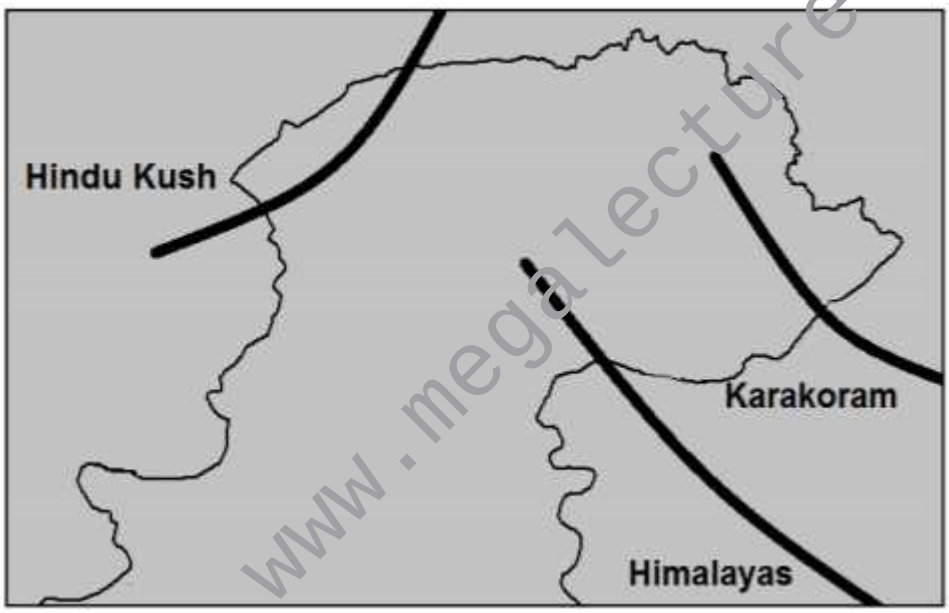
· their altitude increases as we move from South towards the North. 6000m upto 8500m

· These ranges have fast flowing rivers like the River Gilgit, which has formed alluvial fans and deep narrow gorges

· massive glaciers like Baltoro Batura and Siachen

- The soil cover on slopes is extremely thin; the mountains have bare rocks, which support little plant growth above snowline

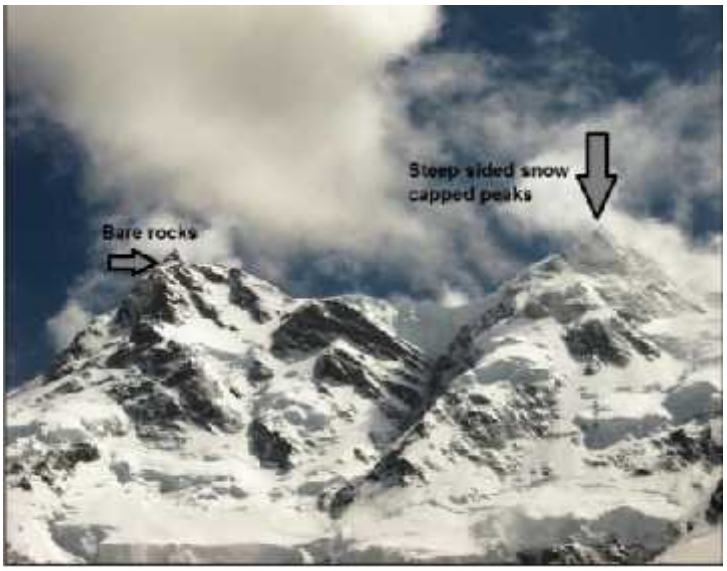
· These rocks usually undergo the process of weathering (by wind, water and lichens etc), which gradually break down the rock into small soil particles over a long time



Drainage features

- Indus starts from Manasarover lake in karakoram range moving towards south joins river Kabul at Attock and enters plain of Punjab at kalabagh
- The Southern slopes of the Himalayas are drained by Eastern tributaries of the River Indus; Jhelum, Chenab, Ravi, Sutlej and Beas.
- All of these Rivers run in North-East to South West direction

- Snowfields are found in areas which are above 4000m and feeds the rivers in summers



Western Mountains

This region consists of the mountain ranges, namely; the Waziristan hills, the Safed Koh range, the Sulaiman range and the Kirthar range (shown on next page) Topography

