

# LANDFORMS

## 1. The Western Highlands

The Western Highlands of Pakistan extend from the Makran Coast in the south to the Pamir Plateau in the north, and cover most of Balochistan, Khyber Pakhtunkhwa, Gilgit-Baltistan, and parts of Punjab.






The Western Highlands can be divided into the following regions:

- i) the Mountainous North;
- ii) Potwar Plateau and Salt Ranges;
- iii) Safed Koh, the Waziristan Hills and the intermontane valleys;
- iv) Sulaiman and Kirthar Mountains;
- v) Balochistan Plateau.








### i) The Mountainous North

The Mountainous North, across the northern part of Pakistan, is a region of towering mountains that rise to snowy heights, and fast-flowing rivers that have cut deep valleys and gorges into the land. Its giant glaciers are comparable only to those found in Antarctica. There are places in this region which have not yet been surveyed, mapped, or even visited by humans.

#### Western Highlands

-  Mountainous North
-  Potwar Plateau and Salt Ranges
-  Safed Koh, Waziristan Hills, and Intermontane Plains
-  Sulaiman and Kirthar Mountains
-  Balochistan Plateau

#### Indus Plains

-  Piedmont plains
-  Active flood plains
-  Old flood plains
-  Alluvial terraces
-  Deltaic plains and Rann of Kutch
-  Rolling sand plains
-  Rivers

