



**METROPOLITAN**

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### **QUESTION.**

Give an account to the different weathering processes and analyze the impacts of the resultant features to the well-being of local communities living in areas where these features are evident.

Weathering is a denudational process which involves physical disintegration and chemical decomposition of rocks into small particles by natural agents on the earth's surface.

Weathering is of 3 distinct types which include physical weathering, biological weathering and chemical weathering.

A. Physical weathering is the type of weathering which involves mechanical breakdown of rocks into small particles in situ mainly due to temperature changes or influence of plants, animals and man.

Physical weathering is mainly dominant in arid areas with prolonged dry season, high temperatures, low humidity of about 30% and also with scanty vegetation of shrubs and thickets. It can be traced in areas of Chalbi desert in Kenya, Karamoja in Uganda, Turkana land in north eastern Kenya, Semuliki and Albert flats in Uganda and in the Ankole Masaka corridor.

The following are the examples of physical weathering;

**Exfoliation.** Temperature differences lead to rapid expansion of rocks during day and contraction during night, this gradually leads to cracking of the upper layer on rocks and followed by peeling off of the broken pieces thus forming exfoliation domes. These can be found in Mubende, Nakasongola in Uganda and in Serengeti in Tanzania.

**Block disintegration.** This involves break down of rocks into large rectangular shaped blocks due to alternate expansion and contraction brought by repeated cooling and heating. This is followed by creation of cracks which are eventually

widened and rock pieces fall off. It forms granite tors for example at Kachumbala in Bukedea in eastern Uganda, Bismarck rock at Mwanza in Tanzania.

Granular disintegration. Is a form of physical weathering which operates on rocks with different minerals for example granite rocks have mica, quartzite and feldspar which are colored differently and therefore have different capacities. Such rocks disintegrate into small rock particles called granules for example in Turkana region in north western Kenya.

Aridity shrinkage. Some rocks for example clay expand in size after absorbing water during the rainy season. During the dry season, they contract and reduce in size due to loss of water through evaporation. This contraction creates strains leading to cracking of the rocks thus disintegration. Common in swampy areas with clay for example Masai Mara plains in Kenya, Nakasongola in Uganda.

Pressure release. This occurs on granite and metamorphic rocks. Involves removal of large quantities of overlying rocks, this exposes the underlying rocks to rapid expansion and cracking. The exposed surface layer bends and starts peeling off. Its examples are the inselbergs in Jinja, Walukuba, Nakasongola and.

Frost shattering. This occurs in regions where temperatures fall below 0 degrees Celsius. During day, snow melts, water enters into the cracks, during the night, it is very cold and therefore the water freezes into ice and therefore expands in volume, ice expansion exerts pressure on the crack walls leading to rock disintegration.

Human activities for example quarrying, mining also lead to break down of rocks in situ. This can be traced at Tororo, Bamburi at Mombasa and Hima.

B. Chemical weathering. This refers to the decomposition of rocks due to chemical reactions that occur between the rock minerals, water and

atmospheric gases for example oxygen, carbondioxide there by changing the mineral composition of rocks.

Chemical weathering is mainly dominant in areas with high temperatures and heavy rainfall which facilitates chemical reaction for example Lake Victoria basin, Kenyan highlands, kigezi highlands and in mbeya region in Tanzania.

The following are the chemical weathering processes taking place in east Africa;

**Hydration.** Refers to the addition of water in a rock. Some rocks absorb water and in the process expand in size giving rise to new compounds, when this takes place for some time, the rock is stressed up and disintegrates to form new rocks such as calcium sulphate absorbs water and changes into limonite.

**Solution.** Some minerals like limestone and rock salt are soluble in water, when it rains falls, such rocks dissolve and are carried away in a solution form leaving behind widened hollows. Solution is common in sedimentary rocks such as limestone, areas at nyakasura, katwe, fort portal, tororo with stalagmites, stalactites and pillars are formed by solution.