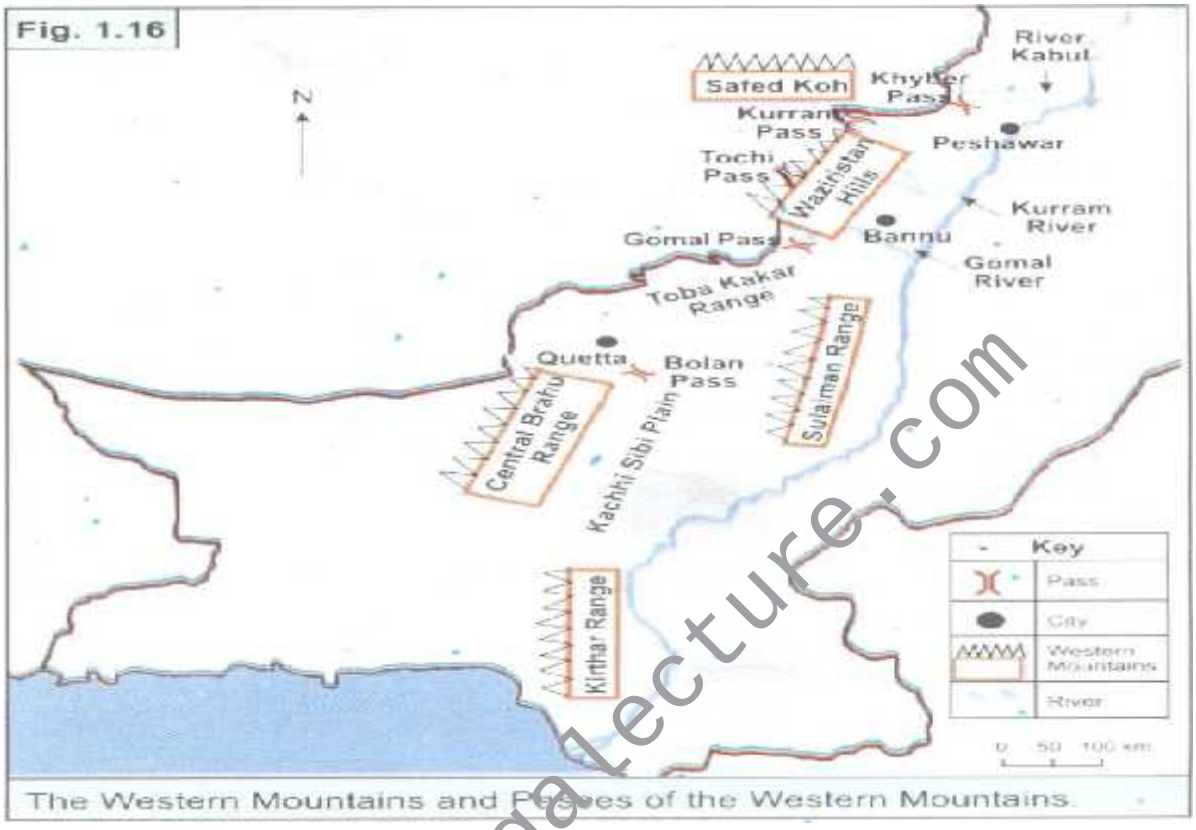
Highly mineralized zone

· All of these ranges run in the North-South direction except the Safed Koh, which runs from East to West.

· The Safed Koh mountain range is the only range, which has some existing snow capped peaks. Other ranges are quite dry.

· These mountains generally have bare rocks due to low rainfall and in some cases very high temperatures (which leads to high rate of evaporation).

· These mountain ranges have steep sided peaks along with deep narrow valleys and gorges



Safed Koh Ranges up to 4712 metres

Waziristan Hills up to 3513 metres

Sulaiman Range up to 3383 metres

Kirthar Hills up to 2174 metres

Drainage

- The Safed Koh range is drained by River Kabul, which runs in an West to East direction and eventually joins River Indus The Waziristan hills are drained by small seasonal rivers like Kurram, Tochi and Gomal.

- These rivers run from West to East, and all are the Western tributaries of the River Indus The Sulaiman range is drained by small hill torrents and small seasonal rivers such as the Bolan and Mula.
- These rivers usually lead to small inland lakes, where the water collects and then dries up (for example the lake Damas) The rain falling on Eastern slopes of Sulaiman range runs down the slopes and falls into piedmont plains leading to the formation of alluvial fans
- The Kirthar range on the other hand is drained by the River Hab (seasonal river), which flows in a North to South direction and eventually joins the Arabian Sea

Balochistan Plateau

Plateau: is an area of highland, which is usually flat although a heavily dissected plateau can also exist

Features are:

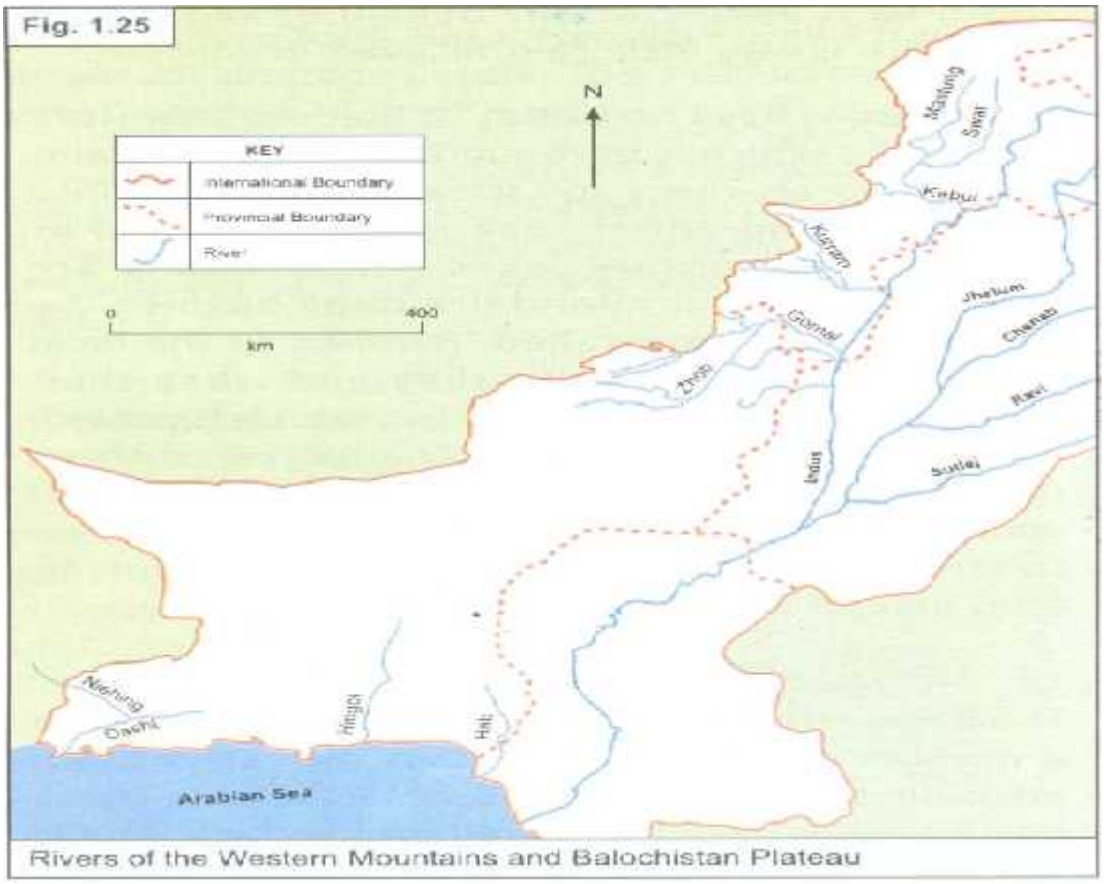
- Balochistan Plateau has a height varying from around 600m to around 3000m
- Total covered area of 347190 sq km
- It has deep narrow valleys like Quetta
- They have bare rocks due to lack of rainfall
- The mountains have steep slopes and none are snow capped.
- There are parallel ranges running in an East to West direction for example the Chagai Hills, Raskoh Range, and Makran Coastal Range are all parallel ranges
- Parallel ranges running North-South direction are Central Brahui and the Hala range

