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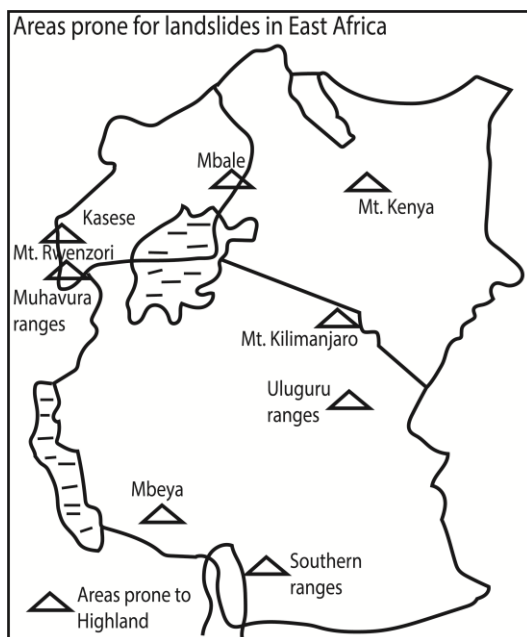
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Physical geography Chapter 6: Mass wasting in East Africa

Mass wasting is the downhill movement of weathered material due to influence of gravity or the creeping/flowing/sliding of rock and weathered materials or debris down the slope under the influence of gravity. It's different from soil erosion in that with soil erosion running water or wind physically erode and transports away top soil. In mass wasting water is not always necessary because every dry rocks may slide and fall downwards from a highland due to influence of gravity. Even where water is available it only acts as a lubricant or increase on the weight of the falling material.



Mass wasting can be slow or rapid. Rapid movements are called landslides. The major types of landslides are slumping/slipping, rockslide, rock fall, mudflows, earthflow and avalanches. While the major forms of slow movements are Talus creeps, solifluction and soil creeps.

Causes and types of slow movements are:

Soil creep occurs on gentle slope with unconsolidated weathered materials. It involves slow movements of massive soils downslope under the influence of gravity. It is usually facilitated with heavy rains. The soils get saturated and heavy causing slow movement downslope under gravity. It may be detected from a tilted tree or pole or blockage of a river or stream

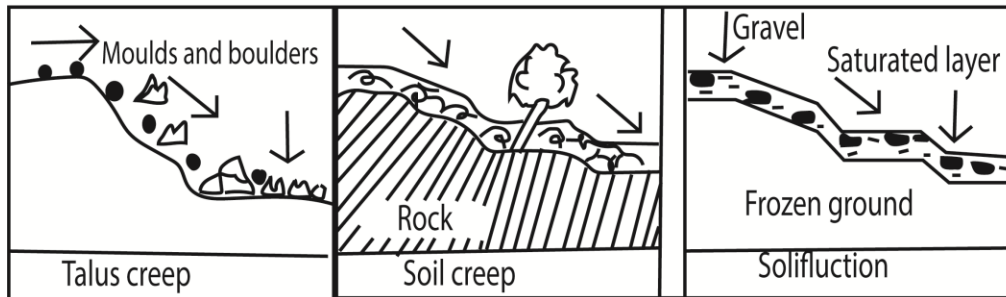
Rock creep

This involves movement of rock debris slowly downslope. Such rocks may move under soil creep. Examples can be found at Kapchorwa and Sironko in eastern Uganda.

Solifluction

This is limited to glaciated regions like the high altitudes and glaciated mountains of East Africa like Rwenzori, Kilimanjaro and Mt. Kenya. It involves the slow movement of saturated gravel and weathered rocks over the frozen subsoil and rocks. During freezing there is less movement but with thawing (melting) of snow/ice, the gravels tend to creep for a short distance.

Illustration of Talus creep, soil creep and solifluction



Rapid movements are called landslides. Landslides can be defined as sudden and rapid movements of rock and soil debris/materials down the slope under the influence of gravity. The major types of landslides are.

Talus-creep

This is the movement of angular rocks/screes of all sizes down slope. It involves movement of weathered materials as a mass over moderate slopes where freeze-thaw is frequent. Freeze-thaw weathering process tears out rock particles from the surface. Such rocks move down slope under the influence of gravity and the thawing water/ice provides a lubricant

Rock fall

Free fall of individual rocks and boulders down very steep slopes/vertical slopes at very fast speed. Examples of such can be found at Mt. Rwenzori and Sironko.

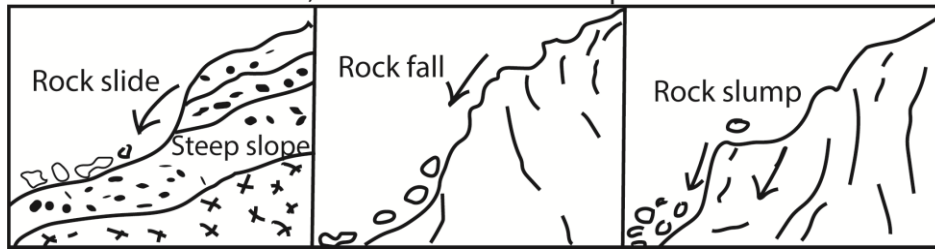
Slumping (rock slump)

Movement of large masses of rock materials and debris on over steepened slopes/cliffs/scarps/roads cuttings at a fast speed. It is common where massive impermeable rocks slide off the underlying soft and permeable rocks and move rapidly down slope.

