Saniya . S.

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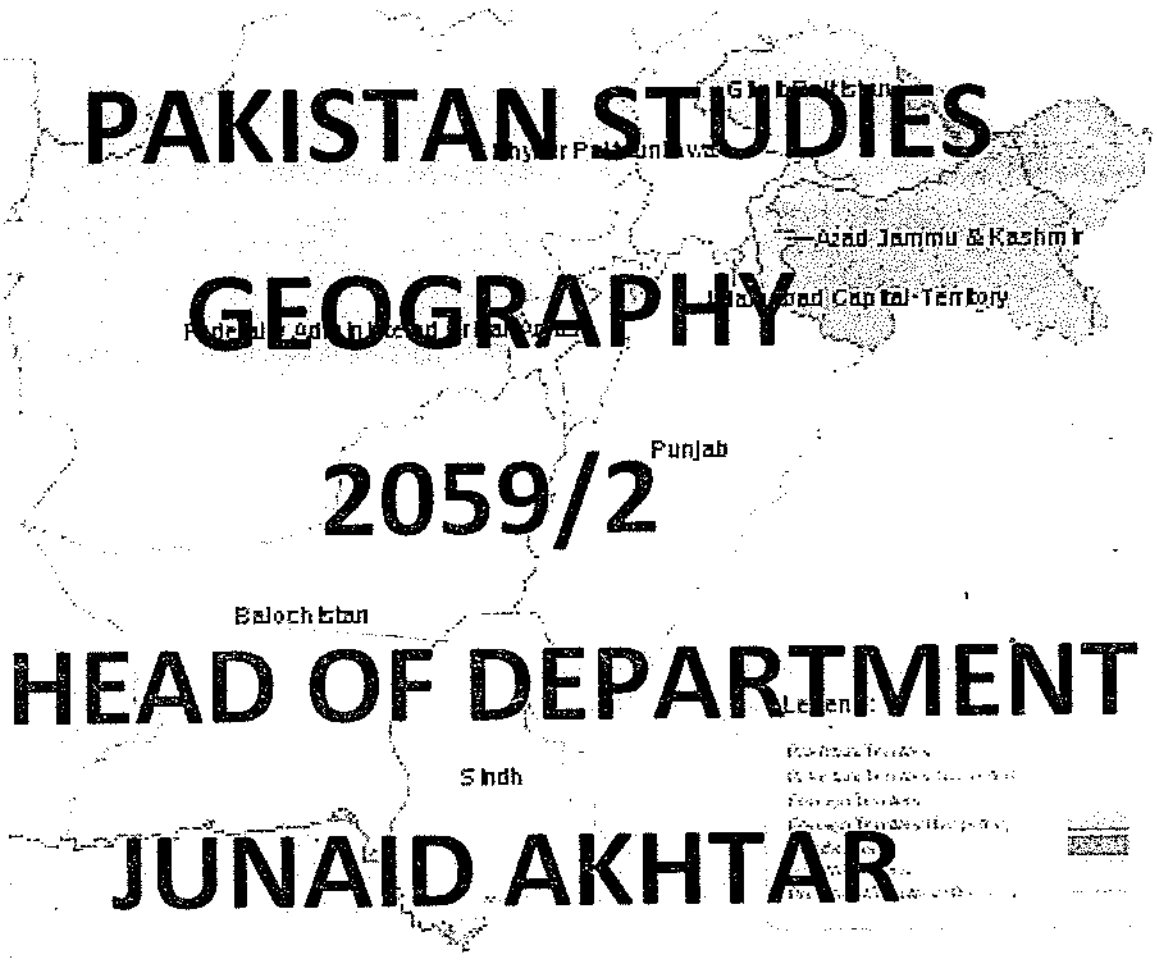
PAKISTAN STUDIES

GEOGRAPHY

2059/2



HEAD OF DEPARTMENT

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TOP IN PAK STUDIES

MAX % 98

LANDFORMS OF PAKISTAN

Relief Features: Topographic features of a land (hills,slopes,soil etc.).
Physical Features: Relief features & climate of an area.
Drainage: A region drained by river water in the form of river or stream that is absorbed into land.
[**Drainage Features:** River's name, type, direction, source, features, size etc. & stream, waterfall, lakes, basins etc]
Inland Drainage: The surface water in the form of river or stream that is absorbed into land but does not reach to the sea.
Braided Channel: (Inter weaving Channel): A dry channel formed after the rainy season, it is rich in alluvium. It is formed when there is an obstacle in the way of water flow.
Ox-Bow lakes: Isolated lakes in the shape of an Ox-bow or up U-shaped.
Dry Lakes: Lakes, which remain dry throughout the year but have water only during rainy seasons.
Interfluves/Doab : The land between two rivers.
Active Flood Plain: Wide, flat fertile alluvial plain along the river,remains active during flood and rains.
Cover Flood Plain:(Old Flood Plain) Areas above Active flood plain & covered with old soil.
Meander Flood Plain: The area adjacent to old flood plain with impressions of Meanders & so on.
Scarp: The slope or the area between old flood plain & bar upland.
Alluvial Terraces/ Bar Uplands/Scalloped Interfluves: Areas of high grounds between rivers formed by the deposition of the old alluvium.
Meander: In the mature stage the river begins to develop bands or loops.
Tidal Delta: If there are no strong tides a delta is formed in triangle shape in which heavier particles are deposited at the mouth while coarser at the sea.
Mangrove Swamp: Fluffy and soft areas where mangroves are present.
Levees; When the river overflows much alluvium is dropped by the sides of the river that natural embankment is called levees.
Low Lying Area: ~~The~~ area totally devoid of vegetation & receive very little rainfall even in winter.
Lobe: Irregular depressions at various places.
Sand Dunes: A mound or ridge of sand formed by strong Winds or by the deposition of sand due to an obstacle. There are two types of dunes Longitudinal and Latitudinal depending on the direction of wind.
Residual Hills: Hills remained after weathering & erosion.
Erosion: Wearing down of earth surface due to wind, water or glacier.
Rill Erosion: When water flows from a place, it forms its pattern on the ~~land called~~ rill.
Gully Erosion: Due to erosion rills are formed when water flows these rills become wider into gullies.
Sheet Erosion: In this the whole sheets of land are eroded due to various agents.
Plateau: A broad highland feature with level top, which descends steeply to surrounding.
Gorge: It is a narrow steep sided valley.
Valley: It is a trough-shaped dip in the landscape, higher areas have steep slopes. There are U-shaped & V-shaped valleys.
Intermontane Valley: A valley which is surrounded by mountains or hills from all sides.
Cuesta: Ridges made of limestone. It is steep on one side while gentle on the other side.
Piedmont Plateau: Situated at the foot of a mountain & are bounded on the opposite side by a plain or the water body.
Alluvial Fans: Formed in piedmont plains & active only during rains
Badland topography: It is an elevated arid or semi-arid area with less vegetation, dissected land and sharp ridges.
Serrated Area: It is a rocky area with saw like edges.
Pass: It is a narrow path or channel which connects two valleys.
Basin: It is a hollow bawl shaped structure.

LANDFORMS OF PAKISTAN

IMPORTANCE OF PAKISTAN'S LOCATION

- Geographically Pakistan is located in **South Asia**.(South Asia: Pakistan, India, Nepal, Maldives, Bhutan Bangladesh & Sri Lanka)
- The location of Pakistan on the map is: **Latitude: 24*N to 37*N & Longitude: 61*E to 76*E.**
- Pakistan is situated in the most important part of South Asia. It is situated in the heart of Muslim countries of the east & west. To the West Pakistan is linked with Muslim countries like Afghanistan, Iran, Iraq, Middle East countries & N-African countries so trade can be done easily.
- Pakistan lies in the **Sub Tropical (20*N-40*N) Zone**. Due to favorable climatic conditions (Warm-hot summers) agricultural activities can be performed throughout the year.
- Water of the Arabian Sea remains open **throughout the year**. So the trade activities can be performed in every season.
- Pakistan can provide port facilities to land locked countries to earn valuable **foreign exchange**.
- High, snow-capped mountains in the north bound Pakistan. The river Indus & its tributaries cut across these ranges. A lot of water, which is used for irrigation & generation of **hydroelectricity**.
- Pakistan standard time has a difference of **+5 hours from GMT**.

RELIEF FEATURES OF THE MOUNTAINOUS NORTH

Mountainous North is divided into these ranges:
(A) Himalayas (B) Karakoram (C) Hindukush (D) Kohistan, Swat & Dir Ranges

(A)HIMALAYAS: (AVG. HEIGHT 4000M.)

- The Western most part of the Himalayas falls in Pakistan.
- Average height is 4000m.
- Mostly snow capped.
- The Himalayas comprise of series of parallel ranges stretching like a bow for about 2500kms.
- The Himalayas are bordered to the West from the mountain ranges of Hindukush & on the North from Karakoram.
- River Indus is making boundary b/w Himalayas & Hindukush / KK. The parallel ranges of Himalayas are divided according to their altitudes:

SUB-HIMALAYAS OR THE SIWALIKS:

- These are the Southernmost ranges of Him.
- Their average height is **600-1200m**
- Their trend is from East to West.
- They cover the hills of **Rawalpindi** district.

LESSER HIMALAYAS OR PIR PANJAL:

- These ranges lie on the North of Siwaliks or South of Greater Him.
- Their avg. height ranges from **1800-4600m**
- Mostly Snow capped mountains.
- Their trend is from East to West.
- They are represented by the **Pir-Panjal** in Jammu-Kashmir (HP).
- They are spread over **Rawalpindi, Abbotabad & Mansehra Districts(RAM)**.
- Kaghan & Naran are the important valleys.
- Some of the hill stations of Pakistan like Muree, Nathia Gali & Ghora Gali are located here.

GREATER OR CENTRAL HIMALAYAS:

- It is located to North of the lesser Himalayas.
- Their average height is **(4600-6000m)**
- Snow capped ranges are covered by glaciers.
- Their trend is from East to West.
- Nanga Parbat is the highest peak (8126m) which lies in Kashmir.
- They dominate the **Kohistan** district.
- Deepest gorge in the world is located in Dasu patan region of Kohistan district.
- The Indus is originated from Mansarowar Lake which is located in Greater Himalayas. Many famous lakes are located here like Saif-Ul-Maluk.

(B) KARAKORAM:

- These ranges are located on the extreme North of Pakistan, at the border of Pakistan & China.
- They attain snowy heights **(6000m)**
- A number of glaciers cover these ranges. For example Siachen (78kms), Hispar (61kms), Baifo (60kms), Baltoro (58kms) & Batura (58kms).
- The trend of KK is East to West.
- Valleys of Gilgit, Baltistan & Hunza (GBH) lie in these ranges.
- There are 14 peaks over 8000m in the world four of them lie in Pakistan. For example in the KK ranges K2 (Godwin Austen) 8611m, 2nd highest peak in the world is also located.
- These mountains can be crossed with great difficulty. Even the passes are 5500m high e.g. the Karakoram pass & Khunjrab pass.
- Major rivers are Chitral, Gilgit & Hunza.

(C) HINDUKUSH:

- They are located to the **North West of Pak** & it is the Western side of the Pamir Plateau at the borders of Pakistan from Afghanistan.
- Their Avg. height is **5000m**
- They rise to snowy heights & are covered with a number of glaciers.
- The trend of these ranges is from N to S.
- Tirich Mir is the heighest peak (7690m)
- Swat, Chitral, Dir & Kohistan (Sc DK) are the most famous valleys.
- There are number of passes which connect Pakistan with Afghanistan e.g. Baroghil, Shera shing. These mountains are mostly bare rocks, arid & poor in vegetation.
- Major rivers are **Ghizer,Gilgit & Hunza**.

- **(D) KOHISTAN, SWAT & DIR RANGES:**
- They are located in the South of Hindukush
- In the North they rise to (5000-6000m) with snow & in the South (200m)
- They are sub-parallel ranges with N to S trend.
- Kohistan (b/w Indus & Swat),
- Swat (b/w Swat & Panjkora) &
- Dir (b/w Panjkora & Kunnar)
- Lawargi Pass links chitral & Dir.
- Deep valleys & gorges are common.

DRAINAGE PATTERN:

EASTERN	WESTERN
• Indus,jehlum,Chenab,Ravi & Satluj	Kabul,Kurram,Gomal,Tochi & Zhob
• Main Rivers	Minor rivers
• Fed by melting of snow & Summer Monsoon	Fed by melting of snow
• Perinnial rivers	Non-Perinnial (Seasonal) rivers
• Flowing Southward	Flowing Eastward
• Slow moving because plians of Indus.	Fast flowing because of steep slopes
• Rivers in mature and old stages(Punjab & Sindh)	Rivers in Youth stages(KPK)

Describe briefly the relief features of the Northern Mountains

Parallel ranges, W to E ranges, Ranges increase in height from S to N, Rise to over 6000m upto 8475m, ice/snow fields/glaciers, Serated , Bare rocks, Steep slopes, Deep valleys /Gorges

Describe briefly the main physical features of Gilgit Agency

High mountain ranges, Karakoram & Hindukush, Parallel ranges, Mainly E to W, Upto 8000m, Permanent snow /ice fields, Deep & narrow valleys /Gorges, Fast flowing rivers, High Passes, Barren/Rocky /Rugged, Landslides/Avalanches, Alluvial Fans, Very cold Climate.

WESTERN MOUNTAINS:

THE SAFEDKOH RANGES, WAZIRISTAN HILLS & INTERMONTANE VALLEYS:

- SafedKoh is located in the South of Kabul River or Hindukush mountains.
- Average height of 3600m.
- They are commonly covered with snow.
- SafedKoh Ranges have E to W trend.
- **Sikeram** is the highest peak
- SafedKoh Ranges merge into the Kohat hills in the East.

- South of the SafedKoh, **Waziristan Hills** are located.
- Avg. height 1500-3000m.
- Trend E to W.
- The important passes on these ranges are **Khyber, Kurram, Gomal & Tochi**. All these passes connect Pakistan & Afghanistan.
- Important intermontane valleys are **Peshawar, Kohat & Bannu**.
- Hills & mountains bound these valleys on all sides except from the West.

RELIEF FEATURES OF THE SULAIMAN-KIRTHAR MOUNTAINS:

- Extending from South of the Gomal River, the Suleiman-Kirthar Mountains lie between the Balouchistan Plateau & the Indus plain.
- The Suleiman Mountains with average height 600m.
- Takht-e-Suleman is the highest peak.
- The Marri-Bugti Hills are the offshoot of the Suleiman Mountains & extend up to Quetta. Near Quetta, they take a 'Syntax Bend' southward & merge into **Kirthar Mountains.**

- Avg. height 300m.
- Their trend is N to S.
- The height decreases N to S.
- The Kirthar Mountains are backed by the Central Brahui & the Pab Ranges.
- The most important pass on these ranges is the Bolan Pass, which connects Quetta with Sibi.
- The Mountains are composed of limestone, sandstone & shaly rocks.

DRAINAGE PATTERN:

- The area is dominated by dry channels, which become active during rainy seasons.
- At the Piedmont plains alluvial fans have been formed due to sedimentation.
- There is no river in this area due to dryness & the main source of water is underground channels.