Drainage

In the Southern part of the Balochistan Plateau, the River Dasht and River Porali flow from north to South, thus eventually draining into the Arabian Sea. Both are seasonal rivers; they flow only during the rainy season.

In Central Balochistan, water either drains into inland lakes known as Hamuns or is absorbed into the ground, if not, it evaporates these basins are known as INLAND DRAINAGE BASINS . Dry lakes known as Hamun exist (like Hamun-i-Mashkel). They are formed when seasonal rivers flow into them during the rainy season and when the water evaporates it forms SALT LAKES or SALT PAN leaving a salty crust behind . A Hamun is a sort of depression on the Earth's surface.

In Northern Balochistan, River Zhob flows from southwest towards northeast. It eventually meets the River Gomal, which is a western tributary of the River Indus

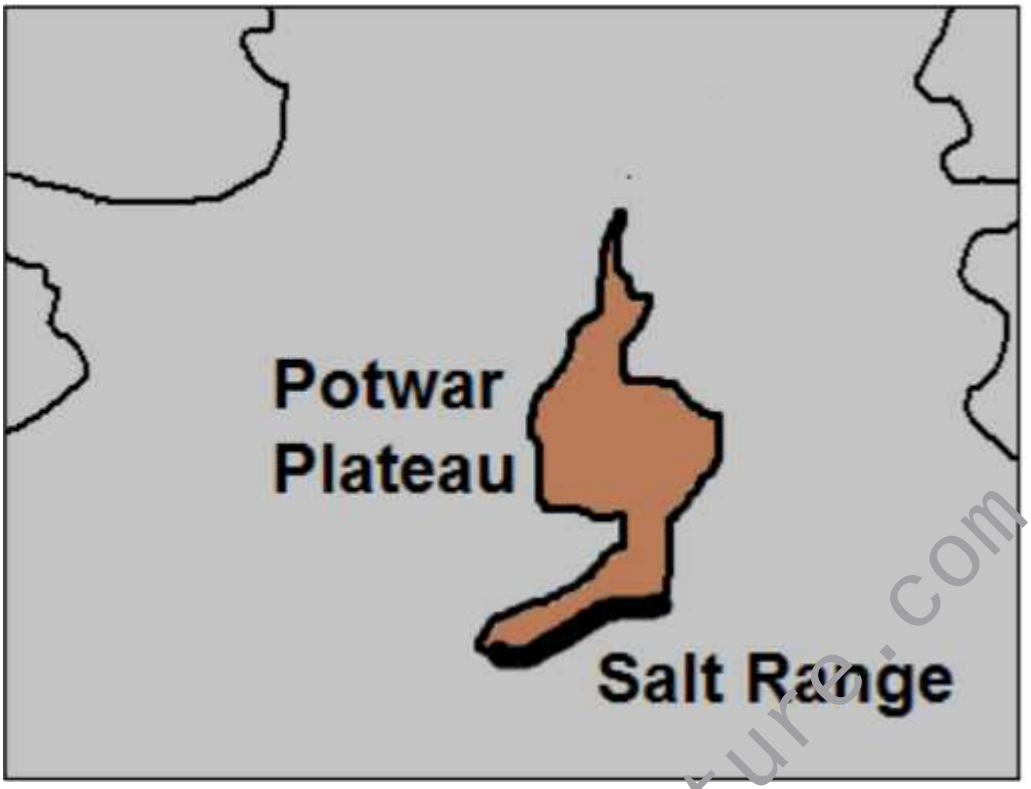


Mountain Ranges of Balochistan

- Ras koh
- Hala
- Makran coastal range
- Central Brahui
- Toba kakkar
- Siahan

Potwar plateau

This plateau covers the northern parts of Punjab and some of the western part of Azad Kashmir. To the North of the plateau we find the Margalla Hills, in the South the Salt range, in the East River Jhelum and on the West the River Indus.