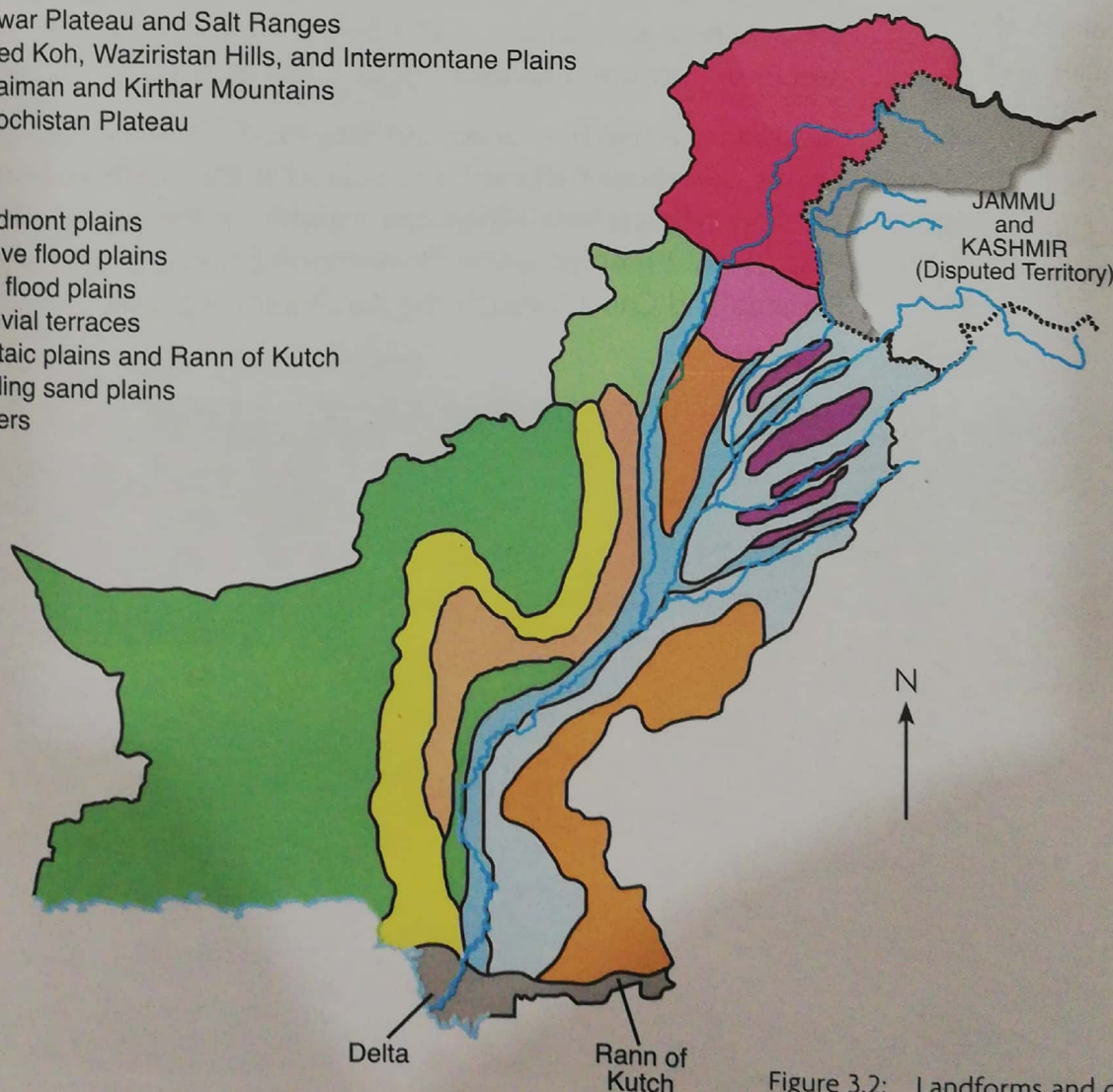


Figure 3.2: Landforms and drainage of Pakistan



Figure 3.3: K2, the world's second-highest peak

**FACTS AND FIGURES**

The Godwin-Austen glacier is close to K2; its confluence with the Baltoro glacier is known as Concordia, a favourite tourist spot for trekking and has spectacular views of the eight-thousander peaks in the region. This glacier and K2 (Mt. Godwin-Austen) are named after the explorer Henry Haversham Godwin-Austen (1834–1923).

The Mountainous North can be divided into the following ranges:

- a) Karakoram Range;
- b) Hindu Kush and other ranges;
- c) Kohistan, Swat, and Dir Ranges;
- d) Himalayan Ranges.

**a) The Karakoram Range**

The Karakoram Range, north of the Indus River, extends from Tibet to the east to Hindu Kush in the west, and further north beyond Pakistan's borders.

The range is about 200 km wide and has more than 20 mountain peaks higher than 7000 metres; four of them rise above 8000 metres. Mt. Godwin-Austen (8611 metres), better known as K2, is the second highest peak in the world after Mount Everest. Many European, Japanese, and Pakistani mountaineers have lost their lives in attempts to conquer these inhospitable peaks but many others, including Pakistanis, have scaled them successfully. The Karakorams are the most extensively snow-clad range beyond the Polar Regions; locally, these mountains are referred to as *mustagh* or 'ice mountains'. Glaciers originate from the tops of these mountains and range in length from 7 to 72 km; the longest are the Siachen (72 km), Biafo (62.5 km), and Baltoro (62 km) glaciers. The snowline, i.e. the point at which the ground is always snowbound, in the southern Karakorams is at a height of approximately 5300 metres and in the northern Karakorams at 5000 metres.

Movement within the Karakoram Range is difficult as there are not many passes, and those that exist are located at the northern border, like the Karakoram Pass (altitude 5568 metres) which is the highest. The Khunjerab Pass (at 4693 metres) is the most important one in that region, linking Pakistan and China through the Karakoram Highway.



