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Structure Investigation, Economics and Stratigraphy of the Paleozoic, Mesozoic and Cenozoic Sequence in the Vicinity Eastern and Western side of the Salt Range, Punjab Pakistan

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ABSTRACT

The "Salt Range is a hill arrangement in the Punjab in Pakistan, deriving its name from its extensive deposits of rock salt. The range extends from the Jhelum River to the Indus, across the northern portion of the Punjab province. The Salt Range contains the most important geologic and paleontological localities in Pakistan, and it is one of the best field areas in world. The Salt Range contains the great mines which yield vast supplies of salt and coal of medium quality In the Salt Range various richly fossiliferous stratified rocks are very well exposed. These include the Permian carbonate succession with its outstanding brachiopod fauna, Lower Triassic ammonoid beds (the Mianwali Formation, formerly known as "Ceratite Beds"), and Lower Tertiary marine strata with age diagnostic foraminifera. These rocks also provide an excellent opportunity for studying of tectonics in the field. In addition to the easily available roadside geology, some prominent gorges provide fantastic locations to study the sedimentary succession. Older strata are exposed in the eastern Salt Range between the Khewra-Choa Saidan Shah and Fort Kussak including the famous Khewra Gorge. In the west, beyond Kallar Kahar, younger stratasuch as in the Nammal Gorgenear Mianwali, the Chichali Gorge near Kalabagh, and further west the Lumshiwal Nala at Makerwal. This succession has been rightly called a Field Museum of Geology and Paleontology and can be classified as one

of the great paleontological areas of the world ,fully worthy of conservation and protection efforts".

Keywords: *Pakistan; Salt Range; Geology; Stratigraphy, Formation, GPS (Global Position System*

1. Introduction:

The "Salt Range forms the southern border of the hydrocarbon-bearing Potwar Basin in northern Pakistan, along the northwestern margin of the Indo-Pakistani Plate (Figure 1). It derives its name from the occurrence of gigantic deposits of rock salt embedded in the Precambrian bright red marbles of the Salt Range Formation (formerly known as the "Punjab Saline Series"). Strata in the Salt Range dip northwards into the Potwar Basin where non-marine Tertiary sediments, collectively known as the Siwaliks, are exposed with a wealth of vertebrate fossils. The southern face of the Salt Range is an escarpment that rises abruptly from the Punjab Plains with a junction marked by the Frontal Thrust. Block faulting is the most characteristic tectonic style within the Salt Range. The Salt Range is essentially an East-West trending elongated narrow trough bounded on the east by the River Jhelum and on the west by the River Indus. Beyond the River Indus, at Kalabagh,, it takes a sharp turn to run almost in a North-South direction (Figure 1) Theentire mountainous belt has, therefore, previously been differentiated into the Cis-Indus Salt Range and Trans-Indus Salt Range now known as The Salt Range and Trans-Indu Surghar Range respectively. The Salt Range is one of the most important geological regions in Pakistan. It is easily accessible and displays a wide variety of geological features and paleontological remains. It has, therefore, been rightly called afield museum of geology and paleontology. It represents an open book of geology with richly fossiliferous stratified rocks that include a Permian carbonate succession with brachiopods, Lower Triassic ammonite bearing beds (the Mianwali Formation, formerly known as "Ceratite Beds") and Lower Tertiary marine strata composed of age diagnostic foraminifera. All the strata are brilliantly exposed due to scarcity of vegetation. The quality of the exposure also provides excellent opportunities to appreciate tectonic features in the field. The Salt Range is, therefore, of international scientific and educational value, and is highly worthy of conservation and preservation".

2. Case Study

We have chosen the Upper Indus basin of Pakistan region as the case study. The area visited by us lies in the foot hills of Himalayas. The Salt Range is situated in District Jhelum of Punjab. It is a low flat mountain range rising abruptly from the Punjab plains and extending to the East West strike, having the following co-ordination

Longitude: 71.74 East

Latitude: 32.34 North

We have used the undernoted instruments during investigations.