Topography

- Height ranges from 305 to 610m and represents a region of badland topography.
- The hills have steep slopes and are badly dissected, faulted and folded.
- Many residual hills are present, a feature left by the last Ice Age due to retreating glaciers.
- Ravines (shallow, steep sided narrow valleys) are present between ridges (elevated pieces of land that run for some distance). Ravines are formed due to the erosion of soft rock by flowing water over a long period of time

Drainage

River Soan drains much of Potwar Plateau. It runs from North-East to South-West and eventually drains into the River Indus. Other small rivers are also present but all are active in the rainy season. These rivers have meanders (curves in the path of a river) because they have to flow around small hills Alluvial plains have also formed along the rivers due to seasonal flooding and the consequent deposition of silt by the river

Natural Topographical Drainage Features of Potwar Plateau

Fig. 1.30 The Surface Landforms	Description
Ridges and residual hills. a  	They rise up to 1200 metres. Due to constant erosion and deposition, residual hills made up of resistant rock are found. (residual hills are the hard rocks which are left behind after erosion)
Ravines and small rivers b 	Small rivers erode the land and take away the alluvium during the rainy season. A feature common in most of the landscapes.
Troughs and depressions. c  	Soft rocks eroded by water and wind create troughs and depression
Dissected and faulted land d  	Land showing cracks due to the uplift of the Northern Mountains during the mountain building process.
Deep ravines in less resistant rocks e  	Running water excavates deep ravines in less resistant rock.

Potwar Plateau: Topographical Features.

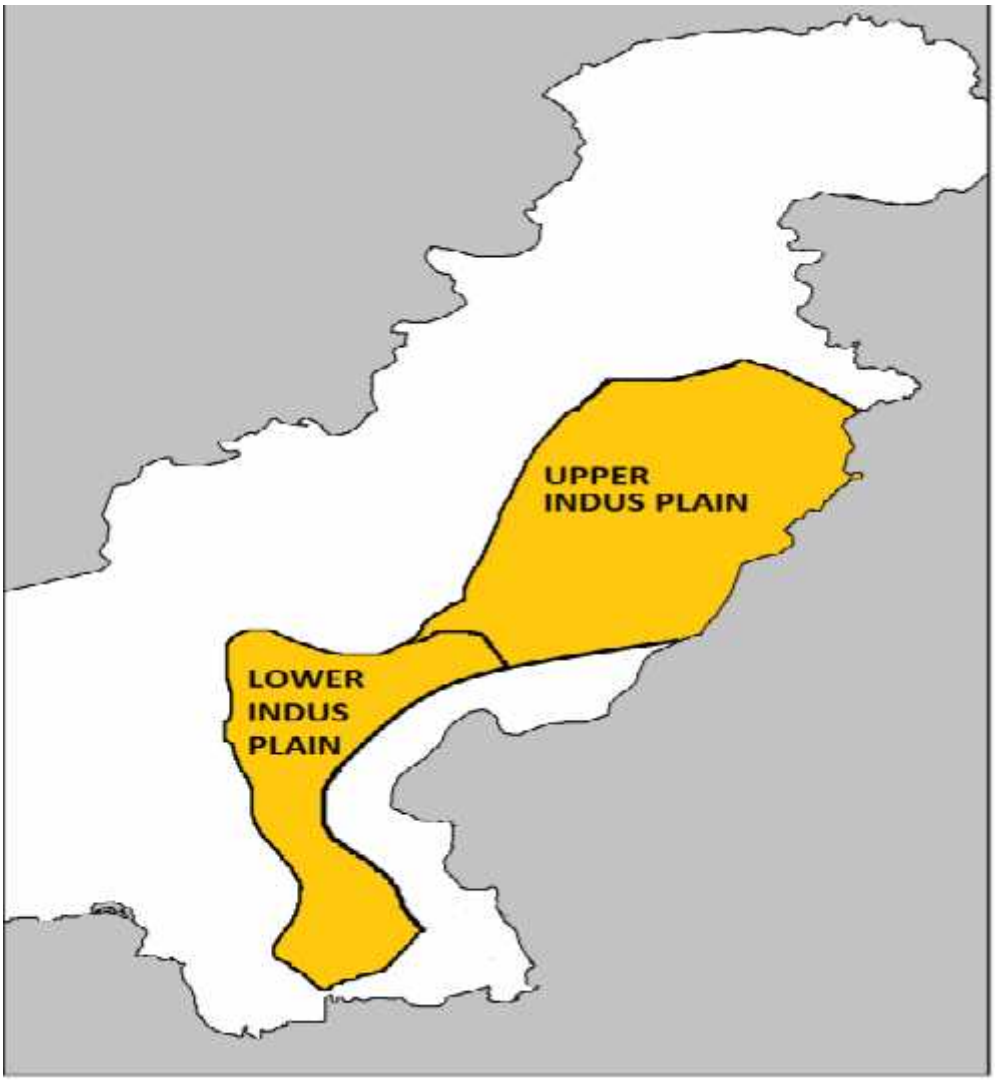
Salt Range

The Salt range is bordered by Potwar Plateau in the North, River Indus on the west and River Jhelum on the east Topography It consists of parallel mountains, which generally run from North-East to South-West. The height of the range varies from 750-900m The mountain range slopes gently towards the Potwar Plateau (in the north) but slopes steeply towards the Upper Indus Plain (in the south)

- River soan is partially separating potwar with salt ranges.
- salt ranges are steeper to words potwar plateau.
- They have higher altitude in the south which decrease nort words.
- There are few beautiful lakes in the region like colour Kalarkahar, Makrachi, Dhabi .
- salt ranges are covered by gullies which are making Bad-land topography. This is because of deforestation.
- small scale subsistance farming is possible around river source and its tributaries.