Figure 3.4: The Baltoro Glacier

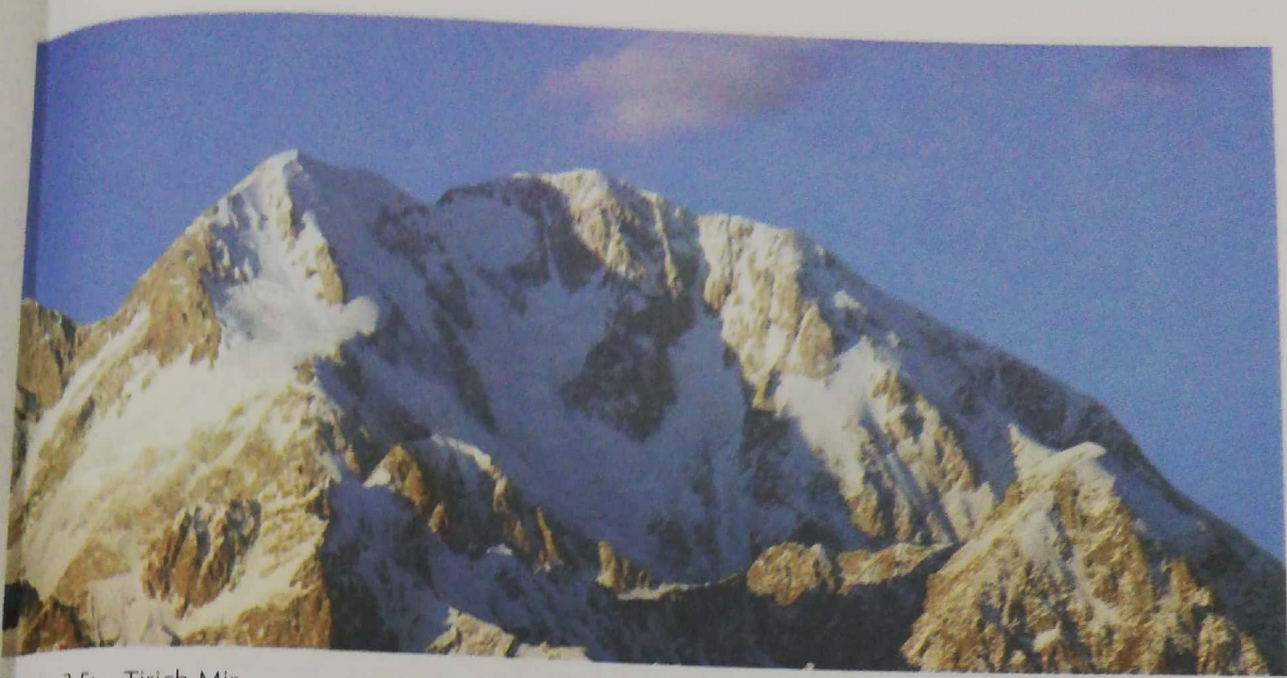


Figure 3.5: Tirich Mir

### b) The Hindu Kush Range

The Hindu Kush Range guards the north-western border of Pakistan and is a continuation of the Karakoram Range. There is no clear dividing line between the Karakoram and the Hindu Kush Ranges; however, the Gilgit River is considered the boundary between the two. Hindu Kush extends west into Afghanistan and merges with the Pamir Plateau in the north; the Ghizer River, a tributary of the Indus, is generally taken as the southern limit. Tirich Mir (7690 metres) and Noshaq (7484 metres) are among the highest peaks. The passes in the Hindu Kush are quite difficult to negotiate; Baroghil Pass connects Pakistan with Wakhan in Afghanistan; the Dorah and Shera Shing Passes lie between Pakistan and Afghanistan. A number of glaciers cap the Hindu Kush, the most important among them being Sakiz Jarab (length 30.4 km).

### c) The Kohistan, Swat, and Dir Ranges

South of the Hindu Kush Mountains are three sub-parallel ranges, the Kohistan, Swat, and Dir Ranges that run from north to south and are separated by rivers. In the north, these mountains rise from 5000 to 6000 metres and are capped by glaciers but are as low as 200 metres to the south. Again, movement in this region is difficult: the Lawarai (also known as Lowari) Pass is the only link between Chitral and Dir and the Lawarai Tunnel at 3200 metres is the shortest route from Chitral to Peshawar, but it is out of bounds during winter, when there is heavy snowfall. Although north-south movement along the river banks is relatively easy, east-west movement is difficult because the rivers have cut deep gorges. Work on the Lawarai Tunnel has been delayed repeatedly, incurring financial loss and increasing the cost of the project. If made operational, this tunnel—termed the longest in Asia—would contribute to the region's socio-economic development by promoting trade, industry, and tourism.