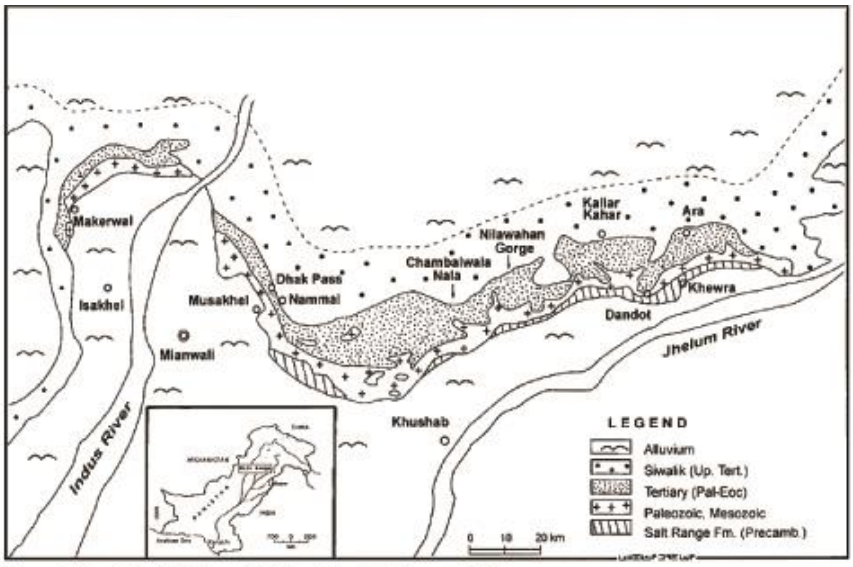

Figure 1: Map of the Salt Range, Pakistan (after E.H. PASCOE, 1919).

Figure 1: Map of the salt Range Pakistan (After E. H, PASCDE, 1919)

3. Geological Hammer:

Standard geological hammer have heads weighing 1.5 to 2 pounds (0.68 kg to 0.9 kg), the length of handle of Hammer 14 inches. Geological Hammer has its own specification. It is used to pick samples, exposure, for digging for breaking rocks and for trimming samples.

3.1 Magnifying Glass:
It is used to magnifying the rock body, structures, micro structures, micro fossils etc.

3.2 Global Position System (GPS):

GPS (Global Positioning System)is a space based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the earth where there is an un obstructed line of sight to four or more GPS satellites, the system provides critical capabilities to Military, civil and commercial users around the world.

3.3 Acid Bottle:

Every serious field geologist carries a small bottle of 10percent hydrochloric acid to perform this quick field test, used to distinguish the most common carbonate rocks, dolomite and limestone (or marble, which may be composed of either mineral). A few drops of the acid are put on the rock, and limestone responds by fizzing vigorously. Dolomite fizzes only very slowly. HCL is used because it rapidly reacts. We must handle it with care because can damage the skin.

3.4 Camera:

It is used to take pictures and must be compact and strong, have a good regulation of pictures, and be water proof a with high memory level.

3.5 Sampling Bags:

These are used to carry rocks, fossils, minerals, fine grains samples. They should make up of plastic or cloth or heavy paper.

3.6 Jacob's Staff:

A short square rod with a cursor use for measuring heights and distance.

3.7 Protectors:

It is used for plotting bearing lines and structures and symbols on maps and photographs. It is also used for measuring angles between structures in the rocks.

3.8 Brunton compass:

It is used to measure the dip and strike during *filed* (The sense is unclear and ambiguous) and to check the bearing and back bearing. It is also use for taking vertical angle of the bed and also to identify the North.

4. Physiographic of the Salt Range:

4.1 Soils:

Two types of soil are present in the salt range i.e. soil at top hills and soil in depressions. Soil at top hill is formed due to in situ weathering and provides leveled soil patches for cultivation of different crops whereas the soil present in syncline depression is carried physically by water in the form of alluvium which is the main source for cultivation.

4.2 Temperature:

Average minimum temperature is 1Co (January) and average maximum temp is 36Co (June). Temperature falls below freezing during winter, and summer is comparatively pleasant as compared to adjoining areas [7].

4.3 Rainfall:

Most of the rain is confined to the months of July, August and September. A much lesser amount is received in January and February. The summer rains are due to monsoon, while those for winter are associated with the western disturbances.
Sakesar Hill and the adjoining areas of some valleys receive maximum rain fall because of their height [14].Winter rain is generally well distributed as compared to summer rain [14].