Indus Plain

The Indus Plain is divided into two regions; the Upper Indus Plain and the Lower Indus Plain. The Upper Indus Plain extends from areas below Kashmir and Lesser Himalayas to Mithankot. The Lower Indus Plain extends from Mithankot to the Indus Delta.



Features:

- Upper Indus Plain In the upper Indus plain there are doabs (a doab is a land between two rivers) e.g. Bari Doab
- Bars (alluvial terraces) are also present, which are 7-12m high e.g. the Nilli and Ganji Bars.
- The rivers keep on changing their course slightly (meanders).
- There are levees along the river bed, which help contain the river.
- Active flood plains are present alongside the river; these are low lying areas of flat land, which are annually flooded in the rainy season. The active flood plain is made up of new alluvium
- The old flood plains are also present. They are flat areas, which are higher than active flood plains. They are made up of old alluvium, which had been deposited a decade ago. They're flooded after a decade or so, when strong monsoon winds combine with the heavy melting of snow and ice in the glaciers of the Northern Mountains.

- Piedmont plains are found at the foothills of the Himalayas in the Salt Range. They are formed by the deposition of material by hill torrents, when they lose their speed. Kirak Hills exist between the River Chenab and Jhelum

Lower Indus Plain

- The Lower Indus Plain principally differs from the Upper Indus Plain due to presence of a tidal delta (the Indus Delta) and also because in the Lower Indus Plain only one river that is, the river Indus, flows.
- Indus delta exists in some of the southern parts of the Lower Indus Plain. A delta is a low lying triangular area which has alluvial deposits.
- the river divides into distributaries before entering a larger body of water (in this case the Arabian Sea). The delta exists because of the deposition of material carried by the river. This happens because when the river enters into the sea, it loses its speed and thus also loses its ability to hold this material, which is therefore deposited at the mouth of the river.
- In the lower Indus Plain, we may find limestone ridges which are known as cuestas, a few examples being; Rohri and Gango Takar Cusetas.
- Oxbow lakes are also present in the lower Indus plain.
- Active and Old Flood Plains are also present, but a doab and alluvial terraces are absent. Meanders however are present too.
- Piedmont Plains are present at the foothills of Kirthar and Sulaiman Mountain ranges.
- Part of the Indus plain that extends into Balochistan is known as the Kachi Sibi Plain. Both these plains have rolling sand dunes (Thal and Thar deserts), flat plain areas, have some low lying hills, oxbow lakes and meanders etc.
- The main differences are the number of tributaries and distributaries (delta) in both the plains,
- The Upper Indus Plain is also a bit higher than the low lying Lower Indus Plain. Considering the altitude of these two plains, we see that it decreases from North towards the South generally

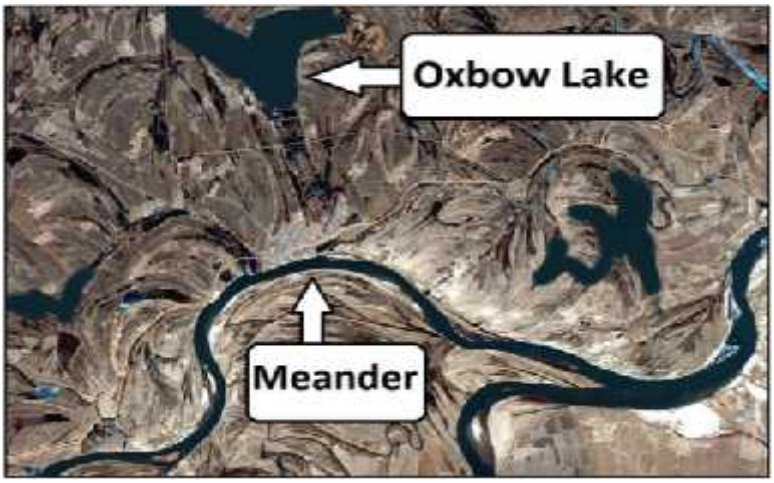
Fig. 1.45

UPPER INDUS PLAIN	LOWER INDUS PLAIN
Located in the northern part of the Indus Plain.	Located in the southern part of the Indus Plain.
River Indus and its major tributaries flow here.	The River Indus flows alone.
The Jhelum, Ravi and Sutlej have joined the Chenab at Panjnad to form the River Panjnad which joins the Indus near Mithankot.	River Indus flows into the Arabian Sea south of Thatta through its distributaries which flow across its delta.
Nearly flat, undulating plain sloping towards the south-west.	Nearly flat undulating plain sloping towards the south
The average width of the Indus is 1.4 km till Kalabagh and 1.6 km near Sukkur.	Width of the River Indus is 1 .6 km.
River Indus is in its middle course in the north and enters its lower course towards the south.	River Indus is in its lower course
Both erosion and deposition take place with ceposition becoming increasingly dominant southwards.	Deposition is the main function of River Indus.
Meanders, oxbow lakes, braided channels & levées are present in doab areas.	Meanders, ox bow lakes, braided channels & levées are present.
Alluvial terraces or bars are formed between the rivers.	Alluvial terraces or bars are non-existent as the Indus flows alone.
Piedmont Plain with alluvial fans to the north and west.	Piedmont Plain with alluvial fans to the west
Ideal for agriculture with a network of link canal irrigation.	Ideal for agriculture with irrigation.