### d) The Himalayan Ranges

The Himalayas extend from Assam (in India) in the east to Pakistan in the west. Their width ranges from 400 km in the west to 150 km in the east. They rise to an average height of

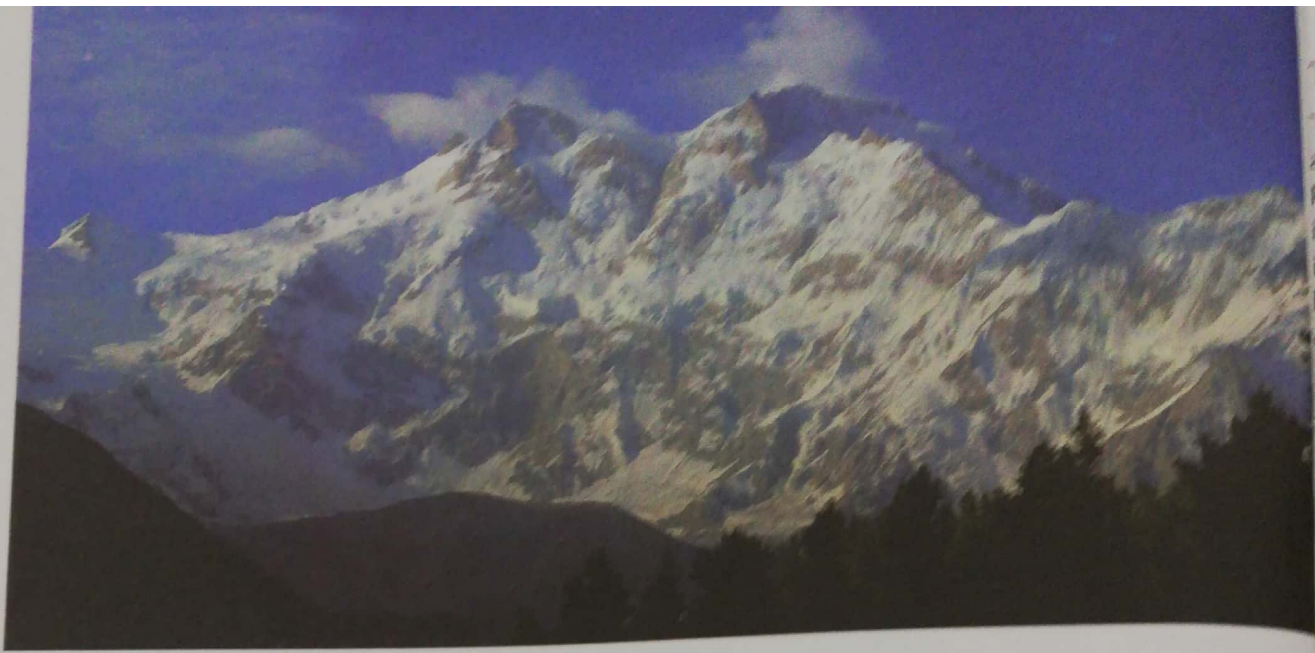


Figure 3.6: Nanga Parbat, the second-highest peak in Pakistan

7000 metres with 22 peaks over this height. Mount Everest, at 8848 metres, is the highest peak in the world. In Pakistan the Himalayas are in three sub-parallel ranges lying south of the Indus River: the Great or High Himalayas, Lesser Himalayas and Sub-Himalayas.

Table 1: The ten highest peaks in Pakistan

Peak	Mountain Range	Height (m)
K2	Karakoram	8611
Nanga Parbat	Himalayas	8126
Gasherbrum I	Karakoram	8068
Broad Peak	Karakoram	8047
Gasherbrum II	Karakoram	8035
Gasherbrum III	Karakoram	7952
Gasherbrum IV	Karakoram	7925
Rakaposhi	Karakoram	7788
Tirich Mir	Hindu Kush	7690
Noshaq	Hindu Kush	7484

## The Great Himalayas

The Great Himalayas are a mighty range south of the source of the Indus River, rising to an average height of 7000 metres; some of the peaks rise even higher, like the famous Nanga Parbat (8126 metres) which is the second-highest peak in Pakistan and the sixth-highest peak in the world. Because of the high altitude, there are many glaciers in this region; the longest is Rupal (S) at 17.6 km followed by Rupal (N) at 16 km. There are also many glacial features here: the bed of the beautiful Lake Saiful Muluk in the Upper Kaghan Valley is an old cirque carved by glacial action; similarly, the largest lake in the region, Satpara Lake near Skardu, is an old valley glacier.