4.4 Topography:

Sand stone and lime stone are the common rock types of Salt Range [2] [4]. The sand stone is laminated by white or cream, dark red or purple brown colors. Most of the soil of Salt Range is heavily salt infested, as the water from brinesprings deposits salts on the soil, all along its route. According to [9] the weathering of pure lime stone leaves no perceptible soil, as calcium carbonate is carried away in solution by rain water. The weathered surface of the rock is left with sharp projections and numerous hollows and is an exceedingly irregular manner, so

sheet rock and boulders are found on the hill sides. In these places lime stone is not so pure, being mixed with shale, and clay or sand and produces some amount of soil. The soil in the weathered lime stone portions forms the thin and shallow layer and is very fertile [14]. Most of the soil present in the valleys in the mountain ranges is water eroded soil. Soil lying between the Salt Range and River Jhelum is heavily saline due to the run-off water during rainy season [4] and most of the areas are rich in salinity [10].

4.5 Vegetations:

The vegetation of Salt Range comprises of both legumes and non-legumes. Little is known about geological history of the Salt Range vegetation. Fossil record indicates that angiosperms date back to tertiary period, while pre tertiary fossils have no angiosperm affinities (Ahmad et al., 2007).The vegetation of Salt Range is in the classification of sub-tropical dry evergreen forests. Olea ferruginous Royal and Acacia modest are recorded to be two characteristic trees of the area [3]. Due to macro and micro environmental variations, large plant and animal diversity of the area is expected to be endemic to it. Scanty reports are available about vegetation of this area. Vegetation of plants of Salt Range consists of an open low forest in which thorny, usually hard woody species pre dominate, the trees usually have short trunks and low branching crowns. The soil is generally saline, but trees grow well, as ground water in most places is not salty. Climbers are relatively numerous and usually exhibit xerophytes adaptations.

4.6 Drainage Pattern:

The drainage is mostly dendritic to parallel and generally controlled by this arrangement. These run along the conjugate share features that strike N30W to N60W and N40E toN50E and Figure 2 and 3 showing the two types drainage pattern.

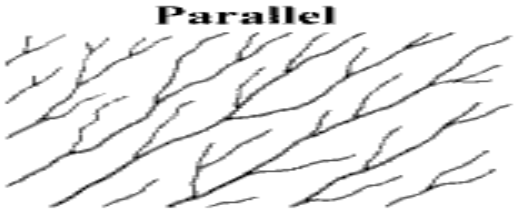

Figure 2: showing the first type of pattern

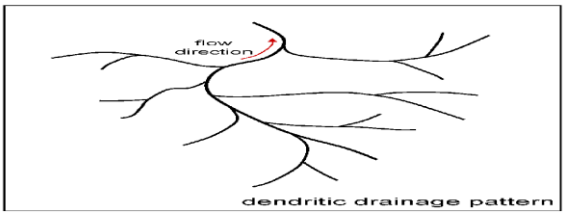

Figure 3: showing the second type of pattern

5. Methodology and Discussion:

Table 1: Stratigraphy of Upper Indus Basin (Salt Range):

Era	Epoch	Group	Formation	Member
Tertiary	Lower Pleistocene & Upper Pliocene	Siwalik Group	31. Soan	
	Middle Pliocene		30.Dhok Pathan	
	Lower Pliocene & Upper Miocene		29. Nagri	
	Middle & Lower Miocene		28. Chinji	
Tertiary	Middle & Lower Miocene	Rawalpindi Group	27. Kamalil	
			26. Murree	
Major Unconformity between Chorgali and Murree				
Tertiary	Lower Eocene	Chharat Group	25. Chorgali	
			24. Sarkesar	
			23. Nammal	
Tertiary	Paleocene	Makarwal Group	22. Patala	
			21. Lokhart	
			20. Hangu	
Major Unconformity between Lumshiwal and Hangu				
Mesozoic	Lower Carboniferous	Surghar Group	19. Lumshiwal	
	Lower Carboniferous, Upper Jurassic		18. Chichali	
	Middle Jurassic		17.	