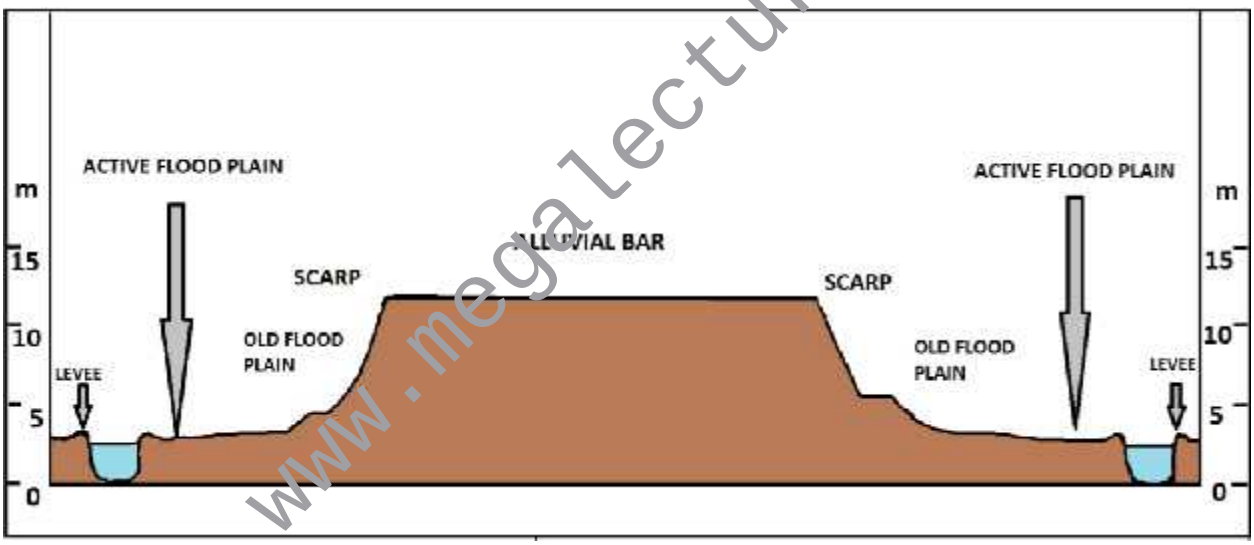
Drainage of Indus Plain

The Lower Indus plain is drained by the River Indus mainly flowing in the North-South direction. Meanders and oxbow lakes also exist. Piedmont plains exist in-between the river Indus and Sulaiman and Kirthar Mountain ranges. In the Upper Indus plain, River Indus and its Eastern tributaries flow in North- South direction. Tributaries are Jhelum, Chenab, Ravi and Sutlej. Meanders and oxbow lakes also exist

- Meanders zigzag pattern of rivers is called Meander.
- Oxbow Lake Crescent shaped part separated from a curve of Meander is known as ox-bow Lake. it is a temporary feature.
- Levees Natural increase of land near river banks is called levees. This is because of the deposition of sediments alongside the river banks.(Embankment walls are artificially man-made walls alongside the river bank)



Features of a Doab



Active Flood Plain

It is a flat plain on both sides of a river, which suffers annual floods during the rainy season. It is around 2-3m above the level of a river. It is around 10-20km long. The river always changes its position, thus meanders have come into existence. Abandoned (dry) and braided channels are also visible in the dry season. Meanders, oxbow lakes and embankments of a river can be seen as well. Soils of loam and silt (Alluvial Soils), which are good for farming, are present in both the UIP and LIP. ¬

Old flood Plain

It is higher than active flood plain around 5m higher than river level. It is around 10-20m long. It is made up of old alluvium. Evidence of meanders and of levees is present in these plains. Oxbow lake depressions can also be seen. The old flood plains are present in both UIP and LIP. ¬

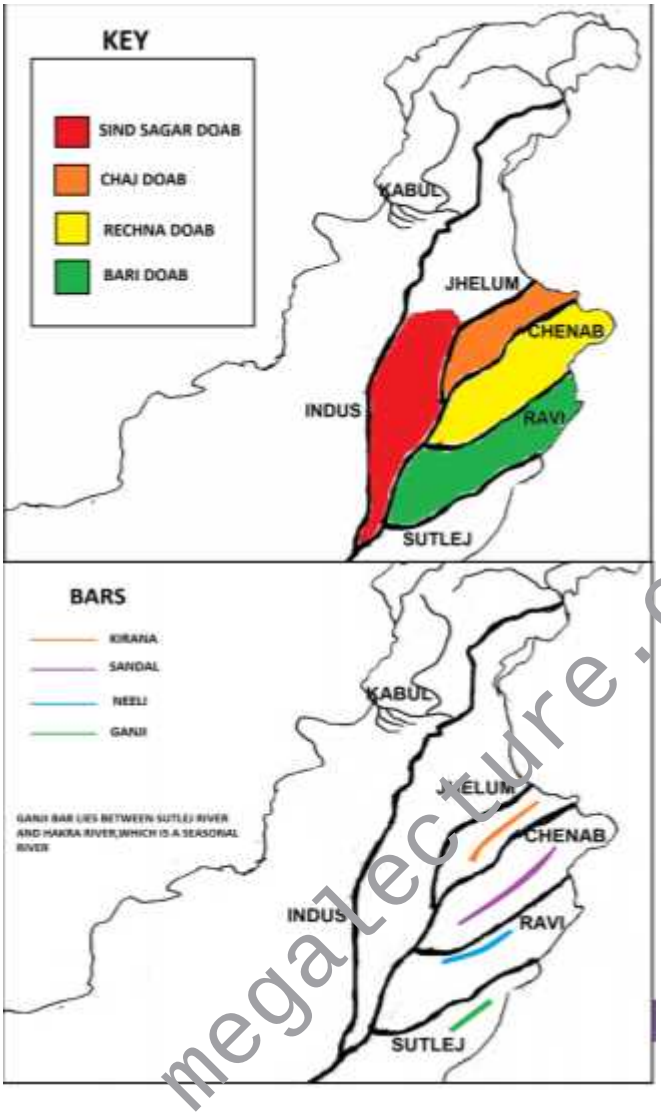
Bars (Alluvial Terraces)

These are flat areas which are only found in the Upper Indus plain. They are 7—12m high and last for 25-35km. They are made up of areas of silt and clay. In Pakistan all the bars have a south west direction.

