

Original Paper

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Early History of Geological Formation & Topography of Gujarat

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Introduction

This research article is based on the study and analysis of early history of geological formation and topography of Gujarat. In the history of Gujarat, there is a clear impression of the geographical environment of that territory on human life in any given territory. Its geological structure of the region has also contributed to the development of the geographical environment. Hence in geographical study, its geological formation is also considered. Different types of rocks lying on the top surface of earth crust and the study of rock layers have been covered in the study of geological formation. Important things like topography and design of land formation, formation of land, structure and its types depends on the topography of particular territory.

Geological History of Gujarat

Gujarat is referred as totally new territory in geological terms. However the geological history of Gujarat is very old and lengthy. Gujarat has experienced many geographical movements during the period from Archean Era to Modern Era. In Gujarat, starting with the oldest rocks of Archean Era there are the territory holding the alluvial rocks of modern era. Altogether 17 geological subdivisions of the world are considered as normal, only 8 geological sections of them are found in Gujarat, the rest is totally lacking. Geological formations found all over the Gujarat are arranged according to their rank and time-age in table - A. From these 8 geological sections many of the geological sections are not found in perfect condition. Some little piece of their regions

appears in sporadically territory. It is incomplete because of some major empty bight coming in the geological history of Gujarat. Thus many sections of "Peliyozoic Era" and "Mesozoic Era" are not found in Gujarat. While the levels of "Pre-Cambrian" and "Turtiary Era" is found relatively.

TABLE - A

No.	Geological Era	Period	Years Ago	Covered Area (k.m.2)	Percentage of Total Area
1	Quaternary Fourth Bio Era	Modern Pleistocene	25,000 10 Lakh	-	-
2	Tertiary Third Bio Era	Paleocene Miocene Oligocene Eocene	1.5 Crore 3.5 Crore 5.0 Crore 7.0 Crore	1,01,743	51.90 %
3	Mesozoic Second Bio Era	Cretaceous Jurassic Triassic	12.0 Crore 15.0Crore 19.0 Crore	68,092 6,636 -	34.70 % 3.40 % -
4	Paleozoic First Bio Era	Permian Carboniferous Devonian Silurian Ordovician Cambrian	22.0 Crore 28.0 Crore 32.0 Crore 35.0 Crore 40.0 Crore 50.0 Crore	- - - - - -	- - - - - -
5	Pre-Cambrian Pre - Bio Era	- - -	60.0 to 300.0 Crore	19,553	10.00 %

Source : Geological Survey of India, Gujarat State.

Geological Formation of Gujarat

Igneous rocks formed by Basaltic Lava known as "Deccan Trap" lying in the wider area of Gujarat as a geological formation. Granite and Nice Rocks are found in some parts of the Panchmahal and Bharuch District. With the exception of ground of Ganga-Satlaj of North India and North Gujarat territory, the structure of entire Gujarat has been formed by lava coming out of volcanic blasts and spread over the surface. "Deccan Trap" is found in most areas of Kutch, Middle and South Saurashtra and territory of Gujarat situated at South of Narmada River. In modern times, the Ground of South Gujarat and valley region of Tapi River have been formed due to alluvium clay separated from worn-out Lava rock. Black cotton soil has been formed due to spreading of alluvium by the rivers of south Gujarat, and then the ground of North Gujarat

just like as ground of Ganga-Satlaj has been formed due to spreading of alluvium by Banas, Sarasvati and Rupen rivers.

The stone of Pre-Cambrian or Archean Era are found in 19,553 km² of Gujarat approximately i.e. in 10% region of total area. In which igneous rocks like Granite, Nis and Shist and deformed rocks formed before starting of 60 crores years to 2 billion years have been found. The oldest deformed "Nis rocks" of Archean Era are found in Chhota-udaipur, Bodeli and eastern region of Sankheda. In these rocks there are various types of mixed "Nis Rock". Most of them originated from igneous rocks. Granite and Pegmatite can be attributed in these ancient rocks.

Geological Formation of Gujarat in Pre –Cambrian Era

Geological formations of "Pre-Cambrian Era" are very important in terms of mineral resources. Manganese mines of Shivrajpur and Green Marble mines of Motipura are lying in geological formation of this time. Important minerals like Crystal limestone, Dolomite, Graphite, Feldspar are found in geological formation of Vadodara district. There are mines of Lead, Zinc and Marble situated near Ambaji in Danta Taluka of Banaskantha district. Crystal limestone rocks are found from the region of Divaniya and Pasuval situated near Amirgadh.

The geological formations of first Bio Era or Paleozoic era are not found in Gujarat. While Jurassic of Mesozoic Era and geological formation of Cretaceous are found in 6,636 km². & 68,092 km². area respectively. That means the layers of Jurassic times lying in 3.4% region of Gujarat and the layers of Cretaceous times lying in 34.7% region of Gujarat. It is believed that in Mesozoic era approximately 15 million years ago larger area of Gujarat was sunk under the sea water. The rock layers of this time are formed due to deposition of rock materials which are separated from corrosion and erosion. Main rocks of this Era are "Shail", "Limestone", "Rocks of Coral", "Sandstone" and "Conglomerates" which are found from Gujarat.