PHYSIOGRAPHIC FEATURES OF INDUS PLAIN

ACTIVE FLOOD PLAIN:

- The area just above the river (1-3m).
- The local name of active flood plains is **"Bet" or "Khaddar"** Land.
- They flood almost **every year.**
- They are covered with rich **alluvium (Fresh)**.
- They are most extensive along the Indus varying from **24 to 40 Km** in width.
- They are least extensive along the Ravi where their width varies from 3 to 5 Km.
- They can be used for agriculture during **winter season** because of fertile soil & water.

OLD FLOOD PLAIN:

- The old flood plains or cover flood plains are few Km (3-5Km) above the active flood plain.
- They are flooded when there is heavy monsoon rainfall, normally every 7-8 years sever flood occur.
- They are safe from flood and covered with **"old alluvium or Bhangar land"**, or the alluvium deposited in the past.
- The old flood plains constitute the main agriculture areas of Pakistan.
- Meander, Oxbow Lakes, Old levees and other features are the important features.
- In Sindh the abandoned channels are called "**Dharos**" and small salt lakes called "**Dhands**". They are the important features of Old flood Plains in Sindh.

SCARP/BLUFF OR CLIFF:

- It is the slope between the old flood plain & barupland.
- Its height is about 5-11m and width is about 6m.
- It is also having old alluvium but can't be used for farming due to slope.

BARUPLANDS OR ALLUVIAL TERRACES OR SCALLOPED INTERFLUVES:

- They are the areas of highest ground (15m) between rivers formed by deposits of old flood plain.
- Bar uplands are the safest places from floods so can be used for houses & other purposes.
- The local name of Barupland is **"Bar"**
- The sediments of the terraces are called **"Old alluvium"**
- The terraces are considered ideal for agriculture with the help of irrigation facilities.
- The alluvial terraces **Kirana Bar** in Chaj Doab, **Sandal Bar** in Rechna Doab, **Ganji Bar and Nilli Bar** in Bari doab.
- A large part of Sindh Sagar Doab between the Indus and Jehlum is covered with a desert called "Thal".

COMPARISON BETWEEN UPPER INDUS PLAIN (UIP) & LOWERE INDUS PLAIN (LIP):

TOPOGRAPHY:

- Both are flat and undulating.
- Both are having active flood plains, old flood plains & so on.
- Both are having deserts and sand dunes.
- Land is higher in UIP than LIP.
- Doabs & Bars are only in UIP.
- Tidal Delta is only in LIP.

DRAINAGE PATTERN:

- Both are having the River Indus.
- Meanders, Braiding, Ox-bow Lakes, Swamps etc. are very common in both
- Indus has many tributaries in UIP but none in LIP.
- Indus has 4/5 large left/east tributaries in UIP.
- Tributaries contribute a large amount of water in UIP but very little only in LIP.
- Indus forms Tidal Delta in the LIP but not in UIP.
- Wider river in LIP than UIP.

RELIEF FEATURES OF POTWAR PLATEAU:

- It is located to the South of the Mountainous North & lie between the River Indus & River Jehlum.
- Its avg. height is **300 to 600m**.
- The Northern boundary of the Potwar Plateau is formed by the Kala Chitta Ranges (Composed of sandstone & limestone) & the Margalla hills while southern boundary by the Salt Ranges.
- It is rich in minerals like rock salt, gypsum, limestone, coal and oil.
- Due to scanty rainfall, rocky & uneven surface, it forms **bad land topography & dissected land**.
- It consists of the districts of Jehlum, Rawalpindi, Attock & Mianwali.

RELIEF FEATURES OF THE SALT RANGES:

- It is located to the south of the Mountainous North & lie between the River Indus & River Jehlum.
- Its avg.height is **900 to 1200m.**
- The Salt Ranges have a steep face towards the S & slope gently toward the Potwar Plateau in the N.
- The Salt Ranges consist of parallel ranges. Sakesar is the highest point (1527m).
- In some areas, bad land topography & dissected land have been developed.
- The Potwar Plateau & the Salt Ranges are rich in minerals like rock salt, gypsum, limestone, coal and oil. Khewra salt mine is also located here.
- It covers Jehlum , Kalabagh, Mianwali & Chakwal districts.

DRAINAGE OF POTWAR PLATEAU & SALT RANGE:

- **Soan** is the important river of **Potwar Plateau**, which produces large traces of alluvial plains.
- Soan & its tributaries have developed gullies & ravines to form typical bad land topography.
- They extend near the Jehlum river.
- The area is dominated by many depressions, salt lakes (Playa Lakes) & dissected land.
- Rivers like **Khewra, Makrachi (Salt Range)**, etc have cut the ranges deeply & have formed gorges. There is a fresh water lake KALLAR KAHAR in this area.

RELIEF FEATURES OF BALOCHISTAN PLATEAU

- It is located West of the Sulaiman-Kirthar mountains & covered with hills & mountains.
- It is divided into two parts by **Chaman & Ornachnal** faults.
- The western part is dominated with a number of sub-parallel ranges having **East-West trend**.
- Important ranges are Makran Coast Range, Central Makran Range, Siahan, Ras Koh, & Chagai.
- Ras Koh is the heighest peak (3003 m).
- **Kharan desert** is located in the Northwest.
- **Kallat Palateau** is located in the South of Quetta.
- **Khojak Pass** in the Chaman & Gonshero Pass in Chagai connect Pakistan with Afghanistan.
- **Khuzdar Knot** represents a complex folded area with many earth activities.
- **Low Lying Basin or Lobes:** There are many irregular depressions in this area called "Lobes", some of them are surrounded by mountains.
- **Low Lying Plateau:** Between Raskoh and Chagai hills there are many low lying Plateau which are the area totally devoid of vegetation with very less rainfall even in winter. Minerals are rich in these areas.

DRAINAGE PATTERN:

- The area is consisted of many non-perennial rivers except of Porali in South but it shrinks into a narrow channel when not fed by rain. Toba Kakar range has a number of basins.
- There are many Playa Lakes, Dry Lakes dominated by Inland Drainage.
- Dry Lakes remain dry throughout the year but have water only in rainy season.
- Locally it is called "**Hamuns**". The largest humun is **Hamun-I-Mashkal** while the others are **Humun-I-Lora & Hamun-e-Morgho.**
- The foothills sloping into the valley floor are dominated with alluvial fans.

MAKRAN COAST:

The length of Pakistani coast is about **700km** out of this 500km is under Makran coast starting from Karachi to East of Jiwani in the West. A notable break along the coast is Miani Lagoon near Sonmiani. It is a narrow beach backed by rock cliffs. Behind the cliff there is a coastal plain which is covered with sand dunes & small hills. There are a number of uplifted terraces from Clifton to Jiwani.

Briefly describe the relief features of THAR Desert

Sandy Plains, Sand Dunes /Ridges, Longitudinal (Kureshy) and Latitudinal (Khan), Upto 150 m high, Barren /bare rocks.

(c) (i) Explain how farming and industry is affected by the climate and topography of mountain areas such as the Karakorams. [6]

Farming

- Transhumance farming due to mountainous topography
- Fruit growing in mountain valleys due to milder climate
- Terracing of slopes to increase flat land for crop growing in valleys
- Storage of food for animals through the winter due to cold temperatures
- Lack of water in winter due to sub-zero temperatures
- Industry
- Small-scale due to difficult access through mountains
- Cottage industries due to cold temperatures in winter

(ii) Explain why travel by land and air is difficult in mountainous areas. [4]

- Roads and railways blocked especially in winter
- Surface damaged by ice and snow
- Steep slopes
- Flooding
- Air travel needs runways & Fog and ice limits air travel

PIEDMOUNT PLAINS:

- The Piedmonts plains cover an extensive area between the Sulaiman-Kirthar & the Indus River.
- They have been building by the **alluvial fans** developing along the rivers due to erosion.
- Most of the rivers rolling down the Suliman-Kithar become active only when rainfall takes place.
- The rivers flow down the mountains swiftly on reaching the foothills they lose their speed & drop part of their load within the stream, which split into numbers of narrow channel.
- These narrow channels become so over burdened that they die before they reach the Indus River towards which they flow.
- Some of the alluvial fans merge into one another & Piedmont Plains are dominated by the alluvial fans.
- The greater parts of piedmont plains have good soils & suitable topography for agricultural purposes but lack of rainfall & drought conditions are the main problem to turn area into agricultural region.

CUESTA:

- These are limestone ridges.
- They have one steep & other gentle slope.
- Rohri Cuesta in Sindh, Ganjo Takar in Hyderabad & Murli hills in Karachi are its main examples.

ROLLING SAND PLAINS & DUNES:

- An extensive area in the South East of Pakistan is covered with Rolling Sand Plains & Dunes.
- In upper Indus Plain this desert is called **Cholistan or Rohi.**
- In lower Indus plain especially in **Tharparkar** desert sand dunes are common features which are formed due to transportation of sand by wind.
- There are two main kind e.g. **longitudinal (Kureshi)** and **latitudinal (Khan)** sand dunes depending upon the direction of winds.

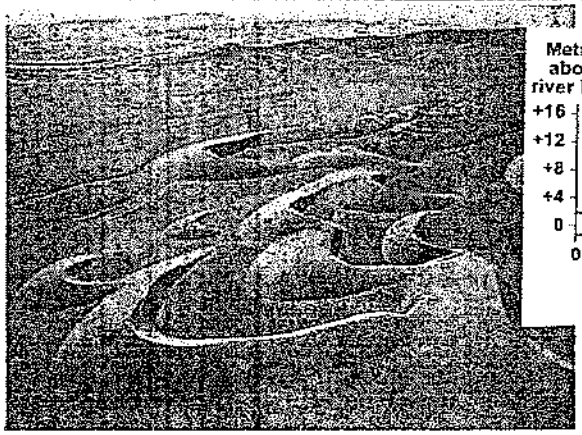
TIDAL DELTA:

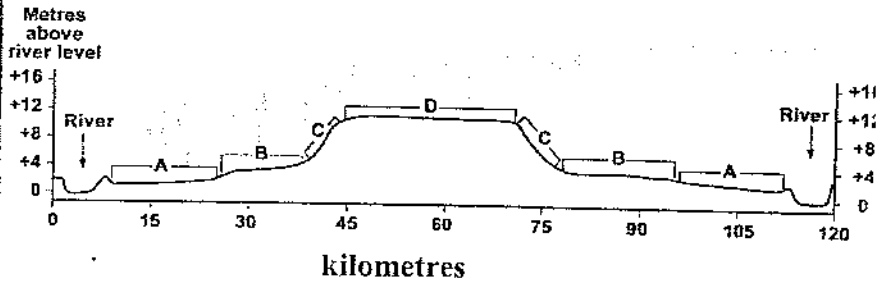
- To the South of Thatta when river Indus falls into Arabian Sea a tidal delta is formed which is triangular or fan shaped structure with many branches.
- Due to this swamp especially **mangrove swamps** are formed.
- The Delta is having old & present channels of the Indus & its distributaries.
- Creeks & Channels. The inland limit of the mud flats is marked by a Cliff which is important for agriculture.
- It is the 7th largest delta in the world which is famous for fish & shrimps.
- It is also having mud flats which are having Crabs.

EFFECTS OF INDUS DELTA ON THE LIFE OF THE PEOPLE:

- Little or no water for agriculture, domestic uses & so on.
- Little or no fertile soil due to advancement of the Arabian Sea.
- Low standard of living due to few jobs mostly fishing.
- Less facilities cause low population density.

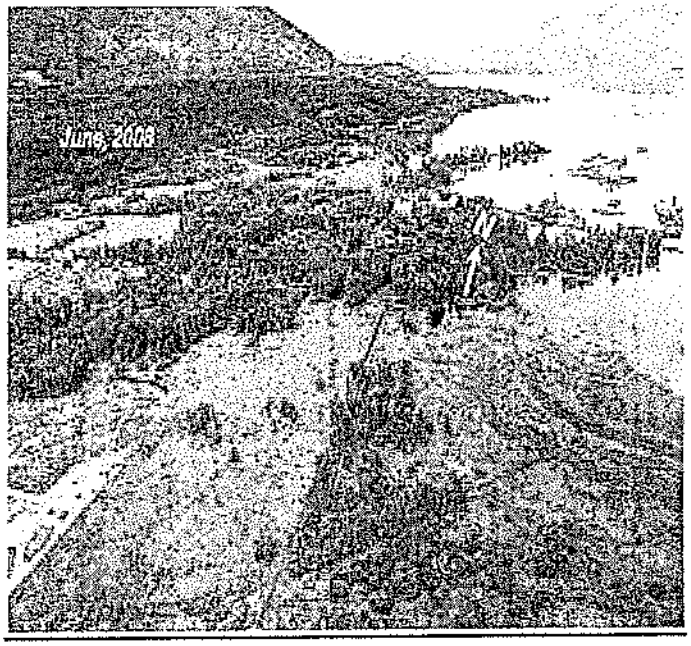
1) Draw the cross-section of DOAB. [4]
2) Label A,B,C & D. [4]
3) Relief features of Indus Plain. [8]
4) Relief features of Upper Indus Plain. [7]
5) Relief features of Lower Indus Plain. [6]
6) Compare the relief features of UIP & LIP. [5]
7) Compare the drainage of UIP & LIP. [5]
8) EFFECTS OF INDUS DELTA ON THE LIFE OF THE PEOPLE: [4]





SAN DUNES

ACTIVE FLOOD PLAIN



TIDAL DELTA

(d) What are the advantages and disadvantages of developing tourism in mountain areas? [5]

Advantages

- Increase local incomes
- Increase local infrastructure
- Opportunities for development
- Maintenance of local environment
- Preservation of local culture

- Disadvantages
- Cost of development
- Loss of local culture
- Small scale clearing of land
- May not be successful

[Max 3 if an answer only considers advantages or disadvantages]

(d) Explain how topography and drainage cause problems for farming in Balochistan. [4]

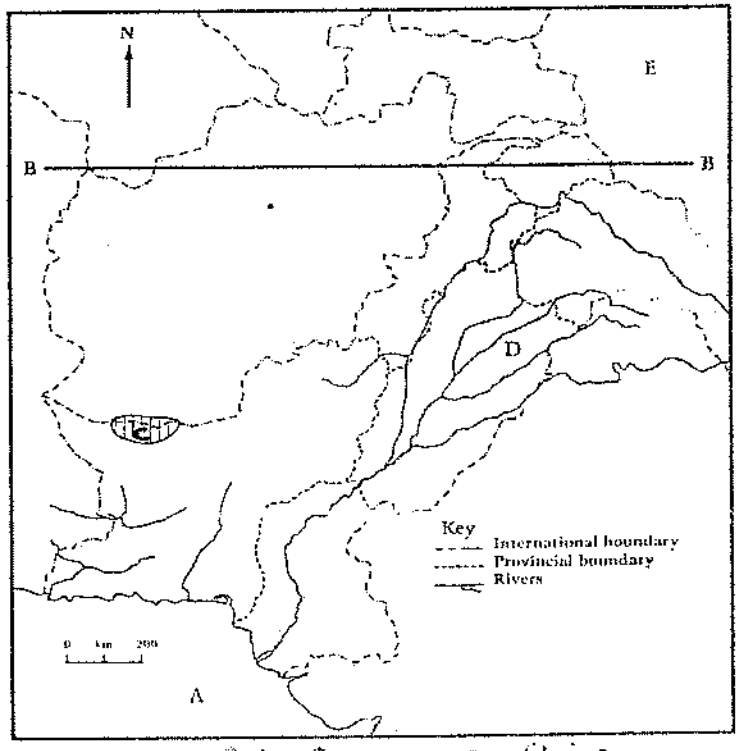
Topography (res.1)