The Indus has carved a number of gorges in the region, including the deepest gorge in the world in the Dasu-Patan region in the Kohistan District. It is 6500 metres deep—deep enough to submerge peaks rising to just under 6500 metres.

Table 2: Important mountain passes in Pakistan

Pass	Mountain Range	Height (m)	Connection
Karakoram	Karakoram	5575	Kashmir to China
Khunjerab	Karakoram	4733	Gilgit-Baltistan to China
Dorah	Hindu Kush	4554	Chitral to Afghanistan
Khyber	Safed Koh	1070	Peshawar to Kabul
Gomal	Waziristan Hills	1098	Afghanistan to South Waziristan
Bolan	Sulaiman	1793	Quetta to Sibi Plains
Khojak	Toba Kakar	2290	Quetta to Kandahar (Afghanistan)
Lawarai	Dir	3188	Dir to Chitral
Babusar	Great Himalayas	4173	Gilgit-Baltistan to Mansehra

## The Lesser Himalayas

The Lesser Himalayas are located south of the Great Himalayas and reach altitudes of 1800 to 4600 metres. The Pir Panjal Mountains in Kashmir and the Batgram, Mansehra, and Abbottabad Districts are part of the Lesser Himalayas. Some hill stations north of the Rawalpindi District, like Ghora Gali, Nathia Gali, and Murree, are located in the Lesser Himalayas. Although there is snowfall in the winter, there are no glaciers in this region.

## The sub-Himalayas

The sub-Himalayas or the Siwaliks are the southernmost in the Himalayan Range, attaining heights of between 600 and 1200 metres, and stretch from Kashmir downward to the south-eastern part of the Rawalpindi District.

## ii) The Potwar Plateau and the Salt Ranges

The Potwar Plateau (also known as Potohar) and the Salt Ranges are to the south of the mountainous northern region, between the rivers Indus on the west and the Jhelum on the east. Their northern boundary is the Kala Chitta Range and Margalla Hills, while to the south are the parallel Salt Ranges with the Soan Basin located between them.

The Potwar Plateau is an undulating area, 300 to 600 metres in altitude, and includes Khairpur Murat (1000 metres), a spectacular peak. The Soan River dominates the area, and its tributaries have cut gullies and ravines, called *khaderas*, forming typical badland\* topography. The Soan and other rivers have also produced large tracts of alluvial plains suitable for farming.

The Salt Ranges have an average height of 750 to 900 metres, steep towards the south and sloping gently into the Potwar Plateau in the north. Extending from the Jhelum River in the east, the ranges stretch westward to Kalabagh, and across the Indus into the Bannu District, including the Uchali, Khabeki, and Kallar Kahar Lakes, dot the region; however, badland topography has developed in some areas. Badlands are large tracts of heavily eroded uncultivable land with little vegetation.