**Carbonation.** Its common in limestone regions of nyakasura, tanga, tororo. rain water in the atmosphere combines with carbondioxide in the air to form a weak solution of carbonic acid that reacts with calcium bicarbonate which is then removed in solution form. Stalactites, stalagmites and pillars are formed.

**Hydrolysis.** Involves reaction of hydrogen ions and some minerals within the rocks. The hydrogen combines with metal ions to give rise to different chemical compounds resulting into formation of clays, carbonates, potassium and silica. Granite rocks rich in feldspar undergo hydrolysis to form whitish clay called kaolin.

Hydrolysis is common in broad valleys of Naigombwa in Iganga Uganda and Bukoba in Tanzania.

Oxidation. This does involve use of water. It involves reaction of oxygen and iron or Aluminium compounds. When oxygen reacts with iron and Aluminium, the rock structure is transformed to laterites and bauxite. Its common ineric landscapes for example laterite capping of Buganda landscape and Ghana. The color of the resultant rock is also changed. Basalt which is black or green is oxidized to red.

Reduction. Involves removal of oxygen from a substance and addition of hydrogen to it. It takes place in saturated conditions where ferric hydrate is reduced to hydrogen sulphide. The addition and removal of oxygen changes the chemical composition of rocks hence disintegration.

Chelation. Involves base exchanges between plants and rocks which cause changes from either side. Plants secrete a fluid through there roots which react and cause rock disintegration. This partly explains why plants can grow on rocks. Plants absorb mineral salts from the rocks necessary for growth while at the same time secrete fluids into the rock. This changes the chemical composition of the rock leading to disintegration. Chelation is common in the forested regions and savannah woodland areas of timu, morongole in karamoja in Uganda, Miombo woodland in central Tanzania and turbo forests of Kenya.

Spheroidal weathering. Is common in areas which receive heavy rainfall for example Lake Victoria basin. Once it rains, the outer layers of the rock absorb a lot of water and expand. Water reacts with rock minerals and eventually the upper layer pull away from the major rock thus disintegration.

C. BIOLOGICAL WEATHERING. Burrowing animals like rats, rabbits, hares dig holes in the ground thereby exposing soils to weathering agents.

Plant roots extend into cracks with the rocks and as they grow and increase in volume they exert great pressure which leads to disintegration of rocks.

The resultant features formed after weathering include; inselbergs which are isolated hills that stand on their own, exfoliation domes, karst scenery features for example stalagmites, stalactite, pillars, underground caves, clints, uvalas, poljes, dolines and among others.

The following are the impacts of the resultant features after weathering to the local communities living in the area.

Kachumbala inselbergs in Bukedea district in eastern Uganda act as sources of tourist attraction hence foreign exchange inflow.

Weathered rocks rich in minerals for example the limestone are used for house construction by the surrounding people.

Limestone acts as a raw material for the cement processing industries for example tororo cement industry in tororo, hima cement industry.

Some rocks for example graphite coal is as a source of thermal energy for domestic and industrial use.

The weathered rock materials forms strong basements for tunnel and dam construction for example kariba dam in Zimbabwe.

Some weathered rocks form fertile soils which support crop farming.

The inselbergs are used as natural boundaries between districts by the local communities.

The exfoliation domes, inselbergs, pillars, poljes, Clints, dolines are used for study purposes.

The weathered rocks form soils which are resistant to erosion.

Some weathered rocks for example clay are used in the art and craft industry as raw materials for making pots, charcoal stoves and among others.

However, the resultant features have also impacted negatively to the local communities as explained below;

The inselbergs and exfoliation domes are barriers to infrastructural development because they can't be easily broken down to construct roads.

The karst scenery features for example the underground caves act as habitats for dangerous wild animals such as snakes, crocodiles which are a threat to the local communities living in the area.

The caves act as breeding grounds for mosquitoes, tsetseflies which spread malaria and sleeping people to the local communities respectively.

Some weathered rocks form infertile soils which don't encourage agriculture to take place due to absence of plant nutrients.

Conclusively, physical weathering is dominant in the arid and semi areas while chemical weathering dominates in areas where there is plenty of rainfall and high temperatures.

References:

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