Candidate needs to link these to problems of farming in Baluchistan (i.e. Not the Indus Plain)

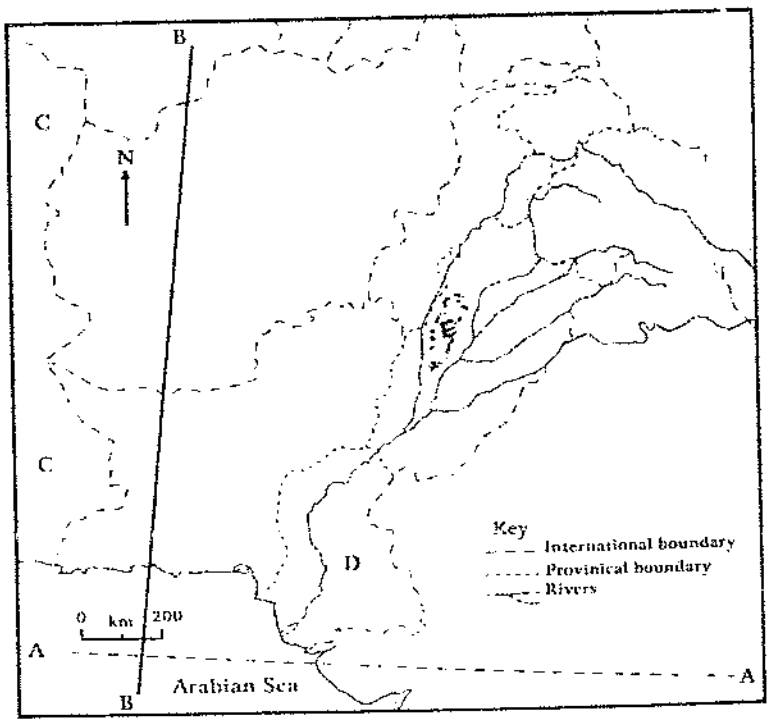
For example:

- lack of fertility, soil erosion, use of machinery, irrigation
- mountains
- plateaux
- steep slopes
- stony soil
- thin soil
- barren land
- 'mountains/rugged topography unsuitable for farming' max. 1

- Drainage (res.1)
- Again, candidate needs to link these to problems of farming in Balochistan.
- inland drainage basins/salt lakes
- few/small rivers
- rivers dry up/evaporate
- much percolation/loss of water through soil
- 'lack of water for farming' max. 1



A - Arabian Sea E - China
B - 36°N Equator
C - Chagai Hills
D - Chenab

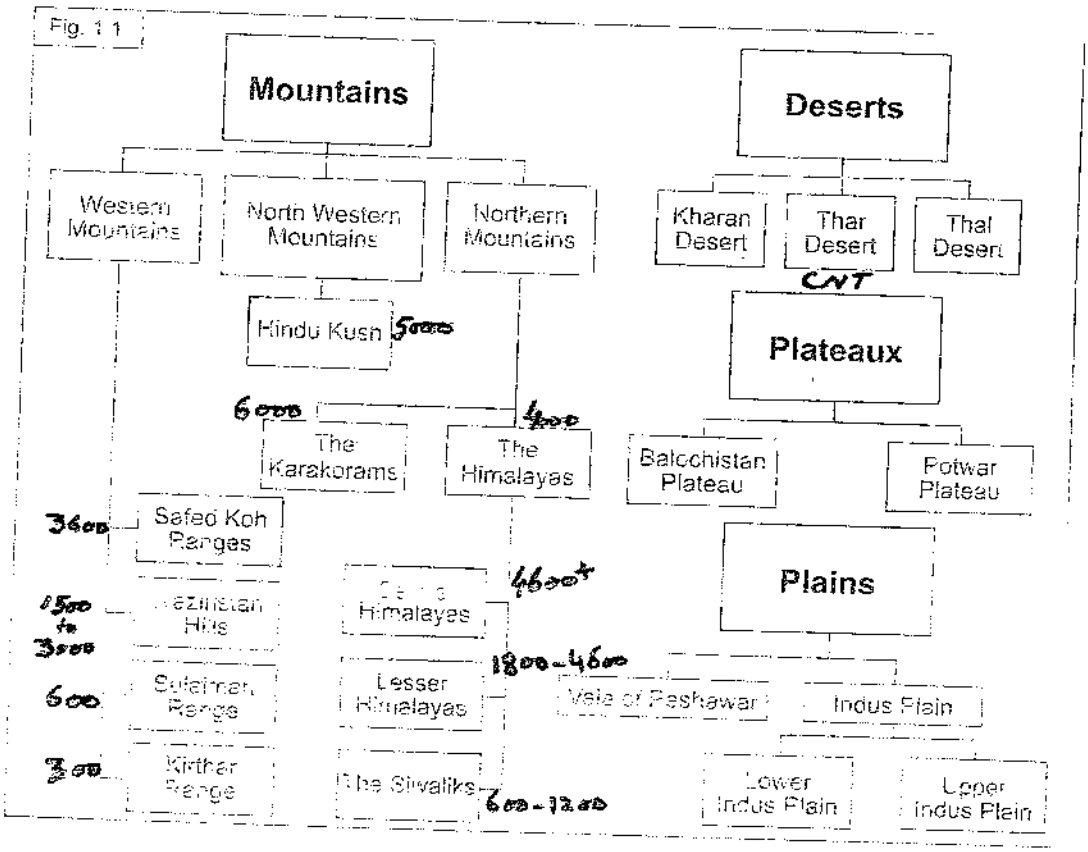


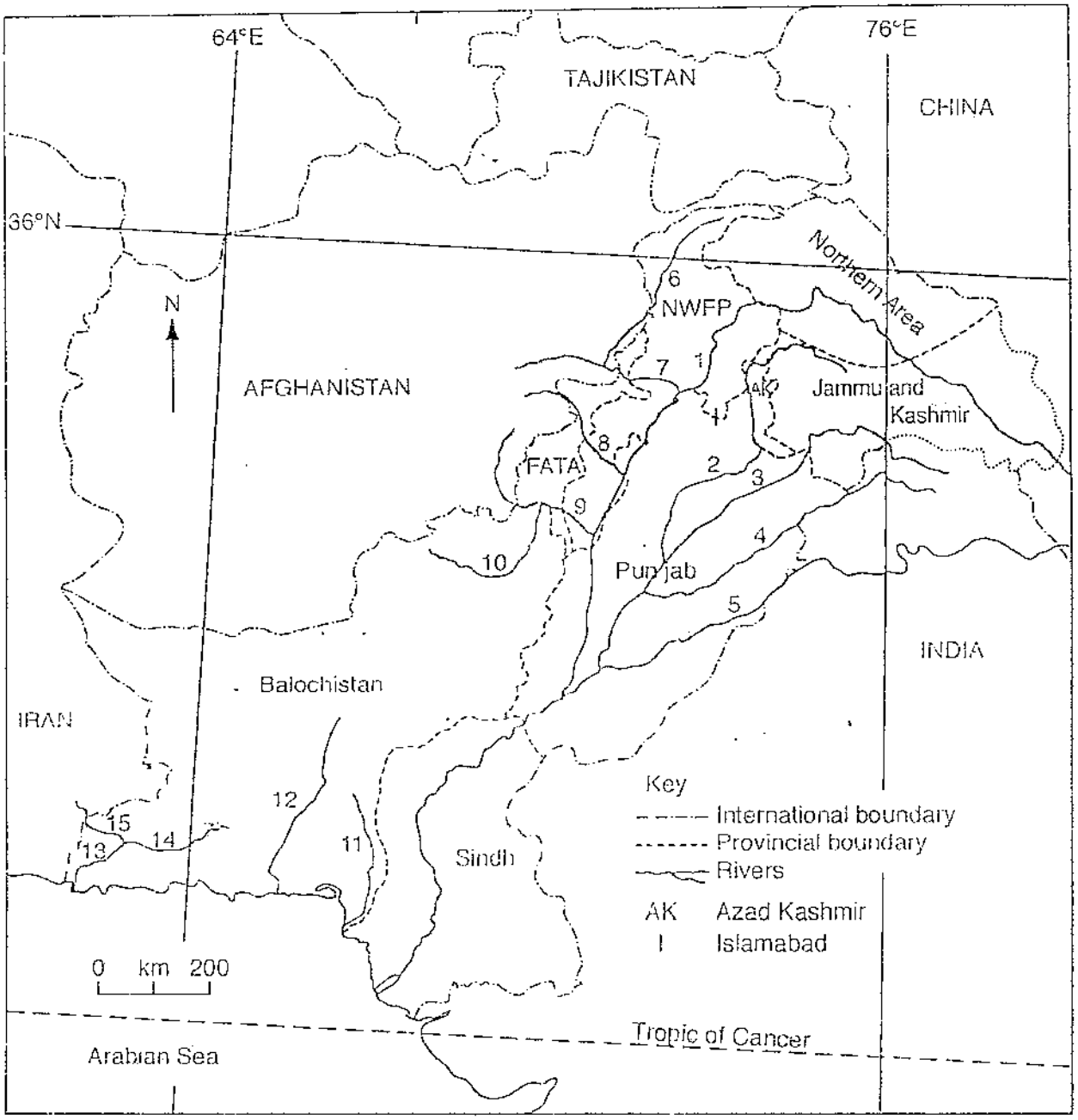
A - Tropic of Cancer
B - 68°E
C - Iran
D - Sindh
E - Tibet

Fig. 0.1


64°E
68°E
72°E
76°E
TAJIKISTAN
CHINA
N
36°N
Gilgit
Chitral
Northern Areas
Mingaora
Skardu
Peshawar
N W F P
AFGHANISTAN
Islamabad
AJK
Jammu and Kashmir
(Disputed territory)
FATA
Rawalpindi
Jhelum
Sialkot
Gujranwala
32°N
Faisalabad
Lahore
Punjab
Quetta
Multan
INDIA
Balochistan
28°N
IRAN
Sukkur
Sindh
Gwadar
Karachi
Hyderabad
Arabian Sea
0 km 200
Tropic of Cancer
23½°N
Key
International Boundary
Provincial Boundary
Balochistan
Sindh
Punjab
NWFP
FATA
Northern Areas
Azad Kashmir (AJK)
Cities
Rivers

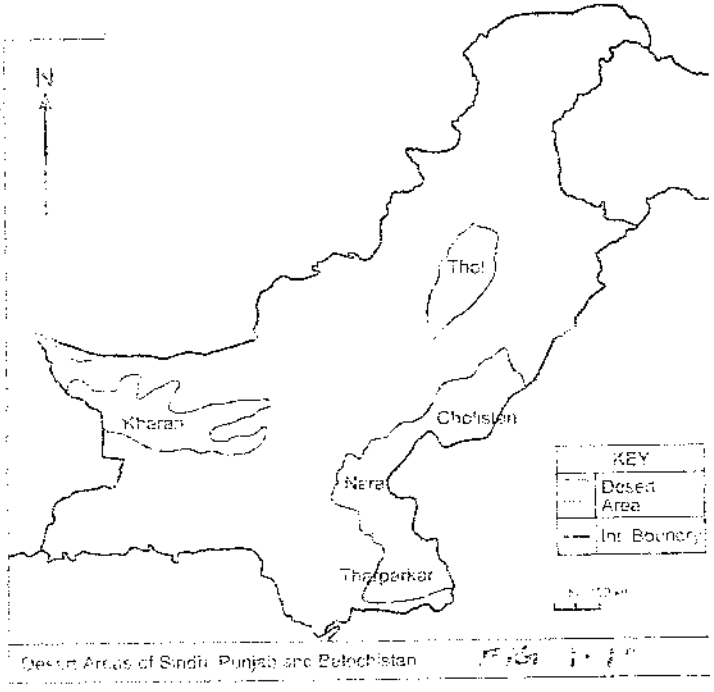
Fig. 1.1


Mountains
Deserts
Western Mountains
North Western Mountains
Northern Mountains
Kharan Desert
Thar Desert
Thal Desert
CNT
Hindu Kush
5000
Plateaux
6000
4000
The Karakorams
The Himalayas
Balochistan Plateau
Potwar Plateau
3600
Safed Koh Ranges
1500 to 3000
Himalayas
4600+
Plains
600
Sulaiman Range
Lesser Himalayas
1800-4600
Vale of Peshawar
Indus Plain
300
Kirthar Range
The Siwaliks
600-1200
Lower Indus Plain
Upper Indus Plain

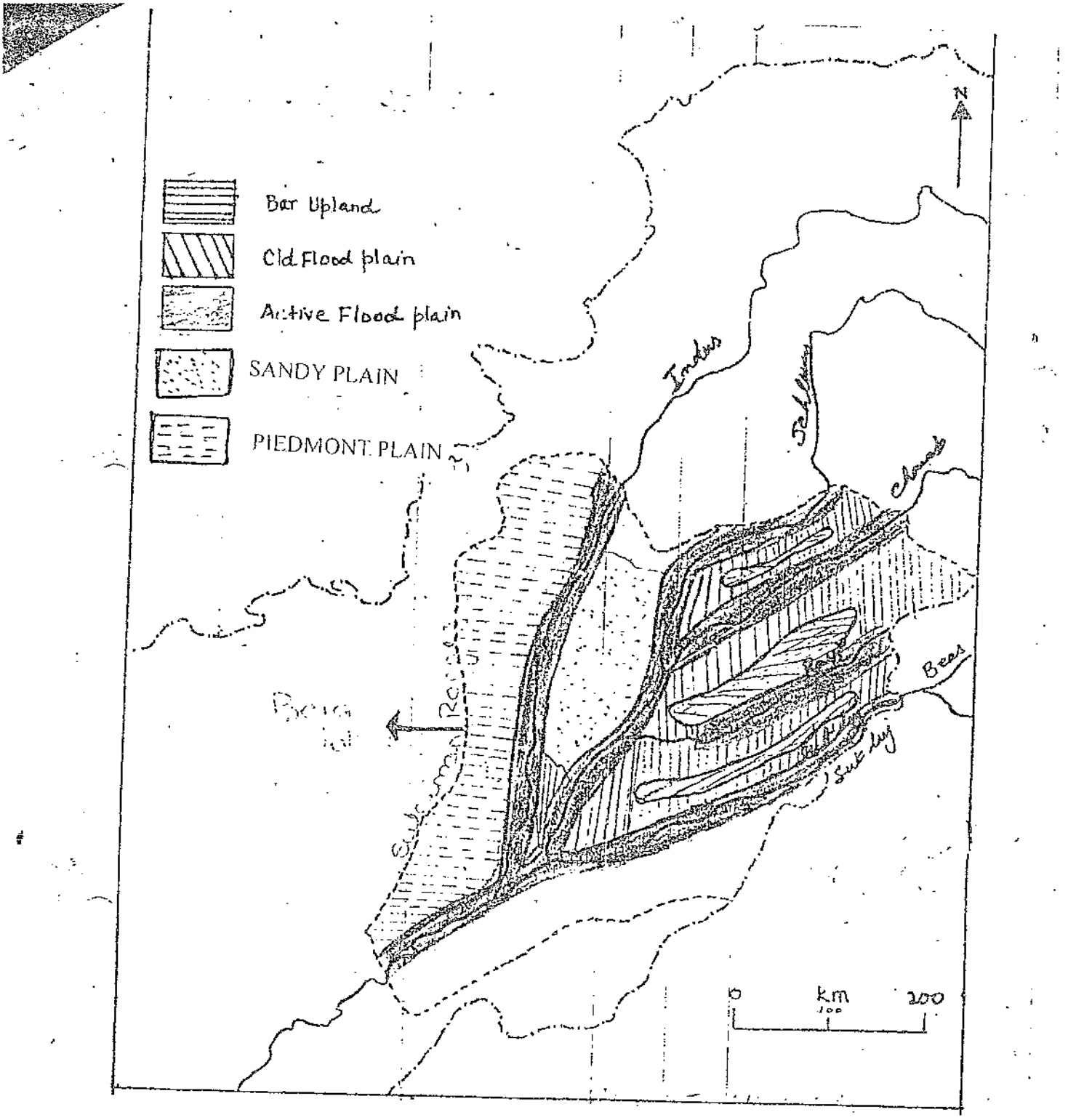


Key for Rivers

1	Indus	6	Mastuj	11	Hab
2	Jhelum	7	Kabul	12	Hingol
3	Chenab	8	Kurram	13	Dasht
4	Ravi	9	Gomal	14	Kech
5	Sutlej	10	Zhob	15	Nihing