¬ Scarp

Scarp is a slope,, which separates the old flood plain from the bar upland. It is around 20m long and 11m high above the river level. It is made when old alluvium on the bar upland is eroded, thus, leaving a slope which connects both old flood plain and the bar upland

Rivers and Doabs of UIP / LIP



CHAJ doab lies between CHEnab and Jhelum rivers.

RACHNA lies between RAvi and CHENAb rivers.

BARI doab lies between BEAs and RavI rivers

Deserts

A desert is a place that receives very low amount of precipitation (less than 250mm). It is an area that can support almost no vegetation. Deserts can be cold as well as hot (have a high rate of evapotranspiration). Pakistan has 3 main deserts; the Thal, Tharparkar and the Kharan desert, all of which are hot deserts

- Thal is found in Punjab between Jhelum and Indus Rivers.
- Tharparkar is divided into 3 parts; Cholistan is found in Southern Punjab, Nara in Eastern Sindh and Thar in the South East of Sindh.
- Kharan is found in Western Balochistan.
- Cholistan :

Topography

There are strips of soil found between sand dunes along with the sandy plains. Sand dunes shift grain by grain due to the pattern

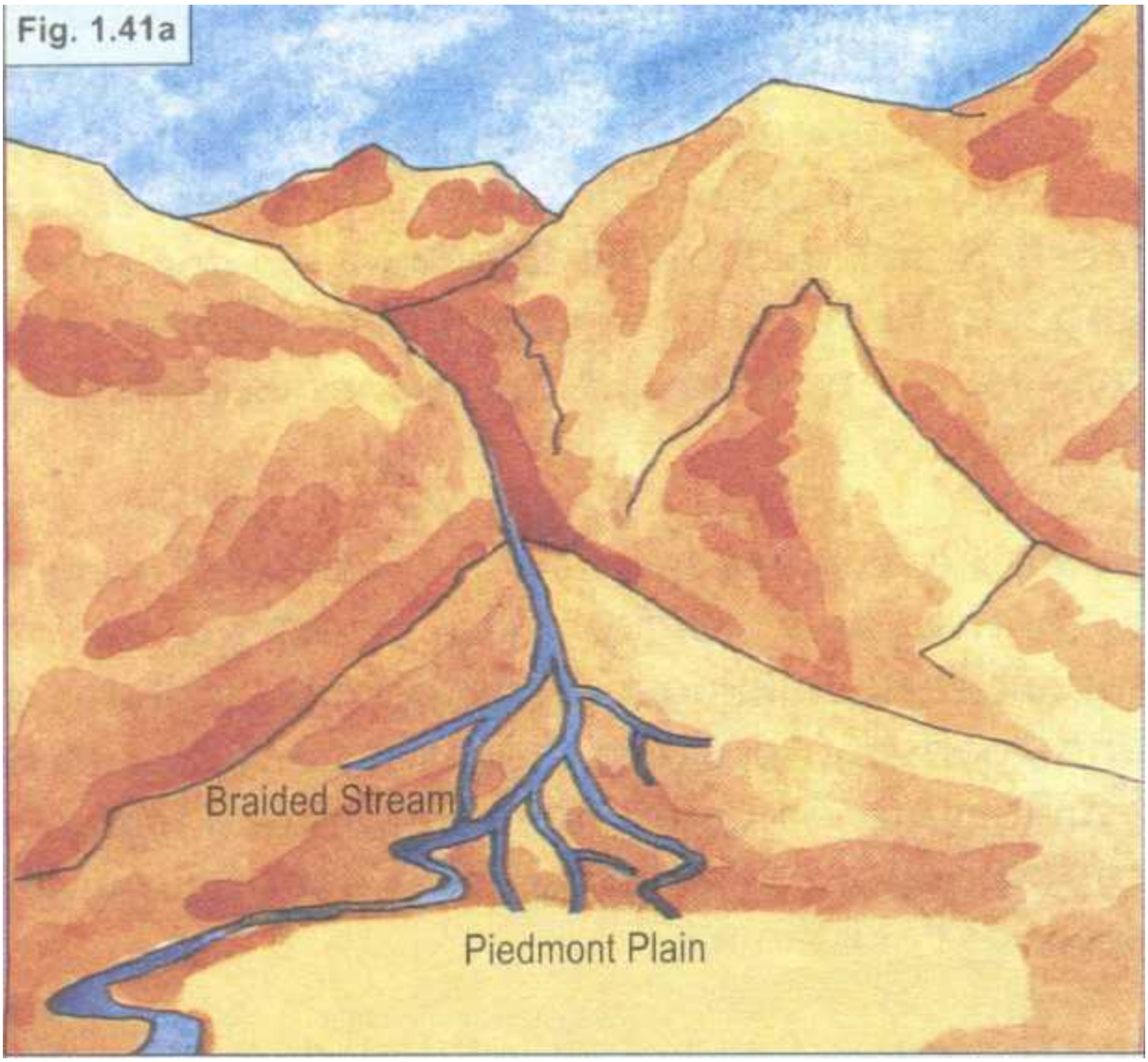
of the blowing wind. Sand dunes sometimes reach a height of 150m, and are both longitudinal and latitudinal in direction. All of the sand dunes are crescent shaped. When the wind blows away the top cover of sand away, bare and weathered rocks are exposed onto the surface

