MASS WASTING

Mass wasting refers to the movement of materials downhill or down slope under the influence of gravity. It's therefore the falling, creeping, sliding or falling of rocks and weathered materials downhill under the influence of gravity. The major factor that helps to overcome any resistance is water. Therefore, water acts as a lubricant for material to move down easily. A water saturated mass moves more easily than a dry one because water both increases the weight of the mass and also decreases the cohesive power of the material.

In other words, mass wasting is a large-scale movement of materials downhill in which the stability of the slope has failed. As a result, the materials move downhill under the influence of gravity with water acting as a lubricant. It is alternatively referred to as slope failure or slope collapse.

Mass wasting is a general terminology which includes all forms of movement along a slope ranging from the slowest to the fastest. Therefore, mass wasting refers to the creeping, flowing, sliding or falling of rocks and weathered materials downslope under the influence of gravity using water as a lubricant.

It's different from erosion in a sense that in erosion, water physically transports away the soil particles but in mass wasting, water doesn't physically wash away the materials but assists the rock to slide under the influence of gravitational pull.

Mass wasting occurs in highland and mountainous areas of East Africa like along the slopes of mountain Elgon, Rwenzori, Kilimanjaro, Kenya, kigezi highlands, Kisoro, Rwampara hills, Kipengere ranges of southern Tanzania, Bulecheke areas in Mbale, Sirinko areas among others.

TYPES OF MASS WASTING

The types of mass wasting include soil creep, talus creep, mud flow, rock slump, rock slide, solifluction, rock falls, avalanches and they can be classified as slow and fast or rapid movements.

Slow movements. Sometimes loose soil particles can flow extremely slowly down slope sometimes as slow as 1 cm per year. Slow movements involve the following types;

a. **Soil creep:**

this refers to a very slow movement of the soil and fine materials downslope on a very gentle slope. Soil creep can be detected by bending of trees, electric poles, fencing poles etc. in the direction of the slope. It can be illustrated as below.

b. **Solifluction:**

This is limited to glaciated regions of cold climatic zones or areas. Solifluction refers to the slow movement of saturated solid gravel materials underlying a frozen ground on a moderate slope. It can be illustrated as below.

c. Talus creep:

This refers to the slow movement of angular wastes or particles of all sizes on a moderate slope.

Illustration.

Fast or rapid movements.

Mud flow: this refers to the fast downhill movement of semi liquid material saturated by heavy rains on a moderate slope.

Illustration

Rock falls: this refers to a very fast movement of individual rocks falling freely from a very steep slope under the influence of gravity.

Illustration

Rock slump: this refers to a very fast movement of rocks on an over steepened slope like scraps, creeps and road cuttings. In slumping, a rock doesn't break up into different particles in the process of slope failure but the materials just slide as a whole mass. It moves in a back ward rotation such that the slump strata which was originally horizontal is tilted backwards. Slumping is mainly caused by massive rocks overlying weak rocks.

Rock slide: this refers to a fast movement of large masses of rocks and debris over a steepened slope and road cutting. Here, the rocks slide from faces of slope or jointed steep slope downwards.

Illustration

Avalanches: this refers to a large scale movement of materials embedded in ice. It's also a fast movement.

NOTE: the rapid movements of materials down the slopes usually involving large boulders and rock particles is sometimes called ***Landslides.***

CAUSES OR FACTORS THAT INFLUENCE THE RATE AND NATURE OF MASS WASTING

Climate: some areas in east Africa experience heavy rainfall sometimes exceeding 2000mm per year which leads to the absorption of water by the soils or rocks. This leads to the increase in weight of the

soils and rocks and also reduces the cohesion of the material in the mass of the rock. Therefore, the loose rock materials can easily slide downhill under the influence of gravity.

Secondly the pounding effect of direct rainfall destabilizes the rock surfaces resulting into mass wasting.

Temperature fluctuations results into expansion and contraction of rocks which results into weathering of these rocks. The loosen particles can the easily fall down under the influence of gravity.

Relief / nature of the slope. Steep slopes usually encourage fast or rapid movements of materials downhill e.g. rock slides, rock falls, rock slumps etc. due to the steep gradient. Gentle slopes on the other hand lead to limited mass wasting and also encourage slow movements e.g. soil creep, solifluction etc.

Nature of the rock. The structure, permeability or porosity of the rock and its jointing determine whether mass wasting will occur or not. Highly jointed rocks are prone to rock falls. This is because jointed rocks are easily affected by physical weathering involving block disintegration. The loose blocks of rocks can easily slide down wards or downhill in form of rock falls.

Where a permeable layer of rocks over lie an impermeable layer, the saturated permeable layer can easily slide downhill under the influence of gravity.

Nature of soils. Clay soils become slippery after absorbing water. The absorbed water increases the weight of the soil and also lubricates it and the ground where it's seated i.e. between the soil and ground hence facilitating downhill movement.