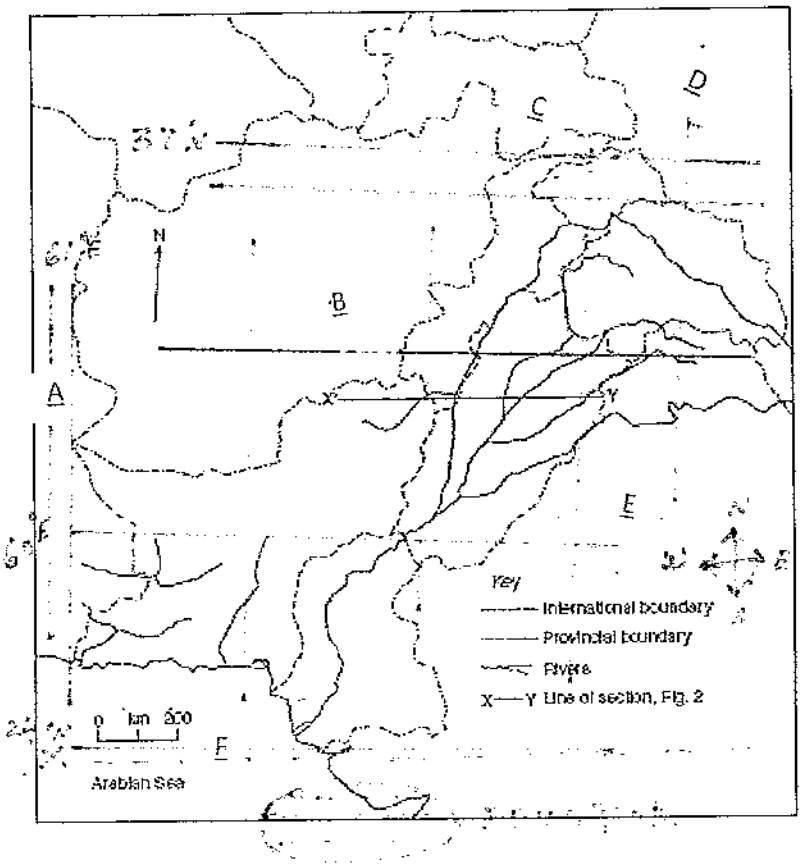


Desert Areas of Sindh, Punjab and Balochistan



Barupland:	Doabs	River
–	Sindh Sagar	Indus – Jhelum
Kirana Bar	Chaj Doab	Jhelum – chenab
Sandal Bar	Rachna doab	Chenab – Ravi
Nili & Ganji Bar	Bari Doab	Ravi – Sutlej/Beas

LATITUDE & LONGITUDE



NEIGHBOURING COUNTRIES

A=Iran

B= Afghanistan

C= [illegible]

D= China

E= India

F=(SEA) Arabian Sea

RIVERS

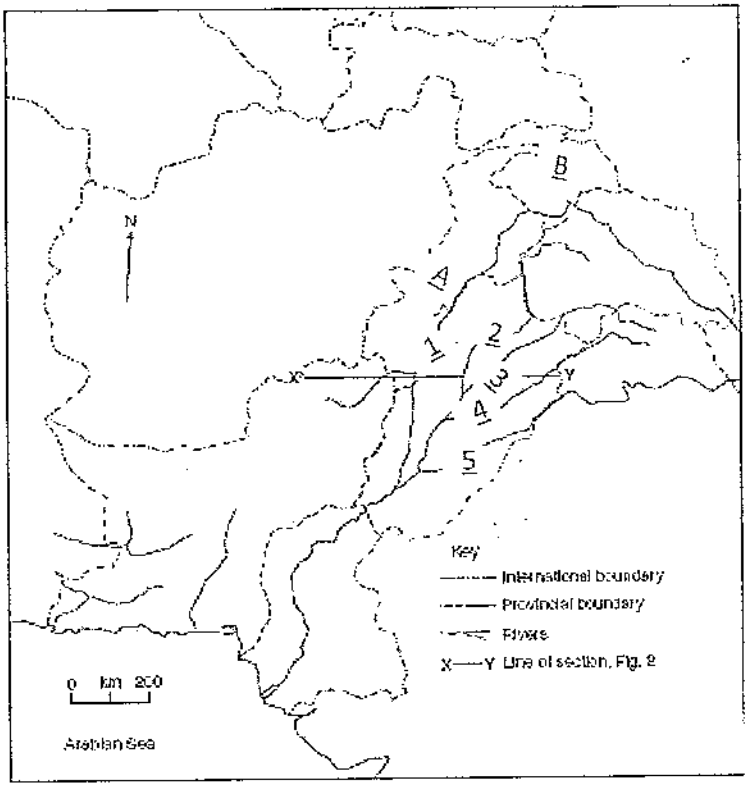
1= Indus

2= [illegible]

3= [illegible]

4= [illegible]

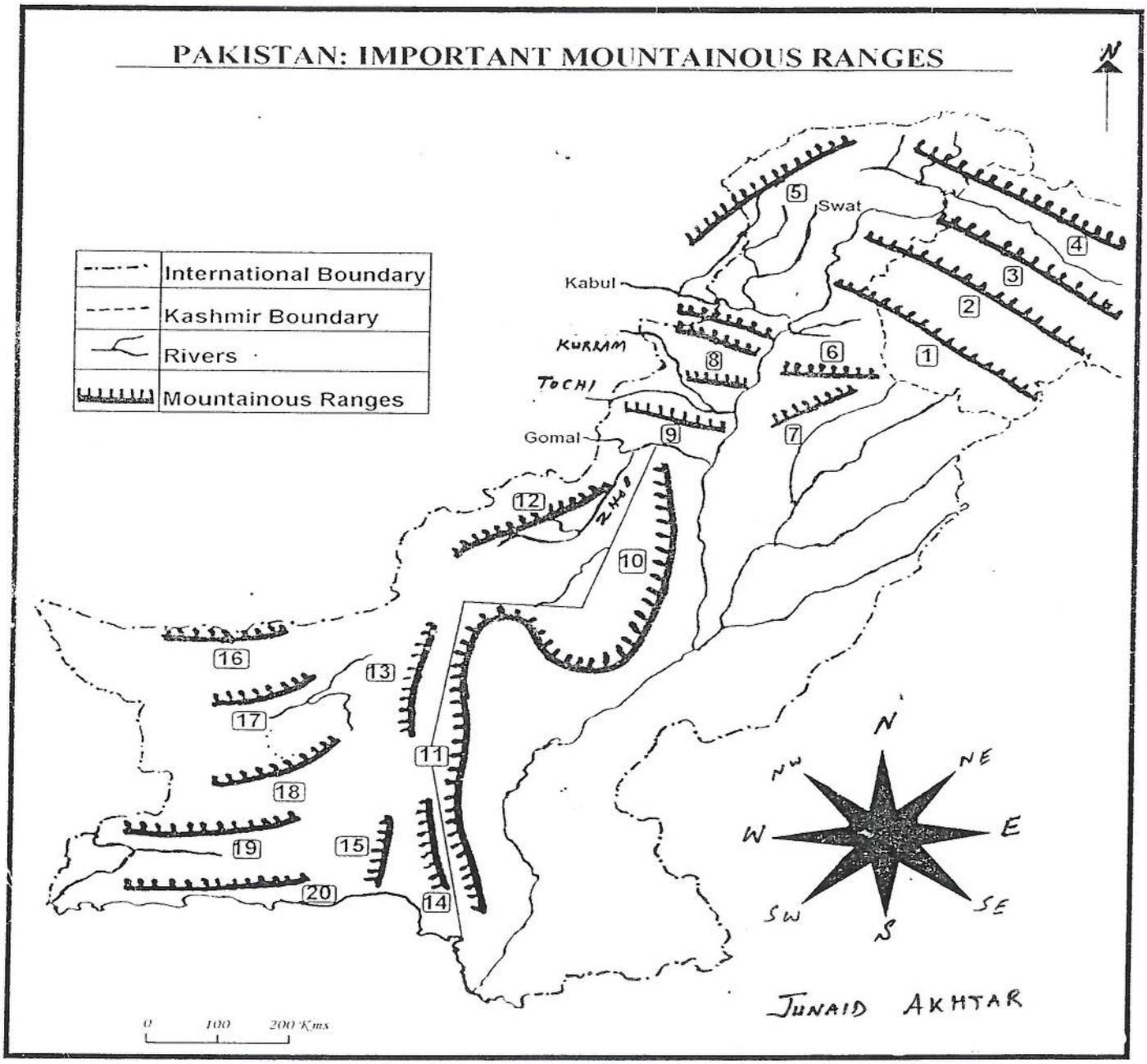
5= Sutlej



ADMISTRATIVE DIVISIONS

A= FATA

B= [illegible]



1	Siwaliks	6	potwar plateau	11	kirthar	16	Chagai
2	lesser Himalayas	7	salt range	12	toba kakar	17	raskoh
3	greater Himalayas	8	safed koh	13	central brahvi	18	Siahan
4	Karakoram	9	waziristan	14	Pab	19	central Makran
5	Hindukush	10	Suleman.	15	Hala	20	coastal makran

Latitude
24°N - 37°N
Longitude
61°E - 76°E

FATA: Federally administered Tribal Areas.
FANA: Federally administered Northern Areas

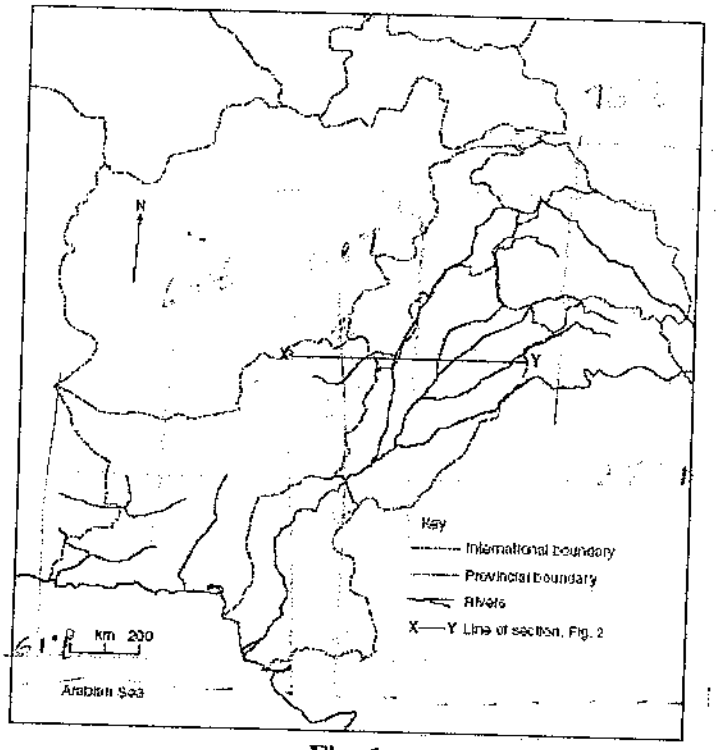
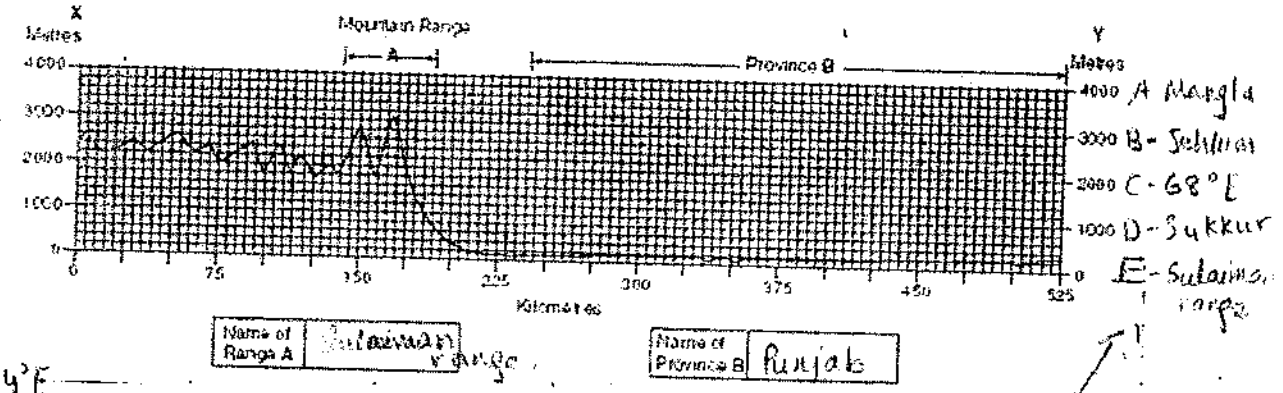
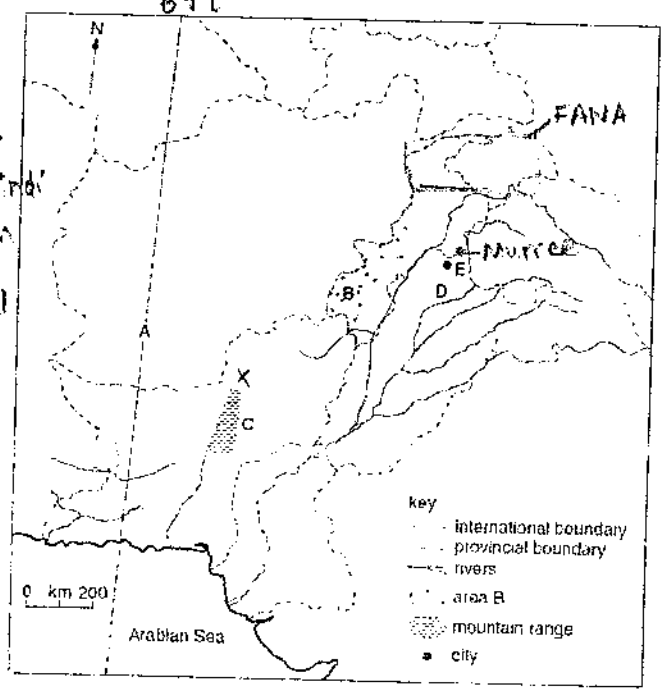
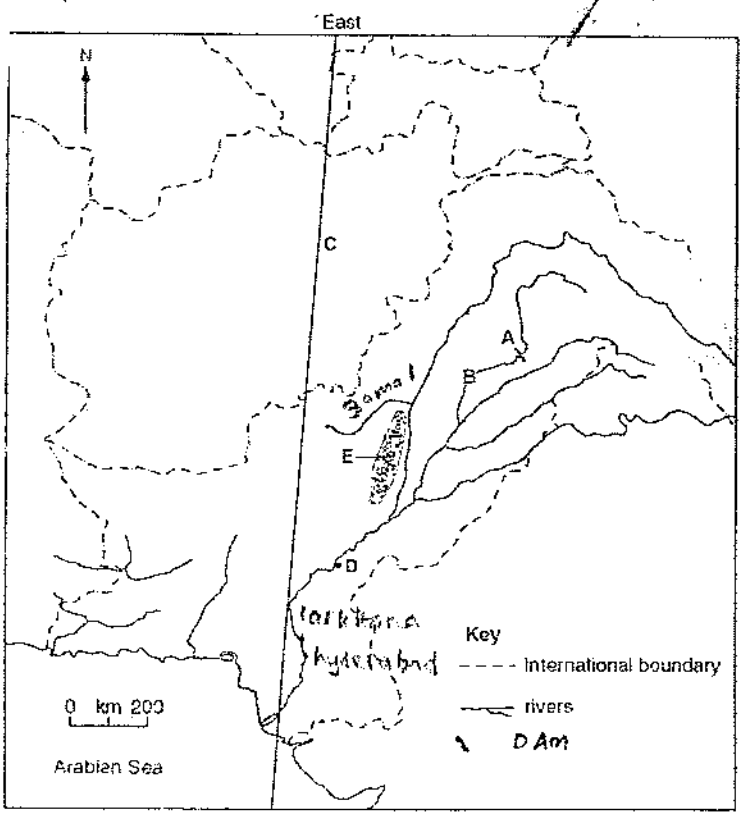


Fig. 1







CLIMATE OF PAKISTAN

Climate & Weather:- The Climatic conditions such as humidity, rainfall, sun shine etc. for a long time period. While these conditions for current situation is called **Weather.**

Evaporation: Removal of water in the form of vapours from water bodies like sea, rivers, lakes etc.