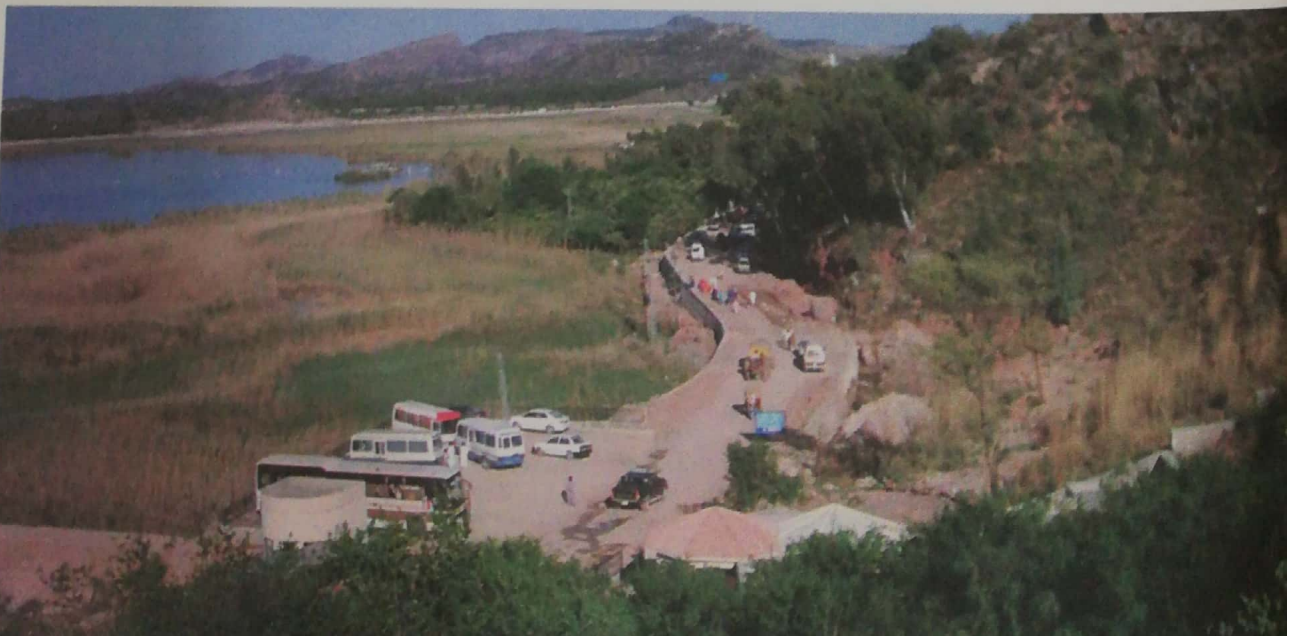
This entire region is rich in mineral resources, including rock salt, gypsum, limestone, coal, and oil. Mineral exploration has been taking place in the region. The Potwar Plateau and the Kallar Kahar region are popular tourist spots with scenic landscape and ancient historical sites. Agriculture in the Thal region and mining are sources of livelihood for the population.

## iii) The Safed Koh Range, Waziristan Hills, and Intermontane Valleys

The Kabul River forms the boundary between the Mountainous North and the Safed Koh Range, which has an east-west decline. The snow-clad peaks rise to an average height of 3600 metres; Sikeram, at 4760 metres, is the highest peak in the region. The Safed Koh Range merges into the Kohat Hills in the east, which are about 1600 metres high. The Waziristan Hills, located south of the Safed Koh Range, are 1500 to 3000 metres in altitude.

These mountains and hills form a barrier between Pakistan and Afghanistan, while the rivers in this region have formed passes through which many armies and peoples have travelled to and from South Asia, influencing its history and culture. The Khyber Pass, connecting Peshawar with Kabul in Afghanistan, is historically and geographically the most important. Other passes include the Kurram, Tochi, and Gomal, named after the rivers near which they

Figure 3.7: Kallar Kahar—a tourist spot by the Kallar Kahar Lake



are located. These rivers have carved three large and important valleys in the region: the Vale of Peshawar, the Kohat Valley, and the Bannu Valley. These 'intermontane valleys' are bounded by hills and mountains on all sides except in the east, where they open up into the Indus Valley where the rivers Kabul, Kohat, and Kurram-Tochi meet the Indus. The Peshawar, Kohat, and Bannu valleys support agriculture which, along with medium-scale industry, is the livelihood of the locals.

#### iv) The Sulaiman-Kirthar Mountains

The Sulaiman-Kirthar Mountains lie between the Balochistan Plateau on the west and the Indus Plains on the east. They extend 850 km to the south from the Gomal River to the Arabian Sea. Comprising mainly limestone, sandstone, and shale, these ranges can be divided into three distinct regions: the Sulaiman Range, the Quetta Syntaxis-Zarghun Knot, and the Kirthar Range.

The Sulaiman Range, with an average height of 3440 metres, stretches 400 km southwards from South Waziristan and merges into the Marri-Bugti hills; Takht-i-Sulaiman is the highest peak in the region at 3487 metres. West of the Marri-Bugti hills is the Quetta Syntaxis-Zarghun Knot, a triangular area about 190 km long and 50 km wide and home to Loe Sar (3583 metres), the highest peak in Balochistan. The area further west is the Quetta Syntaxis, south of which the Kirthar Range extends 400 km, merging into the Kohistan region of Sindh, down to the Arabian Sea. The Bolan Pass, linking the Balochistan Plateau with the Sindh Plains, is between the Kirthar Range and the Quetta Syntaxis-Zarghun Knot.