Desertification

Desertification occurs due to continuous land abuse. It is caused by both natural and manmade factors. Among the natural forces are continuous wind and water erosion (which erode the fertile topsoil so only few plants can then grow) along with long-term changes in rainfall patterns due to climate change (such as a drought). Human factors include overgrazing by animals, strip mining, the excessive usage of groundwater supplies and deforestation (mainly shrubs and wild grass)

Pide-mont plains:

Pied-mont plains are found in the foot hills of Sulaiman kirthar mountains towards river Indus.few the pied-mont plains are also found in the Hills of mountaineers north. The pied-mont plains were formed by the deposition of rivers flowing down the Mountain .The river flow only where and when rainfall taxes place. they come down the Mountain slopes at great speed on reaching the foot hills the gradient decreases and the river loses its speed. This diop in speed cause the river to deposit a substance part of it loads within the river channel. The river is spht in a number of channels known as the braided channel. The sediment deposited with the river channel makes a heap known as alluvial fans. Alluvial fans are the dominant feature of pied-mont plains beyond the alluvial fans the land has a gentler slope and is covered with sand, silt and clay and lined with meandering line. Agriculture is possible in this region but it depends upon rainfall. This type of agriculture is known as rainfed of Baravi agriculture



AFFECT OF TOPOGRAPHY ON ECONOMIC ACTIVITIES

· Mountains

In the Northern areas of Pakistan life is at times harsh. Food and fodder can only be grown in summers because the winters are too cold to support crop growth. Also, most of the soils are thin and infertile except for those in the valleys. Thus, the area available for crop growth is limited. Hence the stockpiling

of food and maintenance of the stock becomes necessary. Furthermore, animals must be kept in sheds during the winter. Transhumance is the practice of the seasonal movement of people with their livestock over relatively short distances, typically to higher pastures in summer and to lower valleys in the winters. During the summers, when the snow retreats from higher parts of mountain slopes; grass can grow as temperatures become warm and sunlight intensity and its duration increases. This comes at a time when the lower valley pastures have already been exhausted by the grazing animals during the winter. As the winter starts, grass grows back in the lower valleys and the animals are moved back towards the valleys. Here they are kept in sheds (which also stores fodder etc). Their products like milk, meat, skins are utilized throughout the year Other than that communication services are limited during the winters. There is a risk of sabotage by terrorists and damage by heavy flooding. Landslides frequently knock out communication poles. Roads are blocked by landslides and railway lines can be also blown away by avalanches. Building roads and railway is difficult due to steep slopes, narrow gorges and deep narrow valleys, which add to the construction time and cost. Sometimes heavy machinery can't be used as these machines cannot climb steep slopes. Many builders die due to landslides etc. Also in these sparsely populated areas there is a small pool of trained labour, which can build and maintain roads and railways etc. On the other hand frostbite can occur and if not treated properly can result in death. People have to wear thick clothes and stay indoors to keep warm. They involve themselves in making crafts etc Only in the summer months do these areas receive significant amount of tourists, which helps to increase the earnings of the local people (who are employed in hotels or sell ornaments etc)

· Plains

The plain areas of Pakistan consist of mainly Indus Plain and Kachi Sibbi Plain These are fertile areas, where agriculture forms an important part of daily life. Almost ample land is available for crop growth and other such activities. Population density is high thus a large pool of trained labour is available. It is economical to build big schools, colleges and hospitals 24 Chapter 1: Topography of Pakistan Temperatures are also bearable although summers are a bit hot, so crops can be grown in both summers and winters. Water is available either from rivers or from wells/karez etc. Since these are flat areas it is easy to build roads, railways as machines can be used. Thus the road and rail density is high. It is easy to transport goods etc. Land for making factories and runways etc is also available, thus more commercial activities can be carried out. In Indus plain the bar upland is both flat and safe from flooding on account of its height and is perfect for buildings etc.

· Deserts

Deserts are vast expanses of barren land. It must be noted that here too both the topography and climate are rough. Food can only be grown during the rainy season which brings less than 200mm of rainfall in only the wetter southern parts of the Thar desert. People (nomads) have to move along with their animals and belongings in search of water (near oasis) and food/fodder. Water availability is a major hindrance to permanent settlement at a single place. Usually the people stay for some weeks at a place where there is food and water for livestock. In places of permanent settlement, embroidery and weaving etc is common Alternating sand dunes mean that crop areas as well as roads and railways can be covered by sand completely in a matter of days. Thus before any such project is carried out the sand dunes are at first flattened, irrigation facilities are built up to grow certain trees and bushes whose roots

prevent soil erosion. All of this is not cheap Population density is low and there is very small pool of skilled labour (don't write no pool of skilled labour), which can help in building and construction of buildings, roads etc. Also it is uneconomical to build roads and railways as they will be used very few people Population density is low so there is less need for providing major health and educational facilities, although these facilities are present but to a limited extent only

· Mangroves

The presence of a delta means that there is a constant risk of flooding, which can inundate houses and sweep away crops and livestock Furthermore there is little firm land (don't write no firm land) to build houses and factories upon. Ground water is salty and is not fit for agriculture. The soil is also too wet due to constant flooding and thus contains little air (there are pores in-between the soil particles which contain air and are necessary for plant growth) Population density is low so there is less need for providing major health and educational facilities, although these facilities are present but to a limited extent only