Transpiration: Removal of water in the form of vapours from plants.

Evapotranspiration (Evaporation & Transpiration)

The volume of water evaporated (conversion of water into steam) & transpirated (removal of water from plants due to heat) from water, soil & plant surfaces per unit land area.

Actual Evapotranspiration (PET): Actual evaporation plus transpiration depending on temp. & water.

Potential Evapotranspiration (AET): Current status of evaporation plus transpiration depending on temp. & water.

Arid Areas: - Areas, which receives rainfall **less the 250mm**. OR

The potential evapotranspiration (PET) exceeds by actual evapotranspiration (AET) by more than two times in Arid Areas.

Semi-Arid Areas: - Areas, which receive rainfall between **250mm-750mm** per year. OR

The potential evapotranspiration exceeds actual evapotranspiration (AET) by less than two times in Semi-arid Areas.

Humid Areas: - Areas, which receive the rainfall **more than 750mm** per year.

The potential evapotranspiration(PET) is very less than actual evapotranspiration (AET).

Annual Temp. Range. The difference between the temp. of hottest month & temp. of coolest month. If the annual temp range is 20 *C or more than 20 *C then it is said to be 'High Annual Temperature Range' otherwise it is called low.

Daily Range: - The difference between the temp. of day & night.

Isohyets: Imaginary lines joining places receiving an equal amount of rainfall.

Precipitation: Rainfall, Snow or Hail.

Temperature Inversion Layer: Due to deserts and sea there is a hot layer on the surface which reduces the moisture of the winds.

Oceanic Influence: - The effects of ocean on the climate of the areas, which are near the sea. Like these areas experience less intensity of summer and winter.

Continental Effect: - The land body heats up rapidly & cools down rapidly so the difference between the temp. due to this effect of solid body.

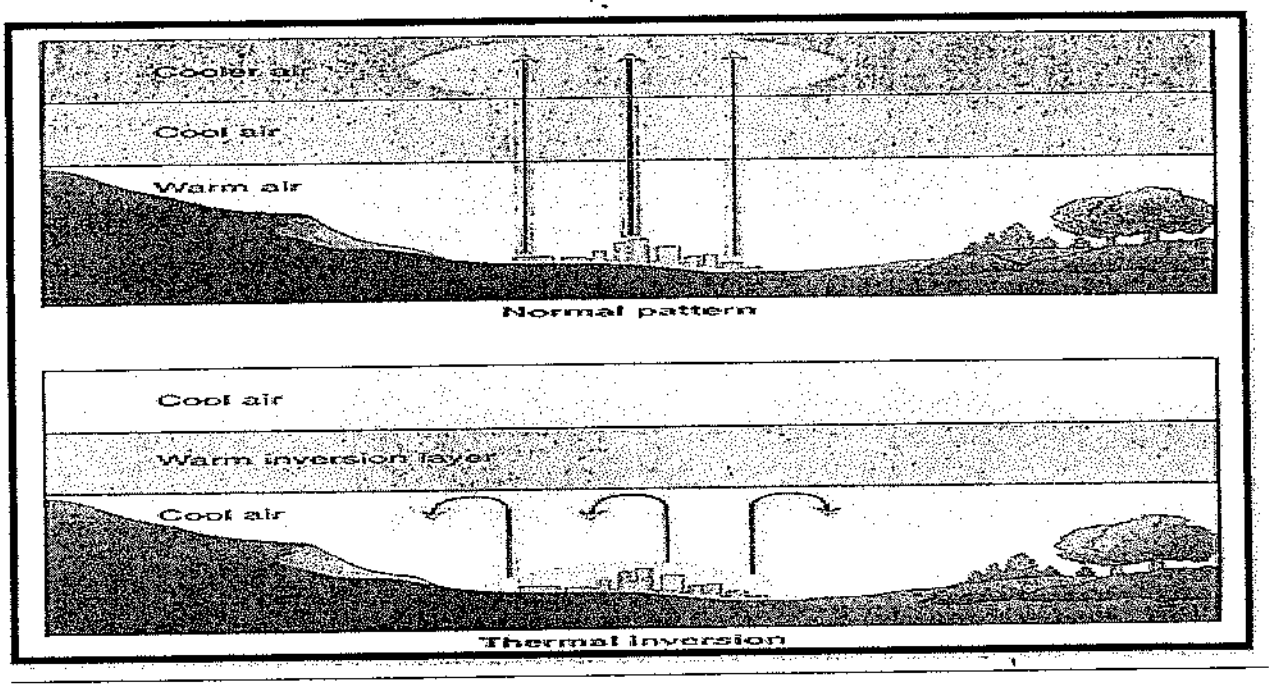
Altitude factor: It is experienced at mountainous areas where there is less intensity of summer due to height.

RAINFALL SEASONS/SOURCES IN PAKISTAN

A) **Summer Monsoon** (July-September): Low pressure is the main reason of Monsoon. In Summer Sindh becomes the lowest pressure zone in the world.

- **July to September**
- **Land is heated**
- **Evaporation & transpiration**
- **Cools, Condensation & cloud formation**
- **These winds blow from Bay of Bengal.**
- **After covering a long journey from Bangladesh & India its tail end reaches Pakistan.**
- **Bay of Bangal becomes the High Pressure Zone & Sindh Lowest Pressure Zone.**
- **These winds also blow from the Arabian Sea in Karachi area but there is no rainfall due to these weak winds.**
- **In Pak Max. Punjab (MSM) & Less in Sindh (SSM).**
- **Specialty of Plain Areas. Precipitation in the form of Rainfall.**

These winds also blow from the Arabian Sea in Karachi area but there is little or no rainfall due to these weak winds & **temp. inversion layer.**
There is very less rainfall in Karachi than Lahore due to the fact that Lahore receives early part (MSM) of it while due to long journey its tail end (SSM) reaches to Karachi. Lahore is having more evapotranspiration than Karachi. Lahore is higher than Karachi so more rain.



B) Western Depressions/ Disturbances:

It originates from **Mediterranean Sea** and covers a long journey from Iran, Afghanistan then its tail end reaches to Pakistan. Its main part causes rainfall in **mountain regions** specially in KPK (Peshawar).

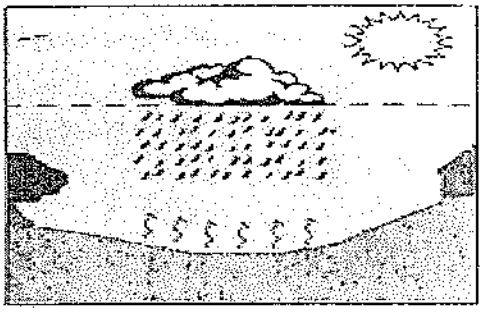
- **December to March.**
- **Land is heated**
- **Evaporation & transpiration**
- **Cools, Condensation & cloud formation**
- **It originates from Mediterranean Sea.**
- **It covers a long journey from Iraq, Iran, Afghanistan then reaches Pakistan.**
- **Max. in KPK (Peshawer)**
- **Less In Balochistan (Quetta)**
- **In Balochistan known as GOORICH and in Karachi known as Quetta Waves.**
- **Causes rainfall in mountain regions specially in Quetta & Peshawar.**
- **Precipitation in the form of Snow and Hail.**

There is more rain in Peshawer than Quetta because of Height, it receives main part of these winds and more evapotranspiration than Quetta. Peshawer is a valley and Quetta is rain shadow due to Central Brahvi ranges. Peshawer is having more plantation than Quetta which is arid.

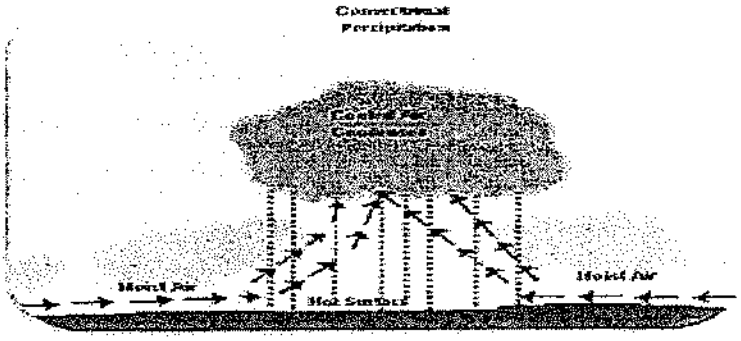
C) Convectional Currents:

Convection is the process in which hot air rises up which contains much moisture and its place is taken by air when it reaches the higher layers it causes rain fall with dust storms and thunderstorms. It takes place only in Northern & Northwestern areas while Southern areas don't receive it due to a temperature inversion layer. Peshawar and Rawalpindi receive most of its rainfall by this in early summer.

Convectional rainfall



Convectional rainfall forms due too heating of the ground by the sun. As the air close to the ground is heated it becomes lighter and begins to rise. When the air rises it begins to cool and condense. As the water vapour condenses back to water droplets, clouds are formed. As the clouds grow bigger it starts to rain.



D) **Relief Rainfall:** When moist unstable air moves upward it causes rainfall especially in mountain areas due to altitude factor. The **windward** side receives more rainfall while **leeward** side receives less rain and called **RAIN SHADOW AREA.** In Pakistan rain shadow areas are Quetta, Gilgit & Chitral. It takes place in northern and northwestern areas due to chilling, which causes condensation and precipitation.

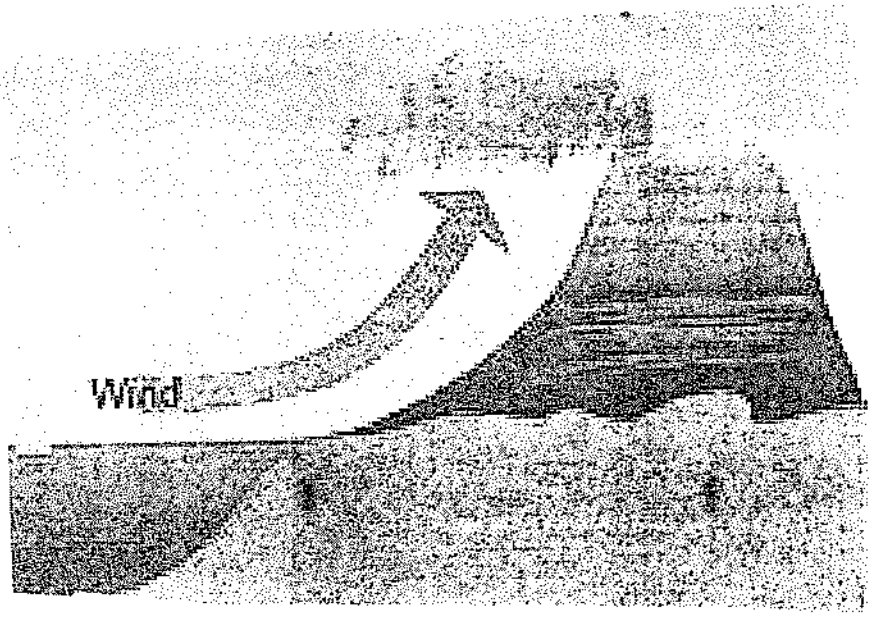
Relief Rainfall

Stage 1.
Warm wet air is forced to rise over high land.

Stage 2.
As the air rises it cools and condenses. Clouds form and precipitation occurs.

Stage 3.
The drier air descends and warms.

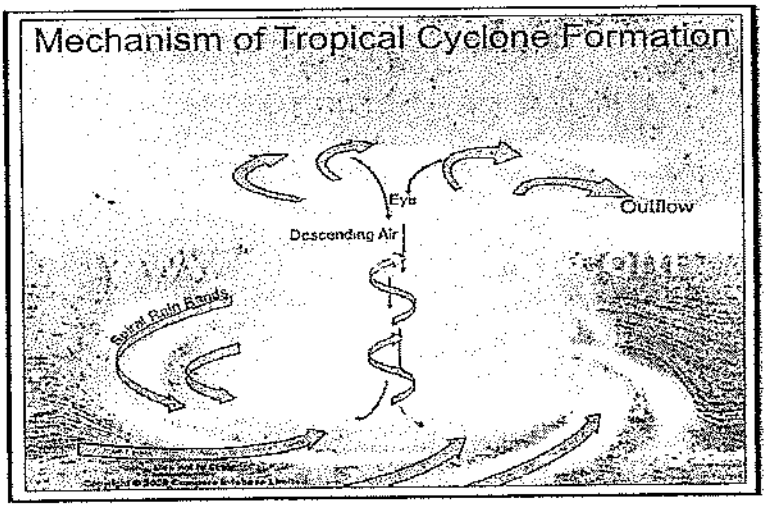
Stage 4.
Any moisture in the air



E) **Thunderstorms** (April-June) (October-November): They are common in northern and northwestern areas of Pakistan, the atmospheric pressure falls and convectional currents rising to 6000m where anvil-shaped cumulonimbus clouds are formed cause rainfall with strong winds along with stormy rainfall and hails for a short time period. They are associated with pre-monsoon & post monsoon period. In summer monsoon some areas of Balouchistan also face dust storms and strong winds. Tropical cyclones from Arabian Sea can also cause rain and wind storms in the coastal areas of Sindh & Balouchistan. **JUNAID AKHTER 0300-2187567**

Tropical Cyclone

A cyclone is a low atmospheric pressure zone where wind flows inward spiral direction, which is anti-clockwise in northern hemisphere.