This region falls in the arid category as it is dependent on seasonal streams. Hence agriculture is not a viable option but stone quarries provide livelihood to some extent. The area is mostly uninhabited.

#### v) The Balochistan Plateau

The Balochistan Plateau, west of the Sulaiman-Kirthar Range and covered with hills and mountains, is interspersed with rivers and basins. It is divided into two parts by the Chaman and Ornach-Nal Faults stretching southward from Chaman to the Arabian Sea.

To the east are the Toba Kakar Range and adjoining basins, the Kalat Plateau, the Khuzdar Knot, and the Lasbela Plains, and to the west are the Chagai Hills where the Saindak copper, gold, and silver mines are located. The road and railway link between Quetta and Zahedan runs through this region. The Ras Koh, Siahan, and Central Makran Ranges are found here,

Figure 3.8: The Bolan Pass



and southernmost is the Makran Coast Range. The main occupation is mining, and subsistence farming on a small scale.

### **The Makran Coast**

The Pakistani coastline is 1046 km long, 745 km of which is the Makran Coast, extending from Karachi in the east to Jiwani in the west. Overall, the Makran Coast is fairly straight with no marked indentions other than the Miani Lagoon, near Sonmiani. There are a number of hammerhead-shaped projections, known as tombolos, near Ormara and Gwadar and the headlands off Ras Multan and Ras Jaddi near Pasni, as well as uplifted terraces, including Ras Malan, and Jiwani.

The Makran Coast has a narrow beach backed by rock cliffs 15 to 65 metres in height, behind which is a 16 to 32 km wide coastal plain with sand dunes and small hills. The Makran Coastal Highway from Karachi to Gwadar provides a scenic view of the Arabian Sea. The population along the Makran Coast has grown with the development of Gwadar as a port city and the coastal towns of Jiwani, Pasni, and Ormara. Apart from port activity, marine fishing is the major occupation on the Makran Coast.

## **2. The Indus Plains**

The Indus Plains, formed by the Indus and its tributaries, occupy a large area to the east and south of the Western Highlands. The plains slope from north to south, from a height of 300 metres down to 75 metres near Panjnad and gradually down to the Arabian Sea. In the last stretch of 560 km, the fall rate is less than 0.3 metres per 1.6 km. There are a few scattered, low hills across the plains: the Kirana Hills in Punjab and the Khairpur and Ganjoo Takkar Hills in Sindh. Agriculture is the source of livelihood for the population of this region along the Indus and its tributaries.



The Indus Plains can be divided into the following geographic regions:

- i) piedmont plains;
- ii) active flood plains;
- iii) old flood plains;
- iv) alluvial terraces;
- v) deltaic plains and the Rann of Kutch;
- vi) rolling sand plains, ridges and dunes.

#### i) Piedmont plains

Piedmont means 'at the foot of the mountain'; piedmont plains at the base of the Sulaiman-Kirthar Range, formed by the deposition of gravel, sand, and silt by seasonal rivers, result in alluvial fans lined with dry, meandering streams which become active only when rainfall takes place. Although it is a very fertile region, rainfall is scant and unreliable, and rain-fed or *barani* agriculture takes place here. A number of small piedmont plains are found in northern Punjab.

#### ii) Active flood plains

Active flood plains, locally called *bet*, are the narrow strips of land along the Indus and its main tributaries, the Jhelum, Chenab, Ravi, and Sutlej. They are found most extensively along the Indus, varying in width from 24 to 40 km. However, they are almost non-existent along the tributaries. Active flood plains are inundated almost every year and covered with rich alluvium (locally called *khaddar*) which makes them excellent for agriculture.

#### iii) Old flood plains

The old flood plains cover extensive areas between the *bet* and *bar* uplands in the Upper Indus Valley (Punjab) and between the *bet* and the desert areas in the Lower Indus Valley (Sindh). The main agricultural region of Pakistan is located here. Old flood plains, being a few metres higher than active flood plains, are normally safe from floods but during times of severe flooding (once every seven or eight years), they become inundated and are covered with alluvium. The limestone cliffs of Khairpur Hills at Sukkur and the Ganjo Takkar Hills at Hyderabad provide raw material for cement factories in the region.