			Samanasuk	
	Lower Jurassic		16. Datta	
Unconformity between Kingriali and Datta				
Mesozoic	Upper Triassic	Musakhel Group	15. Kingriali	
	Middle Triassic		14. Tredian	ii. Khatkiara i. Landa
	Lower Triassic		13. Mianwali	iii. Narmia ii. Mittiwali i. Kathwali
Paraconformity between Chidru and Mianwali				
Paleozoic	Upper Permian	Zaluch Group	12. Chidru 11. Wargar 10. Amb	
Paleozoic	Lower Permian	Nilawahan Group	9. Sardhai	
			8. Warchha	
			7. Dandot	
			6. Tobra	iii. Tillite Facies ii. Fresh Water Facies i. Complex Facies
Major Unconformity between Bhagan Wala and Tobra				
Paleozoic	Middle & Lower Cambrian	Jhelum Group	5. Bhagan Wala	
			4. Jutana	
			3. Kusak	
			2. Khewra	

6. Tectonic Setup:

The Salt range is located in the external zone of the Himalayan fold and Thrust belt. Quaternary alluviums have the older sedimentary rocks and are exposed in entire salt range. The whole series of the rocks have evolved by the collision between Indian plate and Eurasian plate. These thrust run perpendicular to the

trend of the folds in the region. The trend of this fold is East-West and thus the tectonic transport direction is towards the south from the north. The youngest thrust fault in the area is the salt range thrust which has uplifted the rocks from the older age and places them over the younger alluvium. TheKohat-Potwar fold belt is composed of series of folds and thrust faults. Their southern part comprises salt range composite orocline that forms a chain of hill ranges. These ranges include Mangai,Bhitani, Khisor, Marwat, Surghar and Salt Range. Kazmi and Jan hold that the rocks here are of the age Cambrian [2].

Recently, the salt range is a complex salt anticline with a series of salt anticline. It is the widest in central part between Khewra and Warchha. Northern slope and has shallow fold followed by a gentle monocline. In south the folding becomes tight and folds are commonly faulted. Kazim and Jan [1] that along the southern scarp the structure are more complicated and trends east-west. Eastward the salt range loses its structure and bifurcates into two narrow North-East trending ridges. Westward the salt range takes a northwest bend near Warchha. Its structure remains same and is separated by the Kalabagh fault from the Trans-Indus range. Southward the salt range is trenched by a salt range thrust [1].The thrust fault runs along the southern margin of the salt range between Indus and Jhelum plains. It has pushed the older rocks upon the younger Jhelum plain. Thrust is large covered with recent conglomerates. However at places the thrust is exposed (Jalapur & Kalabagh) and shows the Paleozoic rocks lying over the quaternary deposits of Jhelum plain [6-7].The seismic reflection profiles gravity and drill hole data indicates that the salt range and plateau over underlined by the docollment zone within pre-Cambrian evaporates. The salt range is thus the surface expression of the leading edge of the docollment thrust [2].The Kalabagh fault forms the western margins of the salt range and extend North-West from Mianwali for a distance of 120km.It has been described as an active dextral Wrench fault [1]. It has a long southward continuation as indicated by liniments on land set photographs. Buried diextral wrench fault inferred from the Kalabagh fault has affected the quaternary deposits as indicated by the uplifted stream terrices tectonics blocks of evaporite and limestone and truncated alluvial fan. Offset of the quaternary deposits suggest 16 km of strike slip movement along the fault during quaternary time [15].
The Jhelum Fault is a north-east dipping strike-slip fault following the western margin of HKS bend. Rocks belonging to Miocene, Cambrian and Pre-Cambrian

periods exposed along its trace are highly deformed due to recurring shear zones. Individual blocks of Panjal Volcanic and Triassic limestone have been found dragged for several kilometers southward. An accumulative left-lateral offset of about 31 km is indicated on the western limb of the Syntaxes. It apparently dislocates from the Main Boundary though the stand terminates at the eastward continuation of some of the geological structures of Northwest Himalayan Fold and Thrust Belts [5]. These tectonic relationships indicate Jhelum fault as the youngest major tectonic feature in the syntaxial zone. The fault is located at distance of about 50 km east of Islamabad. This fault was reported by original researchers to extend along Jhelum River from north of Muzaffarabad to near Jhelum and further southward to Chaj Doab area [6]. During recent studies it was investigated whether this fault extends southward up to Jhelum or not. Oil and Gas Development Company Ltd. (OGDCL), has mapped a fault parallel to Jhelum River up to Palala Mallah, beyond which it takes a southwest bend and extends parallel to other faults (Dil Jabba, Lehri) of the area as a thrust fault [3][7].