EFFECTIVENESS OF RAIN FALL IN PAKISTAN:

The major sources of rainfall in Pakistan are Summer Monsoon & Western disturbances. The Monsoon winds are not so much effective because of unreliable amount, untimely rain fall and scanty rain in many areas. It usually causes floods which destroys the crops in many areas. It usually comes in the form of heavy showers which also destroys the crops. In summer there is very high intensity of heat which reduces the moisture in the winds. Its most of the water is wasted except some of the amount which is stored in the reservoirs.

The amount of rainfall in winter is useful for Rabi Crops because it comes in light showers for a long time period but its amount is very less. So we can say that rain fall in Pakistan is only effective in Barani farming areas like Potwar Plateau & Northern areas which are not the main farming zones.

TEMP. RANGES IN PAKISTAN

Temperature	Description
32 *C & Above	Hot (S+)
21 *C –31 *C	Warm(S-)
10*C –20 *C	Mild(W-)
0 *C – 9 *C	Cool(W+)
Below 0 *C	Cold(W+)

CONTROLLING FACTORS OF PAKISTAN'S CLIMATE

- The subtropical location (20 N to 40 N), Pakistan (24N to 37 N) this tends to keep the temperature high particularly in summer.
- The oceanic influence of the Arabian Sea keeps down the temperature contrast between summer and winter at the coast.
- The continental effect, the differences in the temperature between the summer & winters in the interior of the country.
- The higher altitudes in the west & north keeps down the temperature throughout the year in the extreme north because of great heights the mountains top freezing temperature all the year round .the hills and mountain also attract rain.

- The monsoon winds, which come in July, continue to below up till September bring rainfall Pakistan receives tail end of the monsoon therefore the monsoon is neither prolonged nor as wet as that in India.
- The western depression originating from the Mediterranean region & entering Pakistan from the west after crossing Iran & Afghanistan bring rainfall in winter (December-march). These cyclones make a long land journey before coming to Pakistan & thus robbed most of their moisture by the time they reach Pakistan.
- Thunderstorms cause some amount of rainfall particularly in north, Convectional rain takes place in the north of Pakistan but not in south due to temp. Inversion layer and Relief rainfall in northern & northwestern areas.

INTERPRETATION OF CLIMATIC DATA

Karachi:

Month	J	F	M	A	M	J	J	A	S	O	N	D	
Temp. (C)	18	20	25	28	31	31	30	29	27	28	24	20	
Prec. (mm)	08	13	05	02	09	01	101	48	23	03	03	06	222mm Annual

- The hottest months of Karachi is June (31 *C).
- Karachi experiences warm to hot summer.
- The coolest month of Karachi is January (18 *c).
- Karachi experiences mild winters.
- It neither experiences extreme Summer nor extreme Winter due to **Oceanic Influence.**
- Annual range of temperature in Karachi is low. (31- 18 = 13)
- Maximum amount of rainfall is recorded in July (101 mm) due to summer monsoon.
- Karachi comes in the Arid Zone of Pakistan.(Less than 250 annual rain)
- In Karachi the potential evapotranspiration exceeds actual evapotranspiration by more than two times.
- Humidity is high.

Sibi.

Month	J	F	M	A	M	J	J	A	S	O	N	D	
Temp. (C)	14	17	23	30	35	38	37	35	33	28	21	16	
Prec. (mm)	17	18	18	06	04	07	38	20	05	01	05	06	145mm Annual

- The hottest month in Sibi is June (38 *C).
- Sibi experiences hot summer.
- The coolest month in Sibi is January (14* c).
- Sibi experiences mild winters.
- It has extreme summer due to **continental effect.**
- The annual & daily range of temperature in Sibi is high.
- Maximum amount of rainfall is recorded in the month of July (38 mm) due to summer monsoon.
- Sibi comes in the Arid Zone of Pakistan.
- The potential evapotranspiration exceeds actual evapotranspiration by more than two times.
- Humidity is low.
- Drought conditions prevail in the summer season.

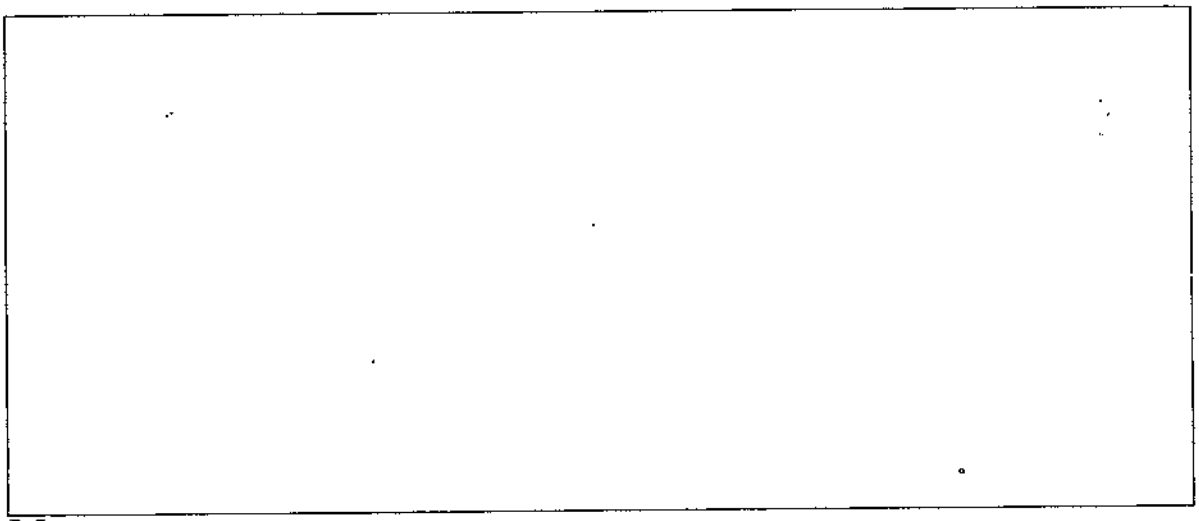
Quetta

Month	J	F	M	A	M	J	J	A	S	O	N	D	
Temp. (C)	04	06	11	16	20	24	27	25	20	14	09	05	
Prec. (mm)	52	53	43	18	10	04	21	09	01	03	05	25	**244mm Annual**

- The hottest month of Quetta is July (27 *C).
- Quetta experiences warm summer.
- The coolest month of Quetta is January (4* C).
- Quetta experiences cool winters due to **altitude factor**.
- Annual range of temperature in Quetta is high (27- 04 =23).
- Maximum amount of rainfall is recorded in February (53 mm) due to western depression.
- As the rainfall season comes in the winter season, most of the precipitation in the form of snow.
- Quetta comes in the Arid Zone of Pakistan.
- In Quetta the potential evapotranspiration exceeds actual evapotranspiration by more than two times.
- Humidity is low.

Peshawar

Month	J	F	M	A	M	J	J	A	S	O	N	D	
Temp. (C)	11	13	17	23	30	33	33	31	29	27	17	13	
Prec. (mm)	37	41	65	42	15	07	34	41	14	10	10	15	**331mm Annual**



Muree

Month	J	F	M	A	M	J	J	A	S	O	N	D	
Temp. (C)	03	04	08	14	18	21	20	19	18	14	10	06	
Prec. (m.m)	120	112	115	106	62	107	362	352	134	53	21	54	**1640** mm **Annual**

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EFFECT OF CLIMATE IN HIGHLAND AREAS ON LIFESTYLE & ECONOMY.

In northern areas temp. falls below freezing point &during winter farming is not possible. People are involved in indoor activities like carpet weaving, embroidery work/pottery etc. Nomadic life is common in winter people come down with families and cattle while in summer go back to mountains population is less due to barren hills of NWFP. Nomadic herdsmen keep goats & sheep & sell milk meet & skin. Peshawar is the greenest part with woodland, orchards & irrigated fields. In extreme north many areas are not accessible due to landslide & snowfall. Job opportunities are limited & economic activities are difficult to carryout.

EFFECT OF CLIMATE ON THE LIVES AND ECONOMY OF PEOPLE OF THAR.

It is very hard to work in the daytime in summer season. Lack of rainfall causes shortage of water. In summer season drought conditions prevail cause destruction crops, man & animals die, which results in migration from Thar Desert. sandstorms damage small huts & houses. The people move from place to place in search of water. Famine also prevails.

EFFECT OF SEASONAL VARIATIONS ON LIFE STYLE & EONOMIC ACTIVITIES IN COASTAL AREAS. Coastal areas experience oceanic influence that's why they enjoy mild winter & warm summer. Rainfall is scanty & mostly due to summer Monsoon, which has no importance for crops. People can use the ports throughout the year so they lead a settled life. Life is easy & there are many job opportunities e.g. industries & factories are there in Karachi. Fishing is an important occupation & there are many facilities in Karachi & Makran coast. Standard of living in Karachi is high, due to more jobs & settled life.

EFFECT OF CLIMATE ON THE LIFE OF THE PEOPLE

AREA				
CLIMATE				
JOBS				
SETTLEMENT				
ST. OF LIVING				
POP. DENSITY				

FLOODS:

REASONS:

1) Melting of snow from top mountains due to summer.
2) Heavy rainfall due to monsoon or any other source.
3) Deforestation on the foothills of mountain gives rise to erosion.
4) Weak embankments on the rivers.
5) India releases water towards Pak.

DISADVANTAGES

1) The land cannot be used for a long time for farming.
2) Destruction of crops.
3) Loss of animal and human life.
4) Mud houses are destroyed.
5) Infrastructure facilities are destroyed.
6) Unmetalled roads cannot be used

ADVANTAGES:

1) Floods bring alluvium, which increases the fertility of land.
2) Reservoirs are filled with water, which can be used afterwards.
3) The salt from salinity facing areas is removed.

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PREVENTIVE MEASURES:

- Afforestation at the foothills of mountains to avoid soil erosion.
- River channels should be enlarged.
- Embankments on the rivers should be strong.
- Reservoirs should be made on the rivers to store water.
- Houses should not be built on the areas face floods usually.
- Forecast of the floods should be done through media and so on.
- Rehabilitation of the affected people should be done promptly.

TYPES OF DROUGHT:

Permanent Drought: When the crops cannot be cultivated due to lack of water e.g. Thal, Chagai.
Seasonal Drought: Due to less rainfall & long dry spells e.g. Salt range.
Invisible Drought: Due to less availability of water, this reduces crop production.
Unpredictable Drought: Due to unexpected low rainfall especially in humid areas.

CAUSES OF DROUGHT:

*Unreliable Summer Monsoon rain, Dry & hot winds reduce moisture in the air, worldwide climatic changes also cause droughts. These are natural factors while deforestation in the mountainous areas causes soil erosion, seepage of water causes water logging & salinity, over grazing of land due to poor farming practices and misuse of water are human factors which cause droughts.

EFFECTS OF DROUGHTS:

In many areas of Sindh & Baluchistan over 3 million people have been effected, many people have been died due to thirst & hunger, live stock farming has been destroyed due to death of many animals. long dry spells & water logging & salinity have converted the cultivable land into barren areas.

CLIMATIC ZONES OF PAKISTAN

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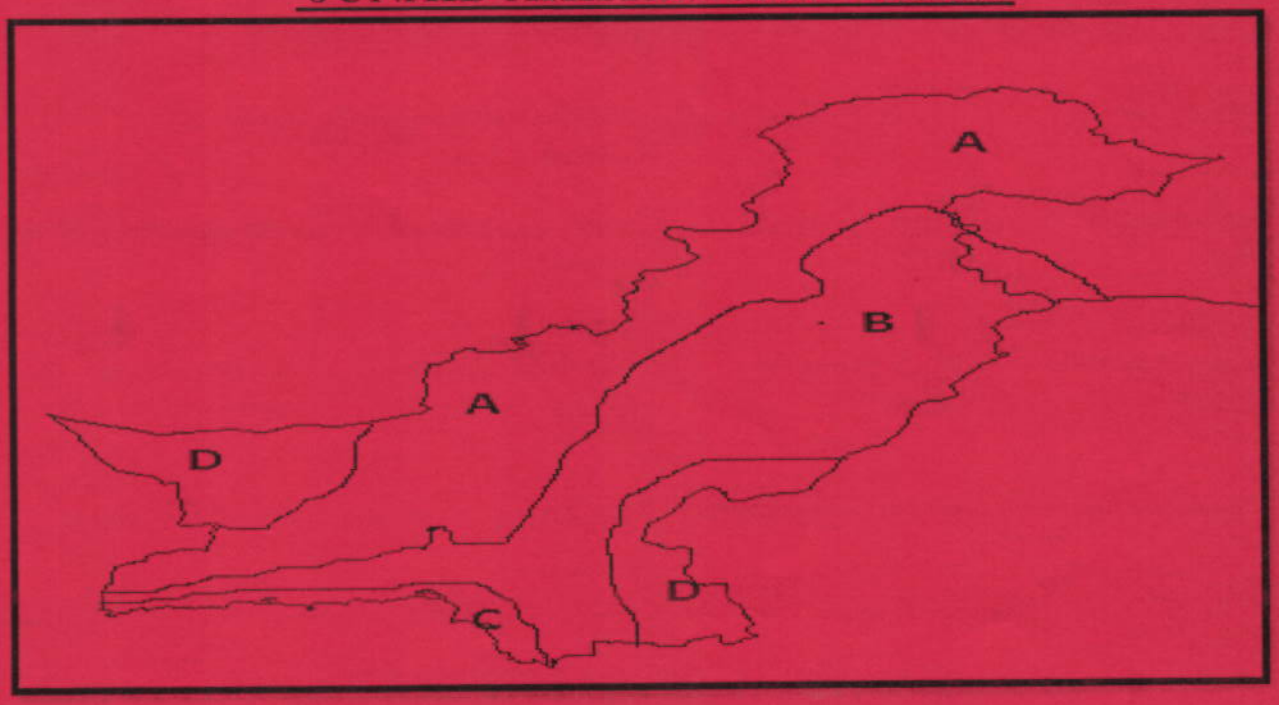

CLIMATIC ZONES OF PAKISTAN

HIGHLAND	LOWLAND	COASTAL	ARID
N & NW areas	Indus plain excluding deserts & coastal areas	Sindh & Makran coastal areas	Desert areas of Thal, Thar & Kharan
Long winters & short summers.	Long Summers & short Winters.	Long Summers & short Winters.	Long Summers & short Winters.
Extreme Winters & low Summers	Cool Winters & Hot Summers	Moderate Winters & Summers	Extreme Winters & Summers (high variation day & time)
Altitude factor	Continental effect	Oceanic influence	Continental effect
Main source of rainfall Western disturbances.	Main source of rainfall Summer Monsoon	Main source of rainfall Summer Monsoon (Sindh) Western disturbances(Makran)	Main source of rainfall Summer Monsoon (Sindh) Western disturbances(Makran)
Precipitation (Snow & Hail)	Precipitation (Rainfall)	Precipitation (rainfall)	Precipitation (rainfall) scanty rain
Blizzards & fog	Floods	Tropical cyclones	Dust storms/ Droughts
Indoor jobs	Outdoor & Indoor jobs	Outdoor, Indoor jobs & fishing	Indoor jobs
Low standard of living	High standard of living	Very high standard of living	Low standard of living
Low population density	High population density	Very high population density	Low population density
Transhumance	Settled or permanent	Settled or permanent	Seasonal migration