#### iv) Alluvial terraces

Alluvial terraces known as *bars* have developed in some *doabs* of the Upper Indus Valley; these include the Kirana *Bar* in the Chaj *Doab*, the Sandal *Bar* in the Rechna *Doab*, the Ganji *Bar* in the Bari *Doab*, the Nili *Bar* between the old bed of the Beas and the Sutlej, and another terrace located south of the Sutlej River (see Figure 3.1). Canals in the area have turned these terraces into excellent agricultural land.

A large part of the Sindh Sagar *Doab*, located between the Indus and Jhelum Rivers, may have been a terrace but is covered over by the Thal Desert, dotted with sand dunes called *tibbas* between which are areas of narrow flat land called *pattis*. With the expansion of irrigation, this region has been transformed into rich farm land.

The Chaj *Doab* and the Rechna *Doab* are dotted with several outcrops of quartzite and slate hills between Sargodha and Shah Kot. The most dominant are the Kirana Hills, close to Sargodha.

#### v) The deltaic plains and the Rann of Kutch

The Indus has a large delta at its mouth between the Kalri and Pinyari distributaries. The apex of the delta has shifted its position southward several times from once south of Hyderabad to now south of Thatta. In area, the Indus Delta is the seventh largest delta in the world. Before the construction of barrages and canals, the Indus and its tributaries

carried 300 million tonnes of sediment per year into the sea and the delta was growing at a rate of 34.4 metres per year. Today, although the discharge of the Indus has greatly decreased the delta is growing, primarily towards the south-west. Bars have developed at the coast and inland there are extensive mud flats whose limit is marked by cliffs, behind which agriculture is thriving.

The eastern coast of Pakistan is about 300 km long; the deltaic coast lies to the east of Karachi and further east is the Rann of Kutch. Unlike the straight Makran Coast, both the deltaic coast and the Rann of Kutch are irregular, marshy areas covered by mud flats and indented with numerous tidal creeks and winding channels. The Rann of Kutch is 21,672 sq km in area; the western portion (780 sq km) belongs to Pakistan, according to the decision of an International Tribunal on 19 February 1968, while the rest of the Rann of Kutch belongs to India.

The Indus Delta which covered an area of 41,440 sq km (16,000 square miles) has been impacted alternately by drought, salinity, and floods in 2010, and torrential rains in 2012. Drought, and salinity, resulting from reduced flow from upstream, have

allowed sea water to intrude, raised salinity, affected plant and animal life, made potable water scarce, and negatively affected the economy of the region. On the other hand, the flood waters and rains have had a positive effect on this region, allowing the mangroves to grow, and supporting marine life for which the mangroves are a nursery. This deltaic region is very important for Pakistan's ecosystem and must be preserved.

#### vi) Rolling sand plains, ridges, and dunes

The Cholistan Desert (25,000 sq km) in Punjab, and the Thar Desert (50,000 sq km) in Sindh stretch from Bahawalpur in the north to Sindh in the south. Thar is the largest desert in the country. Separated from the Indus Valley by the ancient, dry channels of the Ghaggar, Dhoro, and Nara rivers, these deserts are dominated by sand plains, ridges, and dunes. The Thar Desert also extends eastward into Rajasthan in India. With the expansion of irrigation facilities, some areas of the Thar-Cholistan Deserts have been reclaimed for agriculture, mainly in the western part of the Bahawalpur District; cattle-rearing is the main occupation in this sparsely populated region.



Figure 3.10: The Indus Delta as seen from space

The Thal Desert, situated towards northern Punjab, covers about 20,000 sq km. Beginning at the foothills of the Salt Ranges, it is bordered by the Indus River to its west and the Jhelum River to its east. The area is naturally barren with a few shrubs and grasses, but with the construction of the Greater Thal Canal and by boring tube wells, a considerable area has been brought under cultivation.

The Kharan Desert, covering about 20,000 sq km, is in western Balochistan. Located on the Balochistan Plateau and surrounded by mountainous terrain, Kharan has an even and barren, sandy landscape and a very arid climate. Unlike the other deserts which have populations of 7 to 9 million Kharan's population is about 230,000.