

Geology and civil engineering



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Scientific disciplines such as civil engineering and environmental sciences, for instance, rely on a deeper understanding and appreciation for earth's landforms and processes. Generally, any environmentally-related field requires a background on geological studies. Since civil engineers are ideally responsible for the built environment, an understanding of the ground upon which various infrastructures and facilities are built is of great importance.

The works of a civil engineer includes structures that facilitate transport, water supply, shelter and living dwellings, hydrophone, flood control and environmental protection, sewage and waste disposal, urban development and more. These structures include the highways, bridges and railways we traverse on a daily basis, dams and reservoirs that service a community with water, different energy systems and much more. We can clearly see the contributions made to civilization through civil engineering works. These contributions cannot however be possible without our natural environment - the earth.

Consequently, the understanding of this natural building material is indispensable for the construction of safe and reliable infrastructures. One of the tallest standing skyscrapers in the world, Burj Khalifa, stands 828m tall in the country of Dubai (Fig. Imagine if this structure was unknowingly built on top of a fault line and crumbled under the impact of an earthquake. The persons inside and in the near vicinity of the building would suffer tremendously. In addition to safety, the cost (both economic and social) of such a catastrophic event could be crippling. Consider the 1928 failure of the SST.

Francis Dam In California which led to a flood resulting In the death of up to 600. Two of the reasons for failure were due to the Instability of landslide material upon which the dam was built and the position material upon which the dam was built and the session of the dam with respect to the underground fault. Many failures have occurred worldwide due to the inconsistency and unknown behavior of the ground conditions above which such structures are constructed. Thus the understanding of how the ground will behave with respect to Infrastructures Is fundamental to civil engineering.

In addition to safety Issues and costs, the scope of geology Is also important for civil engineering when it comes to knowledge of construction materials. For example, cement, one of the most widely used construction materials, is impressed of inert granular materials such as sand, gravel, or crushed stone known as aggregates. Clays, limestone, literate and other building stones are other construction materials of the earth whose occurrence, composition, durability and other properties of concern to the construction Industry are studied In geology.

Other elements and phenomena such as water, wind, ice and earthquake The knowledge of erosion, transportation and deposition with solving river control, coastal and harbor work, and soil conservation problems The knowledge of groundwater present in subsurface rocks important for water supply irrigation, excavation etc. Foundation problems, as mentioned before, of dams, bridges, and buildings due to the geology of the site In tunneling, constructing roads, canals, and docks and in determining the stability of cuts

and slopes, the knowledge about the nature and structure of rocks is very necessary.

The knowledge of geological features such as faults, joints, folding and solution channels can assist greatly with the stability of civil engineering structures. The study of soil material is important generally. Geology is integrated in foundation engineering, construction materials engineering, infrastructure engineering, disaster mitigation, land-use engineering, water resources engineering and environmental engineering. Generally, civil engineers depend on geology to attain information about how the earth and its processes will affect their designs and how the earth as a material can be used for the improvements of structures.

GEOLOGICAL FEATURES: Certain regions across the world have interesting and unique geological features. Some of the world's most amazing geological wonders shown in Fig. 2 include The Wave on the border of Arizona and Utah, the Antelope Canyon in Arizona, the Great Blue Hole of Belize, The Blue Lake Cave in Brazil, The Crystal Cave of the Giants in Mexico, the Eye of the Sahara in Mauritania, Giants Causeway in Ireland, Hell Gate in Transmitted and many more. Fig. 2 Geological Feature of the World. The islands of the Lesser Antilles form another region of geological interest - a volcanic island arc.

Volcanic arcs refer to a chain of volcanoes arranged in an arc shape, as the name implies. They are formed as a result of the subduction of an oceanic tectonic plate under another tectonic plate, usually parallel to an oceanic trench. Volcanic island arcs consist of islands characterized by offshore

volcanoes. They are formed by the ongoing process of subduction where two areas of oceanic crusts collide. The difference between a volcanic arc and volcanic island arc is shown Fig. 3.

These trenches are the deepest topographic features on the earth's surface, reaching up to 11 km below sea level (Marina Trench). The crustal portion of the subducting slab contains a vast amount of surface water, and water contained in hydrated minerals within the seafloor basalt. Now as the subducting slab descends deeper and deeper into the earth, it encounters increasingly greater temperatures and pressures which cause the slab to release water into the mantle wedge overlying the descending plate. Magma, varying from basalt to andesite, is produced and rises upwards to form a linear belt of volcanoes parallel to the oceanic trench.

ISLANDS OF THE LESSER ANTILLES The Lesser Antilles include: Leeward Islands: Virgin Islands (St. Thomas, St. John, St. Croix, Water Island, Tortilla, Virgin Gorda, Nevis, Antigua, Barbuda, Redonda, Montserrat, Guadeloupe, Dominica, Marie-Galante, Les Saintes archipelago, Dominica, Windward Islands: Martinique, Saint Lucia, Saint Vincent, Grenadines, Barbados, Grenada, Tobago, Trinidad (Sometimes considered part of the Windward Islands). Leeward Antilles - Curaçao, Bonaire, Aruba, the Leeward Antilles consists of about seventeen active volcanoes. Active stratovolcanoes can be found in the submarine Kick 'em Jenny, north of Grenada; at Soufrière at <https://assignbuster.com/geology-civil-engineering/>

the northern end of SST Vincent; at the well-known Met Peeled at the rather end of Martinique; at Sufferer on the island of Babysitter, Guadalupe; and at Montmartre. Strata-volcanoes mean that there are numerous layers of lava flows and fragmented debris.

There is also the geothermal area at Sufferer, SST. Lucia. Other islands, while not active in historic times cannot be considered extinct, including the islands of Saba at extreme north-western end of the active arc, SST. Statutes (or "Static"); SST Skits, dominated by the Met Misery centre, Nevis which has a single cone and crater also has some geothermal activity; and Dominica. Grenade lone which has reached the usually late stage of producing alkaline organic basalts is probably completely extinct.

Kick ' me Jenny is an active underwater (submarine) volcano on the floor of the Caribbean Sea. It is located about km north of Grenade. It is the most frequently active volcano in the region. Between 1939 (first eruption) and 2001 (most recent eruption), at least 12 eruptions were noted. With each submarine eruption, deposits of volcanic material then accumulate around the summit. This demonstrates how the volcanic islands of the Lesser Antilles were formed and began room submarine eruptions. Sufferer volcano forms the northern end of the island of SST.

Vincent. This streptococcal reaches about 1178 m high with its peak (to the left) being the NW rim of a large crater created by a massive volcanic landslide. Since 1718, multiple powerful explosive eruptions have occurred. Met Peeled is one of the deadliest volcanoes in the world. It is famous for its 1902 eruption that led to the death of about 30, 000 people. It is located at

the northern end of the island and French overseas department of Martinique. The volcano has an elevation of 1,397 m. ND earthquakes are common occurrences of this region.