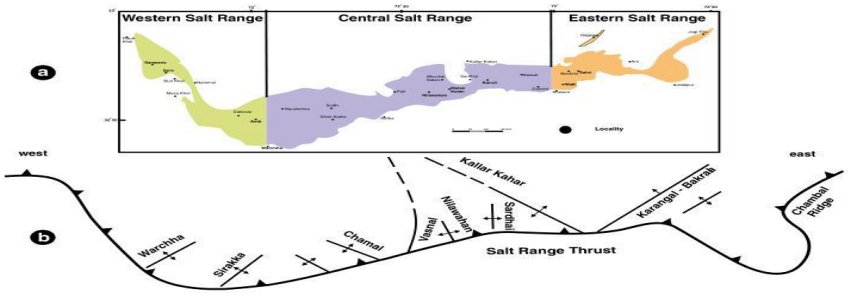

Figure 4: showing the three subdivision of Salt Range

i. Schematic illustration of the three subdivisions of the Salt Range.
ii. Generalized map showing major structural trends in different parts of the Salt Range. The general trend of the folds is East-West in the Central Salt Range, A few North-South trending and northward plunging anticline**.**

7. Geological Structures of Salt Range:

The Kohat Potwar fold belt is composed of :

i. East-West trending folds (Parachinar – Kalachitta fold belt (1) Northern folded zone (2) etc.)

ii. Thrust faults. (Salt Range (3) , Kalabagh (4), Jhelum (5), Khair-e-Murat (6), Dinghot (7) and Aniwan (8).

Its southern part comprises the Salt Range composite Orecline which form chain of Ranges, namely

a. The Manzai , Bhittani (a)
b. Khisor – Marwat (b)
c. Surghar (c)
d. The Salt Range (d)

The Kohat Plateau (9) Pwar Plateau (10) is largely covered by Neogene Siwalik Molasse, which several large fold (1 and 2) , some of which are faulted (3 to 8).

The very shape and orientation of these surface structures define a number of structural zones within the Kohat Potwar Plateau.Seismic reflection profiles and oil well data suggest that these zones reflect difference indeeper structures and lithostratigraphy. The Salt Range is a complex asymmetrical and overturned and the structure along its, first, A- Northern slope (1 and 2). The Northern slope is comprised of simple, broad, shallow folds followed by a gentle monocline. The second is B- Southward (3)Southward the folding becomes tighter and the folds are commonly faulted. Faults are normal and formed (Horst and Grabban) along the southern scarp the structures are more complicated and comprise east-west trending faults and over fold.

Southern the salt range is truncated by the salt range thrust. The Eocambrian evaporites are exposed in some of these over folded and faulted anticline, which are actually nose type structures have also formed. C- Eastward Salt Range bifurcates into two narrow northward trending ridge.

i. The Diljabba (C-1) Diljabba Hill is a steeply dipping anticline traversed by Diljabba-Domeli Thrust
ii. The Chambal-Jogi Tilla (C-2) Chambal-Jogi Tilla comprises steeply dipping monocline, complicated bycomplex thrusts and tear faults.

D- Westward Slat Range takes a northwest bend near Warcha (11). Its structures remain the same and it is separated by the Kalabagh Fault (4) from the TransIndus Ranges, (12)

Salt Range Thrust: This thrust fault runs along the southern margin of the Salt Range, between Jhelum (13) and Indus River (14), and it has pushed the older rocks of the Salt Range upon the lessdeformed tertiary sequence of the south lying Jhelum Plain (15). The thrust zone is largely covered by recent agglomerates. Along the Salt Range thrust effective decoupling of sediments from the basement along the salt layer has led to southward transport of the Salt Range and Potwar Plateau in the form ofa large slab over the Jhelum Plain.

Kalabagh Fault: The fault forms the western margin of the Salt Range and extends NNW from near Mianwali(16) for a distance of 16 km. It has been described as an

active Dexteal Wrencha Fault (17) associated with several recorded earthquake epicenters.It has a long southward continuation as inclined by lineaments on landsat photographs and Buried Dextral Fault Inferred from seismic data. It cuts folds and faults in the Eocambrian to Quaternary rocks. In its northern segment the Kalabagh Fault hasaffected.

a. The Quaternary deposits as indicated by uplifted stream terraces,
b. Tectonic blocks of evaporite and Limestone,
c. Truncated alluvial.Southward the Kalabagh Fault apparently displaces the Salt Range Thrust.Near its southern end (North of Khairabad), the kalabagh fault splays out and forms two additional sub parallel faults, the Dinghot (18) and Aniwan (19) Faults.