Jurassic Layer of Kutch

The oldest layer of Kutch and Saurashtra is of Jurassic time. Mainly Jurassic layers are composed of under the sea water. The layers of this time are found in Kutch, so it is believed that ocean of Tithi was expanded till Western Madagaskar. The layers of Jurassic time are found from the surface of Kutch. These layers are categorized in "Pachham", "Chari", "Katrol" and "Umiya" layers which are derived from fossils in Kutch. Jurassic layers of Gujarat are scattered in large region, and has a thickness of more than 2000 meters. The layers of this time are found in highlands of Kutch and Dhrangadhra of Saurashtra. Lower Jurassic rocks are mainly limestone which is composed of shellfish and Corals. While upper Jurassic rocks consists of sand stone, shail and Conglomerates. The Jurassic time layers are situated near Bhuj in Kutch and near Umiya and in Pachham and other islands of big desert and in Rajkot of Saurashtra and Dhrangadhra and Wadhvan of Surendranagar district. Limestone, Bauxite, Porcelain soil and Betoniet are found in Kutch from this time rocks. While Silica sand and Porcelain soil are found from the district of Rajkot and Surendranagar.

Upliftment of Coastal Layer

Towards the end of the Jurassic period coastal regions are lifted in upward direction and conglomerate sediment in coastal oceans. Thereafter due to increase in the sea level, ocean water moved on land territories. In cretaceous time, i.e. 12 million years ago ocean of Tithi had moved in Kutch, Saurashtra and in the valley of Narmada. The history of this Era has been maintained in the layers of sand stone known as "Nimar" and "Ahmadnagar" and in the layers of "Bagh" and "Lameta". In cretaceous time, ocean water entered into river valley region and coastal land moved towards downward direction. Hence the layers of cretaceous time are found in narrow strip of coast as well as Narmada River's valley. Sand stones of cretaceous time are found in Himmatnagar region of Sabarkantha District. Moreover, sand stone, shale, Conglomerates are found in Dhangadhra region of Surendranagar District as well as in Songir of Vadodara district. Layers known as "Nimar Sandstone" are found under the "Deccan Trap" in southeast region of Pavagadh Hill. Nimar sand stone found from every layers. In some places Lameta layers are situated under the "Deccan Trap" Volcano. The geological formations of cretaceous time are lying in Kutch, Zabva, Alirajpur, Chhota-Udaipur and valley region of Narmada. Thickness of these layers is only 18 to 21 meters.

Geological Formation during Tertiary Era

In Tertiary Era which comes after Mesozoic Era, ocean attacked once again on western region of Gujarat. The mark of this attack is seen in the layers of limestone and clay developed in ocean. In which number of oysters of ocean are seen. The thickness of these layers is 30 meter. Above these layers there are layers of sand, gravel and clay whose thickness is 1219 meter. The carnelian of Ratanpur found from the valley of these layers. The attack of ocean occurred in the region of coastal area. So the oyster layers are seen in Surat and Bharuch district as well as both sides of Gulf of Khambhat. Crude oil fields of Gujarat have been found in these layers. These layers are considered since Miocene times. The oldest layers of Tertiary Era are lying in estuary of Narmada and Tapi rivers of Eocene times. These layers are separated by the Kim River's sediments. These Eocene layers are composed of soil which is separated from abrasion of volcano rocks, gravel, sandstone and limestone. The layers of this time are found at Bodhan situated near Surat. In Kutch, the layers of this time are designed on "Deccan Trap". This ejected rocks designed in Eocene time specially found from Surat, Bhavnagar and Kutch district. The main minerals like Bentonite, limestone, gypsum and lignite are found from the rocks of Eocene time. The Eocene time's layers having thickness of 1000 to 1500 meter are designed from Gravel, Conglomerates, sandy soil and limestone. These layers are compared with Gagaj layers of Lower Miocene time. The geological formations of Tertiary Era lying in Kutch district are of Eocene, Oligocene and Miocene time. The geological formations of Eocene and Miocene time lying in Gujarat's coastal regions are covered with coastal alluvial. The layers of Miocene time found in Kutch district are known as "Nari" and "Gajstaro". Large number of limestone rock is found from those layers. "Nari" and "Gaj" layers are found in some regions of Abdasa, Nakhtrana, Mandvi and Lakhpat Taluka of Kutch district and in Saurashtra, Kalyanpur Taluka

of Jamnagar district and Ghogha Taluka of Bhavnagar district.

Conclusion

There are many spectacular changes Geologically in the History of Gujarat. The present Condition of Geographical Formation and Environment of Gujarat is the result of millions of years process. The Geological Formation of Gujarat was the major factor for the development of Political, Social and Economic History of Gujarat. This research article is an attempt to find out the history of Geological Formations in Gujarat. It is not only an article, but also a small study of geological factor of the Gujarat state. Geological formation is a part of Geography. In the historical perspective, the geography of Gujarat is an important platform of Natural History of Gujarat. It has also contributed and constructed the Human History in Gujarat.

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