Loose sandy soils are affected by increasing temperatures. The temperatures turn the sandy dust which can easily creep downhill.

Earth movements (crustal instability). Areas in east Africa which are affected by increasing landslides are the ones that are prone to the occurrence of the earth's movement is greatest for example earth quakes and earth tremors, volcanicity etc... These destabilize loose particles of rocks and weathered rock materials resulting into mass wasting.

Over steepening of the slope by either river or lake erosion. Lakes may lead to the creation of cliffs due to wave erosion. This over steepened cliff can facilitate mass movement of weathered materials.

Over loading of the slopes by weathered materials where the excess load can easily be destabilized hence fall off by the influence of gravity.

Heavy moving objects like Lorries, heavy machinery like trains cayuse vibration of the earth's surface that trigger off mass movements.

Human activates like mining, quarrying, road construction, grazing of animals on steep slopes, lumbering in mountainous areas etc. result into destabilization of loose rocks on steep slopes resulting into landslides and rock falls.

Effects of living organisms e.g. barrowing animals like rats which loosen the rocks and the soils resulting into weathering which eventually makes the rocks prone to mass wasting. Wild animals grazing in mountainous areas trample on the surface and cause vibrations hence disturbing unconsolidated rock materials and finally results into landslides.

EFFECTS OF MASS WASTING

Loss of lives. Severe landslides especially those associated with heavy rains and earth quakes result into rock falls and rock slides that destroy settlements and kill people living in such settlements like on the lower slopes of mountains like the Bulecheke landslides in 1996 killed about 100 people, in Buhweju many people were killed by the landslide s that occurred in May 2002, 2010 and 2018 on the slopes of mountain Elgon.

Loss of property by the falling and sliding of rocks of various sizes. Many houses and settlements are normally destroyed for example in 1996 in Bundibugyo, a land slide occurred and destroyed several homes and properties for example roads, and electric poles connecting Bundibugyo to Fort Portal were destroyed and that from Kabale to Kisoro. Many crops and the would be agricultural land are often destroyed as they are buried by the debris from the upper slopes.

Destruction of forest resources. When a slope with forests fails, chances are that those forests are rolled down and totally buried and therefore destroyed for example the landslide that occurred in 1985 in Bundibugyo destroyed some good forested area in the Semiliki National Park.

It results into displacement and resettlement of people to other areas e.g. the recent transfer of people from mountainous areas of Elgon to Bunyoro. This resulted into loss of cultural identity as well as heavy government expenditure to resettle these people.

Mass wasting results into damming of rivers which may result into back ponding to form temporary water reservoirs or permanent lakes eh lake Bujuku on mountain Rwenzori, Lake Mbaka in southern Tanzania.

Results into exposure of fresh rocks to weathering.

Creation of landforms e.g. terracets, scars, etc. and this has promoted both local and foreign tourists who earn the government income.

Mass wasting results into the provision of fertile soils on lower slopes of hills, mountains by soil creep, exfoliation, etc. which has promoted agriculture in valleys e.g. vegetables growing in the valleys of kigezi.

MEASURES TO REDUCE LANDSLIDES OCCURRENCE

Among the measures taken to combat the problems of landslides' occurrence include the following;

Re- afforestation and afforestation. Planting of tress on the slopes where the trees were cut should be done in order to increase the cohesiveness of rocks. This has been on the slopes of the Kigezi highlands where eucalyptus trees have been planted. The government should establish forest reserves on the slopes and protect them against people's encroachment. This helps to increase the firmness on the slopes and reduces the chances of landslides to occur.

Hillslope drainage. A lot of water on the slopes increases the lubrication, saturation and weight levels of the rock particles on the slope which accelerates the chances of slope failure and landslides. This therefore means that excess water should be drained away through the drilling of pine lines on the slopes or construction of deep channels or trenches. This has been done on the Kenyan and kigezi highlands. This can also be done through the planting of eucalyptus trees so that they can drain away the excess water on the slopes of highland areas.

The government should come in to stoop people form cultivating on the slopes of mountains and highland areas like on the slopes of mountain Elgin, the kigezi highlands among others whose stability is doubtable. This will help to reduce the chances of landslide occurrence and their associated impacts on the environment and people.

(Research for other measures)

Revision questions

1. **With reference to specific examples from East Africa, examine the causes of mass wasting**

Approach

Define mass wasting and site the areas prone to mass wasting in East Africa.

Identify, explain and illustrate the various forms of mass wasting (both the slow and fast movements)

Give and explain the causes of mass wasting linking them to various types of mass wasting

2. **To what extent are the various forms or processes of mass wasting influenced by climate in East Africa.**

Approach

Define mass wasting and site areas prone to mass wasting in East Africa.

Identify, explain and illustrate the various forms of mass wasting (both the slow and fast movements)

Thoroughly explain the influence of climate on mass wasting

However, ……. give other factors

Give an evaluation or conclusion

"We shall draw diagrams when schools open"