8. Economics:

Economics of any country depends upon the natural resources present in it. In Pakistan nature has gifted abundant natural resources. Salt Range contains abundant mineral deposits and building material, which are used in industry as crude materials. It has large deposits of Halite, Gypsum, Phosphate, Potash, Coal, limestone, Dolomite, Silica sand, Iron ores, Petroleum, Radioactive minerals, clays etc.

8.1 Halite

The main salt production comes from Billianwala member in salt range. Where Several salt mines are established in the areas of Khewra, Warcha Kalabagh. The 2nd largest salt mine “Khewra Salt mine” is found in Billianwala member of Pre-Cambrian age of salt formation range. Massive beds of Halite are embedded in red colored marble. Salt has been mined at Khewra since 320 BC, in an underground area of about 110 Square KM (42 Sq.Miles) Khewra Salt mine has estimated total of 220 million tons of rock salt deposits. The current production from the mine is 325,000 tones salt per annum. The mine head buildings have 19 stories, with 11 below ground. Only 50% salt is extracted and 50% is left as pillars to keep the mountains intact. The salt-mine is 288 meters (940 ft) above sea level cumulative length of all tunnels are more than 40 KM (25 Miles).There are seven thick salt seams with a cumulative thickness of about 150 meters. At place the rock salt is 99% pure. Salt is transparent white, pink, reddish to beef-colored. There are beautiful alternate bands of red and white color salt.

8.2 Gypsum

Thick deposits of gypsum are present in Bhander Kas member of salt range formation, through which Gypsum is mined. The thickness of the Bhander Kas gypsum
is more than 80.(Give unit) Gypsum is used primarily in the plaster-making industry.
Crude gypsum is used as a fluxing agent, fertilizer fill in paper and textiles and retarder in Portland cement. About three-fourth of the total production is calcined for use asplaster of Paris and as building materials in plaster, cement, board products and tiles and blocks. Gypsum plaster is a white cementing material made by partial in- complete dehydration of the mineral gypsum, commonly with special retarders or hardeners added. Applied in a plastic state (with water) it sets and hardens by chemical recombination of the gypsum with water.

8.3 Lime stone

Limestone is for most abundant mineral commodity in Pakistan containsvast reservoirs in many localities in salt range wargal lime stone, Sakesar limestone, Nammal formation and Chak Jabbi limestone indicated major lime stone. More than 95% limestone issused in cement making, so this is the reason that Pakistan's many cement industries are present in salt range areas. Limestone is used in variety of purposes due to the variation of its composition. The more commonly uses for which these rocks are suitable include concrete and other aggregate crushed rock for road metal and other uses, agriculture limestone riprap and building stone.

8.4 Dolomite

Pakistan contains vast amount of dolomite.
In the upper Indus basin major dolomite bearing formations are Jutana, Kingriali and Samana Suk. Dolomite is of good grade, close to the theoretical value of dolomite. The internet differences between dolomite and calcite drive the application for dolomite. Dolomite is chosen for many construction and building product applications due to its increased hardness and density. Asphalt and concrete application prefer dolomite as a filler for its higher strength and hardness dolomite also finds use in a number of applications as a source of magnesium such as glass and ceramics manufacture as well as sintering agent iniron are pelletization and as a flux agent in steel making. Farmers use dolomite for agricultural PH control. In chemical industry uses the mineral dolomite in making

magnesium salts including magnesia, magnesium oxide (MgO) which is used in pharmaceuticals.

8.5 Coal

Pakistan contains large deposits of low quality coal of Tertiary age. The salt range contains major coal fields of the country. The salt range province contains two horizons, which are Makarwal and Khushab-Dandor coal fields. This coal is present in Hungu formation in eastern part of the salt arrange and other in Patala formation, which is formed all over the salt range but coal of economic value is only present in central salt range area. For many centuries coal was burned in small stores to produce heat in homes and factories. Today the most important use of coal, both directly and indirectly, is still as a fuel. The largest single consumer of coal as a fuel is the electrical power industry. The combustion of coal is power generating plants is used to make steam which in turn operates turbines and generation. Coal is no longer widely used to heat homes and building as was the case a half century ago, but it is still used in industries such as paper production, cement and ceramic manufacture, iron and steel production and chemical manufacture for heating and for steam generation. Another use for coal is in the manufacture of coke. Coke is nearly pure carbon production when soft coal is heated in the absence of air. In most cases one ton of coal will produce 0.7 ton of coke in this process. Coke is of value in industry because it has a heat value higher than any form of natural coal. It is widely used in steel making and in certain chemical processes.