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(i) Explain why the monsoon wind that is shown develops.
Strong heating of ground / High temperatures over land / N Pakistan / Central Pakistan
Causes air to rise / become lighter / less dense
Low pressure created
High pressure created
Winds move from high to low pressure

(ii) Explain why heavy rain falls during the monsoon season. [3]
moisture-bearing/wet winds/carrying rain
from the sea/Bay of Bengal
rise over land/hills/mountains
cools
moisture condenses/clouds form
low pressure (over northern Pakistan) brings air in

(b) Explain why the precipitation increases in July and August. [4]
Caused by the monsoon
Humid air from the Bay of Bengal
Where air pressure is high
Moving from the east or north-east
Towards a low pressure area over the mountains
Caused by heating of the land
Air rises
Moisture condenses
Clouds form [4]

(ii) Describe the rainfall distribution shown in Fig. 2 and explain how it is caused by the monsoon winds.
Description (res 2)
Lowest/ less than 25mm in West Baluchistan and extreme NW
Large areas / Lower Indus Plain less than 125mms
Most of Baluchistan less than 125mm
Decreasing towards NW and SW / Increasing towards SE and NE
Highest in NE Punjab / Murree area / over 500 mm
Explain (res 2)
Winds from N India forced to rise by mountains
Winds from Arabian Sea / secondaries rise over SE Sindh
Wind has lost moisture over India/and Bangladesh/ tail end, so less rain in Pakistan than India
Baluchistan remote from monsoon winds so less rain
High mountains in NE increase rainfall
Plains have less rain than mountains Res 2 + 2, float 3 [7]

(iii) Explain why western depressions cause rainfall in Pakistan [3]
come from Mediterranean(sea)
bring moisture/cloud/water
cooling causes condensation
explanation of cyclonic rainfall can go to 3 marks

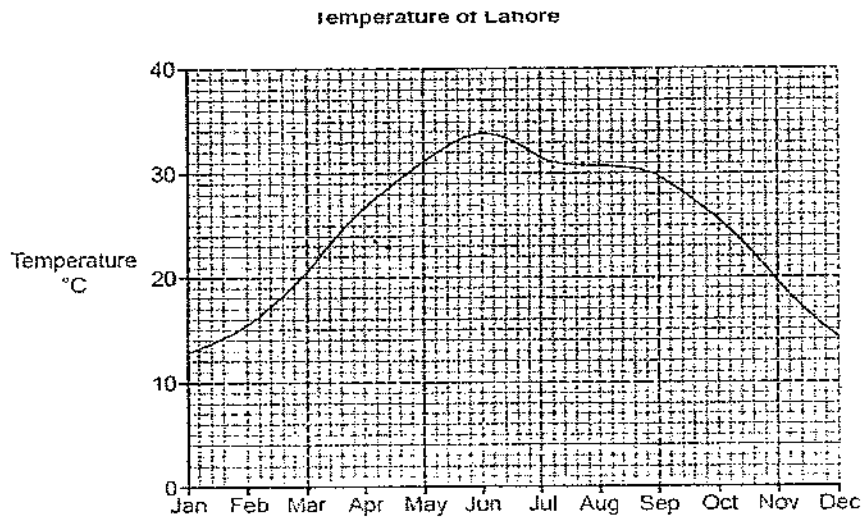


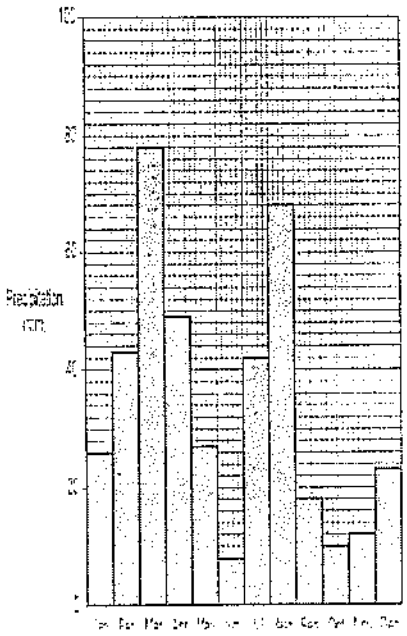
Fig. 1

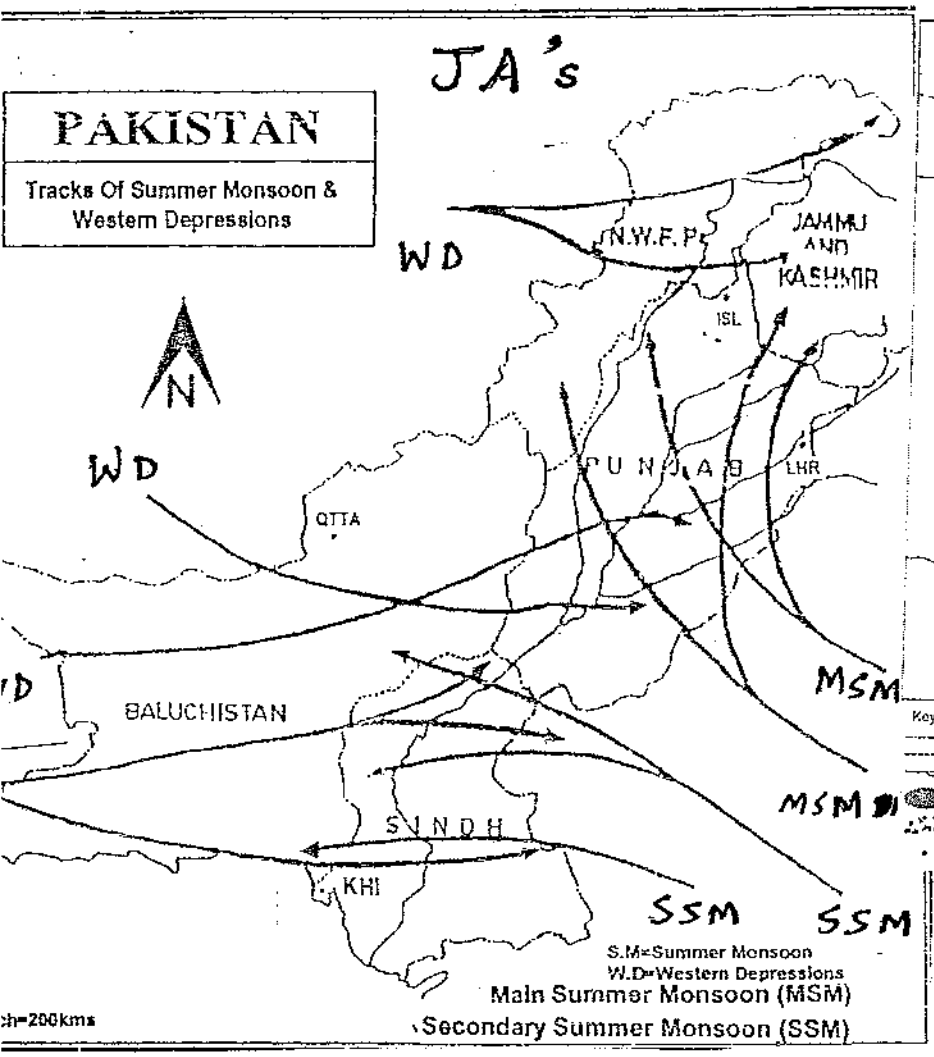
(i) Describe the pattern of temperature through the year at Lahore. [3]

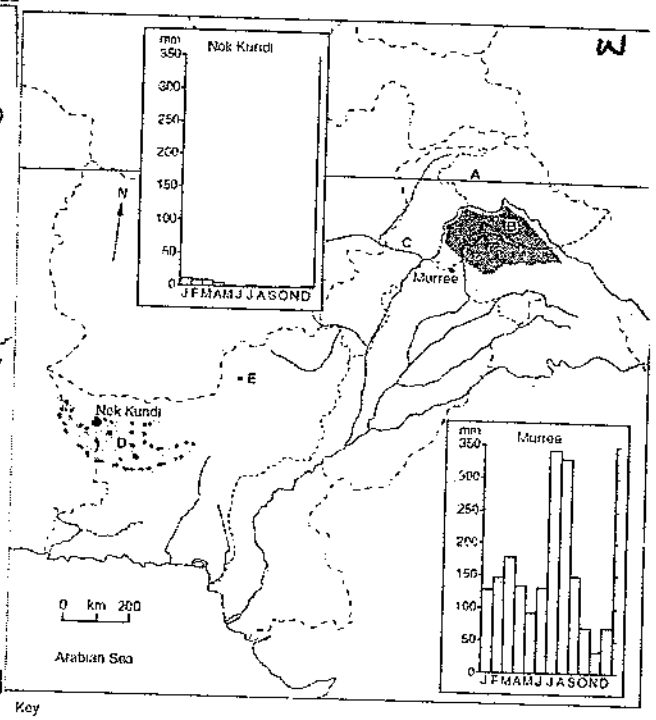
Either – using only the graph
rises from January to June
slow fall July to September/levels out
falls further to December

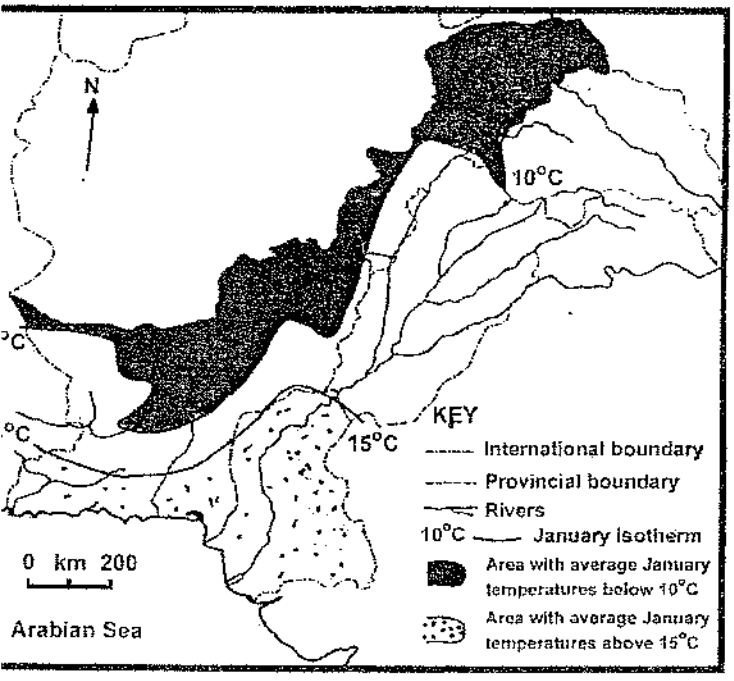
low in winter + months
rising in spring + months
falling when monsoon starts + months
continues falling in autumn

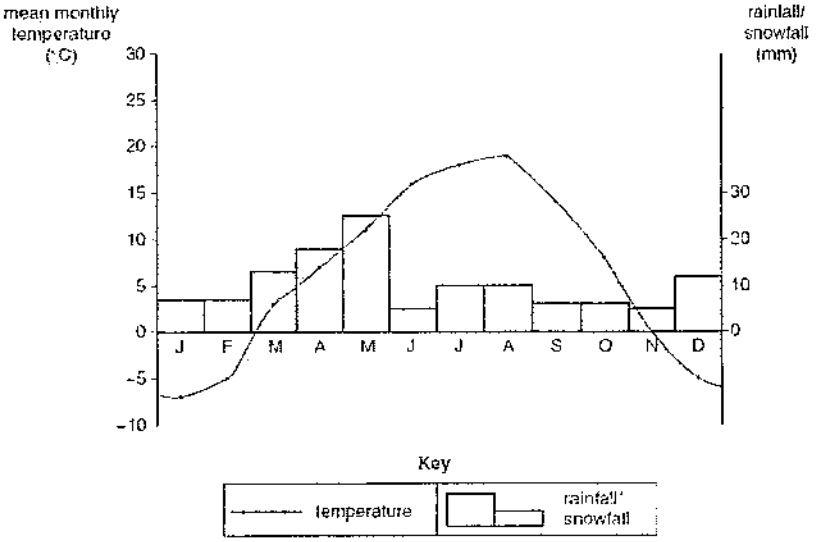
b) Study Fig. 2, a bar chart, showing precipitation for Peshawar.
(i) Describe the precipitation in the months from June to September.
increases June – August (from 8mm to 68mmin)
decreases in Sept (to 18mm)
max. in August/minimum in June
one mark each for correct months of increase and decrease
one mark for correct figure(s) [3]







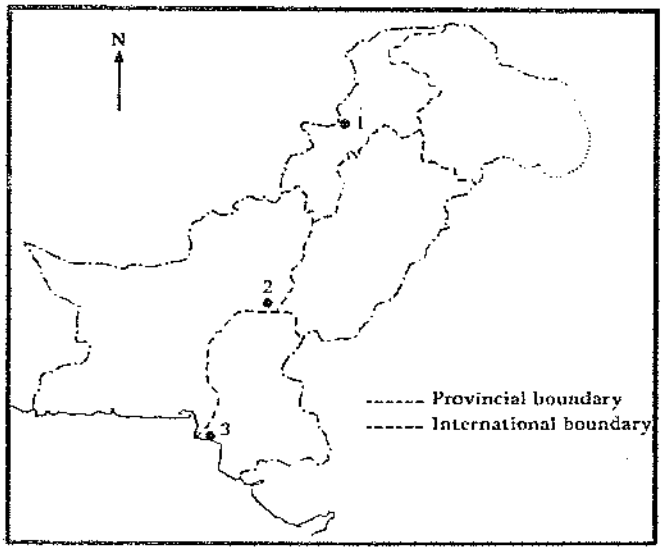




	J	F	M	A	M	J	J	A	S	O	N	D	
Temp °C	15	18	24	30	35	37	35	34	32	28	22	17	Total 99mm
Rainfall mm	8	8	7	2	4	6	37	22	1	0	1	3	

Temp °C	19	20	24	28	30	31	30	29	28	28	24	20	B
Rainfall mm	13	10	8	3	3	18	81	41	13	3	3	5	Total 201mm

Temp °C	11	13	17	23	29	33	33	31	29	24	18	13	C
Rainfall mm	39	41	65	42	40	7	39	41	14	10	10	15	Total 363mm



DEVELOPMENT OF WATER RESOURCE

- **What is IRRIGATION? Describe why irrigation is necessary for Pakistan.**

Irrigation is the artificial way to give water to crops.

It is necessary for Pakistan due to following reasons:

- Insufficient rainfall in various areas and many areas are arid & semi-arid
- Insufficient rainfall for a particular crop.
- Some times rain is much & some times less than requirements.
- High rate of evapotranspiration.
- Small number of rainy days.
- High variation in distribution in many areas.

Why is canal irrigation successful in Pakistan?

It is successful due to following reasons:-

- A large amount of water can be saved otherwise it would fall in the Arabian Sea.
- Cheap labor & cement are easily available in Pakistan.
- It can irrigate far-flung areas.
- Soil is soft so canals can easily be made.
- Southward slope of various rivers provides water to many areas.
- Summer Monsoon & melting of snow can obtain a lot of water.

Explain the importance of Indus system to Pakistan

ANS: The Indus Basin covers an area of about one million square kilometers and more than one hundred and fifty million people live in this basin defined by the 3180 km long Indus and its five tributaries. The system irrigates about 60% of Pakistan's 20 million hectares of cultivable land.

EASTERN TRIBUTARIES OF RIVER INDUS:

Jhelum, Chenab, Ravi & Satluj are the main eastern tributaries of the Indus.

WESTERN TRIBUTARIES OF RIVER INDUS:

Kabul, Kurran.Tochi, Gomal and Zhoab are the western tributaries.

Differences b/w the drainage pattern of the Indus system and Baluchistan plateau.

INDUS SYSTEM:

*Rivers are big.
*Flow all the year long(Perinnial)
*Fed by melting & sum Monsoon
*Rivers flow in southern directions
*Drainage pattern is exposed/Dandratic
*It covers almost all the areas of Pakistan
*It is important for the canal irrigation

BALUCHISTAN PLATEAU:

*Rivers are small
*Flow only in rainy seasons(Non-Perinnial)
*Rivers flow in Western direction
*Drainage pattern is covered or inland means the rivers don't reach till sea.
*It covers less area of Pakistan
*They are not important for irrigation.

Explain how water is used as an important component in different industries.

Mineral water Industry: Water is the only compound that is further processed for drinking
Iron and Steel Industry: To cool down the furnaces for making steel etc.
Thermal Power Stations: To produce steam that makes the turbines move.

Hydroelectric Power Stations: Enough volume of water is the main requirement for HEP generation. Pressure of water from a steep slope makes the hydro turbines move.
Tanning Industry: For washing, dyeing of leather etc.
***Pharmaceutical Industry:** For injections, Syrups, I.V. Infusions (Drips)
***Food processing Industry:** For preparing juices, squashes, syrups and beverages.
***Chemical Industry:** For making Acids, Liquids Bleach, Solutions etc.
***Textile industry:** For washing, Bleaching, Bluing, Dyeing, Printing.

Give an account of the development of the irrigation system in Pakistan.

CONVENTIONAL SYSTEM:

Shaduf: In Shaduf a bucket is attached to a pole on one side and weight on the other side. When the bucket is filled with water the weight on the other side takes the bucket out. A small area can be irrigated by this method.
Charsa: In Charsa, animal power is used to pull water from the well.
Persian Wheel: It is a system of continuous supply of water and irrigates a comparatively larger area. In this method one horizontal & one vertical wheel are geared together which are moved with the help of animal power.
Karez: A Karez is a horizontal underground canal in the foothills that brings underground water to the surface. The underground canal may be several kilometers long. It is difficult to do so a group of people is required. Vertical shafts are also dug for maintenance purpose. It is used only in Balouchistan.
Inundation Canals: Digging of long canals taken off from large rivers is called inundation canals. They receive water when the river is in flood.
Tank Irrigation: Constructing mud banks across small streams to make a small reservoir, which will collect excess water during the rainy seasons, practices tank irrigation.
Kaurjos: In this method surface water is used & diversion canals are made to divert the water. It is used in Makran, Baluchistan.

ADVANTAGES OF TRIDITIONAL METHODS OF IRRIGATION:

*They are cheap.
*Can be built easily.
*Best for subsistence farming.

DISADVANTAGES OF TRIDITIONAL METHODS OF IRRIGATION:

*Limited water can be obtained.
*Limited area can be irrigated.
*They require man or animal power/demands heavy labour.
*They are time consuming.
*Some of them are difficult to build and maintain.
*Far-flung areas can't get water.

MORDERN SYSTEMS:

Perennial Canals: They are linked to dams and barrages to provide water throughout the year and they irrigate a vast area.
Tube Wells: Tube wells have electrically operated pumps that can raise water from the depth of 92m or more to irrigate farms of more than 1000 hectares. Tube wells also help to lower the water table thereby protecting the land forms water logging and salinity.
Sprinkler and Spray Irrigation: Sprinklers are centrally placed in fields, connected to public water supply pipes to water the plants. They are mainly used in Orchards.
Tanker Irrigation: Tankers are used to supply water from one place to other.

ADVANTAGES OF MODERN METHODS:

*It prevents water logging & salinity.
*There is no wastage of water.
* Far Flung areas can be irrigated.
*They are fast & efficient. – less time consuming
*No animal or human power is needed.
*They have water throughout the year.

DISADVANTAGES OF MODERN METHODS:

*Maintenance & lying cost is much higher. * Faces rusting problem like sprinklers.
*Cannot be used on low scale farming.

(c) (i) What are perennial canals, and why are they better for farming than inundation canals?

What are they? (res. 1)
Canals that supply water throughout the year from dams/barrages
Why better? (res.1)
Water always available when needed
Can be better controlled
Reliable/do not depend on the weather
or credit the reverse for inundation canals
(res. 1) [for each of 'what' and 'why', float of 1] [3]

Explain why before irrigation was introduced there was little change in the level of the water table.(After the introduction of unlined canals)

There was very little change in the level of water table before the irrigation was introduced because at that time only rivers were flowing in a swift way which does not allow water to seep, while after the introduction of canals it increased so swiftly because these canals contain waters for a long time which flows slowly and causes seepage, as a result the water table increases so swiftly and causes water logging and salinity.

LINED CANALS:

*They are cemented.
*Mostly taken from canals and barrages.
*They have water at all times.
*Used in commercial farming.
*They don't cause water logging and salinity
*The construction and maintenance cost is high.

UNLINED CANALS:

*They are not cemented
*Mostly taken from rivers
*They have water in rainy and flood seasons
*Used in subsistence farming
*They cause water logging and salinity
*Construction and maintenance cost is low.

PERENNIAL CANALS:

*They are linked to dams and barrages.
*They provide water throughout the year.
*They irrigate a vast area.
*They are cemented.
*They cost a lot.

INUNDATION CANALS:

*They are linked from large rivers.
*They receive water when river is in flood.
*They irrigate a small area.
*They are not cemented.
*Their cost is less.

Describe the problems, which have resulted from the use of unlined canals to supply water for irrigation in Pakistan.

Ans: Water logging & salinity, conversion of cultivable land into barren land, causes unemployment, less crop production.

WATER LOGGING AND SALINITY: The gradual increase of water table till (5m) from surface is called **WATER LOGGING.** When the seepage remains continue & ground water comes to (3.3m) so due to capillary action it comes on the top of the surface it contains a large amount of salt in it so the excess amount of water is evaporated leaving the salt behind called **SALINITY** which converts the fertile soil into barren lands.

Describe the program started by the govt. to control water logging & salinity.
Ans) SCARP (Salinity Control & Reclamation Project)

Methods which have been introduced by SCARP to overcome water logging & salinity.
Lining Of Canals: Most of the unlined canals have been lined.
Installment of Tube Wells: The excess amount of ground water is taken out from the surface to lower the water table. They can be installed everywhere and are very use full to drain the water off from various depths.
Canal Closures: Most of the unlined and lined canals are closed after irrigation for maintenance.
Flushing of water: The extra amount of water, which comes on the surface, is flushed out with the help of pumps.
Planting desert trees: The long rooted trees are grown which absorb the excess water like Eucalyptus & Cactus.
RECLAIMED AREAS: Chaj Doab, Thal Desert, Bahawalpur, Pat, Larkana, Thatta.

Lift Irrigation: Wells and Tube Wells are its examples.
Discharge of Water: The amount of water, which passes from a specific place in a specific amount of time.
State the meaning of the term 'ground water aquifer'
ANS: Ground water aquifer basically means an underground water-bearing layer.

(ii) How may irrigation damage the soil?
Causes water-logging and salinity
Groundwater rises/swamps formed (max. 2)
Salts added to soil by groundwater
Evaporation leaves salts on surface
Hard crust formed
Soil not properly flushed out/shortage of canal water [3]

(iii) How may this damage be overcome?
Water-logged/wet soil (res.1)
Concrete linings to canals
Closure of canals when not needed/regulate flow
Planting trees eg. Eucalyptus
Tubewells used (instead of old methods),Tubewells used to lower water table
Surface drains
Lower canal water levels/dredge silt
(res. 1) Salty/saline soil
Water from tubewells used to flush out salts
Education/knowledge of better farming methods [6]

(c) (i) Why do problems of waterlogging and salinity occur in some irrigated areas? [3]
Waterlogging
Water available all year
Crops given more water than they use
Watertable rises/reaches surface
Salinity
Evaporation of water
Salt in irrigation water
Salts brought to surface
Unlined canals leak

Describe and suggest reasons for the main features of the tunnel in case of Karez.

It is dug by a group of people who share the water for irrigating their crops. **Vertical shafts are also dug down to the canal so that it can be cleared and repaired to prevent any blockages in the flow of water.** This is an old system practiced in Balouchistan only where water is scarce and the evaporation rate is high. By building the canal underground evaporation losses are minimized. Its used in that area because it's mountainous region & the water table is very low in those areas. **It is used only in Baluchistan.**

Q) Describe why Indus Water Treaty was important for Pakistan?

It was very important for Pakistan because it is an agricultural country & most of the irrigation was dependant on the water coming from Indian Punjab, It was the time when there was a refugee problem so we needed more food at that time.

DAM:

- They are built in the mountainous areas.
- Their construction and maintenance cost is very high.
- They have more capacity to store water.
- They are used to generate electricity and store water.
- They connect two mountainous areas.
- They control water in the rivers.
- In case of any damage there are many losses.

Barrage:

- They are built in the plain areas.
- Their construction and maintenance cost is low.
- They do not store water but only divert them to the canals for irrigation & save the areas from flood.
- They control water in the canals.
- They connect two plain areas or banks of the rivers.
- In case of any damage there are less loses.

With reference to examples compare & explain the sizes of the areas served by the two types of dams.(Major and small dams).

Large dams serve larger areas because their capacity is much greater & the electridity from large dams go onto National Grid. On the other hand small dams serve small areas because their capacity is less & the electricity generated by small dams go onto a Local Grid.

EXAMPLES OF LARGE DAMS:

Tarbela\ Mangla serve most of Punjab.
Warsak irrigates 48000 hectares.
Kurramgarhi irrigates 1,14,000 hectares.

EXAMPLES OF SMALL DAMS:

Hab irrigates 34,000 hectares.
Nari-Bolan irrigates 9700 hectares.
Rawal irrigates 5000 hectares.

Q) What is SILTATION? Describe its causes, effects and measures to control it.

The deposition of sand & silt that is brought by the water moving down from mountains is called SILTATION.

CAUSES:

*Soil erosion caused from the foothills of mountains.
*Deforestation, which makes the soil loose.
*River & rainwater brings a lot of sand & silt & deposit it on various places.

EFFECTS:

*It blocks the canals.
*The silt weakens the foundation of dams.
*It reduces the capacity of a dam to store water.
*It reduces the flow of water, which is required to run the turbines.

SOLUTIONS:

*Afforestation on the foothills of mountains.
*Cementing of the embankments of canals. (Lining the canals)
*Silt traps should be placed before water reaches to dam.
*Regular cleaning of dams to remove extra silt.

Describe the distribution of dams in Pakistan.

Major dams are in Northern and northwestern parts of Pakistan, means upper Punjab and NWFP.
Major dams are on Indus and its tributaries.
Most of the small dams are in Northern and northwestern areas.
Most of the small dams are on the tributaries of the Indus.
Dams are not located in Sindh, Southern Baluchistan & Northern mountain areas.

Describe the physical/ natural factors, which favor the construction of dams.

*Mountanous area
*Deep valleys (Gorge)
*Large basins for water storage.
*Large catchment area for rainfall.
*Rivers have high discharge of water
*Firm foundation or solid rocks for dams,
*Impervious rocks for reservoirs,
* Areas of more reliable rainfall,
*Lower evapotranspiration rate

Compare the purpose of major and small dams.

- They both store water mainly for irrigation
- Major dams serve near and far areas, but small dams serve only local areas
- Major dams are more multi-purpose than small dams
- All major dams are major suppliers of HEP, but small dams supply little or no HEP.
- The reservoirs of both types of dams are used for fishing and recreation

Name two institutions set up by the government to build the dams.

- Water and Power Development Authority (WAPDA)
- Small Dams Organization (SDO)

Indus River System Authority (IRSA) for distribution of water only.

Explain why barrages on rivers such as the Indus are usually long, high and wide. The length of the Sukkur barrage, for example, is about 1500 meters (1 mile).

Barrages on the river Indus are usually long, high and wide because the length of the barrage usually depends upon the length and width of rivers. Most barrages are built where there is excess amount of water to divert the water in many areas that's why the barrages are wide and long. Most of the barrages are built on the river Indus that is the biggest river of Pakistan especially in the Sindh area where other tributaries also join the river Indus. In case of monsoon rains and melting of glaciers the amount of water in the river Indus is much more than dry seasons that's why the height of these barrages is much more than in the upper Indus region. Sukkur Barrage irrigates an extensive area & it is the biggest barrage of Pakistan.

State two uses of BARRAGES other than that for irrigation.

Barrages can be used to divert the water, to stop floods, water for industries other than that for irrigation.

Chashma Barrage: Located on the Indus. 64 km down stream from Jinnah Barrage.
It is designed to divert one million cusecs into Chashma Jhelum link Canal through which it will irrigate areas served by Sidhnai-Maisli-Bhawal link system and also Hareli and Ragpur canals.

Rasul Barrage: Located on Jhelum. 4 km downstream from Rasul.
The flood discharge capacity if Rasul Barrage is 85000 cusecs. It supplies water to Rasul Quaidabad link canal for ultimate supply to Sulemanki barrage on Sutlej.

Describe the main features of Mangla & Tarbela Dam.

MANGLA: It is built on the river Jhelum & one of the longest earth filled dam in the world. It is a multipurpose dam built to store water & generate electricity. Due to scenic beauty it has become a tourist attraction & fishing centre.

TARBELA: It is built on the river Indus near Attock. It is 143 m high and has a reservoir area of 243 sq. km. & 119 billion cubic meter storage capacities. It has 9 gates to control floods. It is world's largest earth filled dam.

Q) What is link canal? Describe it with examples.

Link Canals are built to divert the water from big rivers to small rivers or from western rivers to eastern rivers or from rivers to canals. Examples are Rasul-Qadirabad Link carries water from Rasul Barrage on Jehlum to Chenab. Chashma-Jhelum Link transfers water from Chashma on the Indus to Jehlum river.

DESCRIBE THE WAYS TO CONSERVE WATER RESOURCES IN PAKISTAN.

*Equal distribution of water among various provinces to utilize the water resources.
*Small dams, which are cheaper, less time consuming to build should be set up.
*Programs to avoid the seepage of water should be started in various areas.
*The water of fresh water resources should be protected from industrial waste & other impurities.
*Natural water lakes such as Kalri, Haleji should be protected from pollution.
*The seepage of toxic waste should be avoided to utilize the underground water.
*Awareness should be created among the people regarding the preservation of fresh water resources.

(ii) Compare the height and length of a barrage with those of a major dam like Tarbela.
- Barrages are lower in height than dams
- Barrages are longer than dams
- Barrages are smaller = 0

2 @ 1[2]

(iii) What is the main purpose of a barrage and how is this purpose achieved?
Main purpose:
To provide water for irrigation/arable farming/crops
How purpose is achieved:
- Gates closed
- The barrage backs up/stores water behind it/holds the water back
- Canals/link canals take water and distribute it into a network of smaller canals
- Link canals take water from western rivers to eastern rivers

3 @ 1[3]