8.6 Clay

The term clay is natured, earthy, fine grained, material, largely, composed of hydrous aluminum silicates deposits of clay are wide spreading in time and space in Pakistan. The clay is classified into four different categories: china clay, fire clay, fuller'searth and bentonite. Fire clay and bentonite are present in salt the range.

8.7 Fireclay

Fire clay deposits are reported from Datta formation, Hangu formation and Patala formation in the salt range. The principal uses of fire clay are in manufacture of firebrick and of various accessory utensils, such as crucibles, raggers, retorts, and glass, ports, used in the metalworking industries.

8.8 Bentonite

Beds of bentonite are known to occur in the rocks of Swalik group in Upper Indus Basin. Bentonite can be used in cement, adhesives, ceramic bodies, and cat litter. Bentoniteis also use as a binding agent in the manufacture of taconite pellets as used in the steelmaking industry. Fuller's earth an ancient dry cleaning substances, is finely ground Bentonite, is typically used for commercially designed clay bodies and ceramic glazes.

8.9 Iron ore

Sedimentary iron ore deposits are known to occur in upper Indus basin in saltrange. The large deposits of iron, through of low quality are found in Sakesar in Salt Range. In Jurrasic Age Chorgali and Hangu formation two sedimentary iron horizons are present in red shale. Iron ore mined is used for making steel. Raw iron by itself is almost as strong and hard as needed for construction and other purposes. So the raw iron is alloyed with a variety of elements such as Tungesten, automobiles and other formation of transportation such as trucks, Trains and Train Tracks.

8.10 Potash

In the salt range potash beds are associated with rocks salt in salt range formation and with green sand of Chichali formation of Surghar range. Potash has three uses, Fertilizers, Lime Stock Feed supplements and industrial processes 95% of world's potash is used in fertilizers, while the rest is used for feeds supplements and industrial production. Potash is a key ingredient in fertilizers that enhances water retention of
plants, increases crop yield and plants disease resistance in feed supplements, the key function of potash is to contribute to animal growth and milk production. Potash is also used to produce glass, ceramics, soap etc.

8.11 Sand stone

Sand stone are present in the Khewra, Juttana, Warcha and King iryaliformation in salt range, sand stone is a good reservoir rock with the petroleum perspective. Sand stone is used in construction of roads, buildings, tiles and glasses industries.

9. Conclusion

The salt range is the result of tectonic activity and was imposed during the later phase of the Himalaya orogeny in late Cenozoic time the occurrence of the thick, incompetent salt range formation at the base of the sedimentary sequence has strongly influenced the structure. The salt range and Potwar plateau are part of the active land and thrust belt of the Himalayan ranges of northern Pakistan within the salt range, the structure of consist of a narrow zone of intensely folded faulted and uplifted rocks which contracts with the open folds of low structural relief of the Potwar plateau. As we move from eastern to central salt range the structures becomes complex. The salt range contains the exposure of Precambrian salt range formation to recent deposits. The distribution and their internal sedimentary features indicate that the most formation in the salt range was deposited in the shallow marine and fluvial environment ie. Molasses deposits. Due to the excellent exposures and a more or less complete Stratigraphic sequence of Phenerozoic rocks, the area is rightly called as "Museum of Geology". Salt ranges have richly fossiliferrous stratified rocks that include Permian carbonate succession with Brachiopods, Lower Triassic Ammonoids bearing beds and Lower Tertiary marine strata composed of age diagnostic foraminifera. The detail study of fossil can help to understand the depositional environment. Numerous coal mines are present in the field area, coals being extracted from Patala formation by drilling through lime stone beds of Eocene age. Presence of coal seems beds and mines shows that the area has enormous potential of coal and hydrocarbon exploration and is economically important. Due to excessive mining the extracted material are not disposed of properly which contaminate the surface and ground water concerning environmental impact to area.

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