Rock slide

Rapid movement of large masses of detached rock particles/debris rolling down at a fast speed along a slippery over steepened slope. It is accelerated by earth movements like earthquakes and the intensity of gravity due to steepness of the slope. This is common along the Usambara and Pare ranges in Tanzania and Butiaba escarpment in Uganda.

Illustration of rock slide, rock fall and rock slump



Mudflows

Movement of semi-liquid mud with gravels, boulders on moderate to steep slopes at a fast speed. They are common in arid and semi-arid areas as well as volcanic regions of east Africa like Kigezi highlands, Mt Kilimanjaro and Mbale along the slopes of Mt. Elgon etc. they may be caused by a combination of factors such as prolonged rain, absence of vegetation, etc.

Avalanches

Sudden downfall of rock materials embedded in ice and snow on steep slopes. In East Africa it is restricted to permanently snowcapped mountains of Rwenzori, Mt. Kenya and Mt Kilimanjaro

Causes of mass wasting in East Africa

(i) Relief

It is the major cause of mass wasting. Relief refers to the general appearance of land. The gradient of the slope determines the rate of downward movement. For example

- Very steep slopes encourage rock fall
- Over steepened scarps, cliffs and road cuttings encourage rockslide, rock slump, avalanches.
- Steep slopes encourage rock slide, mud flow and avalanches.
- Moderate to steep slopes encourage mud flow and talus creep
- Gentle slopes encourages soil creeps, solifluction etc.

(ii) Climate

- Heavy rainfall avail water that saturates rocks and weathered material making it heavy and also lubricates the slopes resulting into mudflow, rock slump etc.
- Pounding effect of heavy rainfall destabilizes surface layers of rocks triggering movement of rocks and weathered materials under influence of gravity.
- Temperature changes that lead to alternate freezing and thawing makes the ground slippery and water made available increases weight leading to mud flows, talus creep, rock fall and avalanches.

(iii) Nature of rocks

- Permeable weathered rocks overlying impermeable rocks absorb water, get saturated, overloaded and lubricated encouraging mudflow and rock side and vice-versa.
- Well jointed rocks may encourage landslides in form of rock fall, rock slides, avalanches etc.
- Alternate layers of hard and soft rocks also cause landslides in form of rock slump/ rock slides etc.

(iv) Nature of the soil:

- Heavy wet massive clay soils encourage landslides when they absorb water, the weight increases, become lubricated, are much slippery thus leading to mud flow.
- Earthquakes and earth tremors cause vibrations that trigger off landslides like rock slump, rock slide, rock fall etc.

- (v) Over loading/accumulation of rock debris in large masses on over steepened slopes promote landslides.
- (vi) Tectonic movements like faulting, warping creates steep slopes, cliffs and escarpments that encourage rock slide, rock fall etc. While vulcanicity involving basic lava flows down slope mixed with ashes promote rock slump, mudflow.
- (vii) **Human** activities that promote land slides
 - Construction of roads, settlements etc. in highland/hilly areas which leads to cliffs that encourage rock slump, rock fall and rock slide.
 - Mining and quarrying that involves use of explosives that cause vibrations, steepening and exposing slopes triggering rock slide, rock fall, mud flows etc.
 - Poor agricultural methods like up and down ploughing makes unconsolidated soils and weathered rock materials to move down slope in form of mudflow, rockslide, rock fall etc. • Deforestation along slopes leaving the slopes bare exposing it to rain water which encourages mud flows, rock slump.
 - Overstocking and overgrazing on the steep slopes loosens the rock structure leading to slumping and mud flow. This may be due to exposure of the soil/rock material and trampling of animals.
 - Movement of heavy vehicles, trailers, buses and trains cause vibrations along road cuttings and steep slopes that encourage rock slump, rock fall e.g. Kabale - Kisoro road, Simu-Kapchorwa road etc. **Heavy** vehicle cause vibrations that may encourage mass wasting
- (viii) **Deforestation** and removal of vegetation from steep mountains lead to mass wasting
- (ix) **Living** organisms such as burrowing animals like squirrels loosen the soil while stumping action of big animals like elephants cause vibrations leading to mass wasting.
- (x) Additional weight from materials or rain water promotes overloading hence rock slump, rock fall, mud flow.

Importance of mass wasting

Positive

- Exposes mineral such as gold in Kyamuhunga
- Fill pits and holes left after mass wasting
- Facilitated soil formation by exposing rock to agents of weathering
- Mudflow and soil creep may deposit fertile soils in the low lands
- May create new land forms such as terraces and scars on Mt. Kilimanjaro
- Leave features such as terraces and scars that attract tourists
- Education and creation of employment

Negative

- Mudflow carries fertile soils for highlands such as Kenya highlands, Kigezi Highlands etc.
- Landslides may be fatal
- Landslides may block roads and disorganize transport and communication
- Landslides may block rivers leading to flooding
- Disorganize electricity distribution by falling electric poles

Measures to control mass wasting in Uganda

1. Afforestation in areas prone to mass wasting such on mountains
2. National Environment Management Authority (NEMA) is educating people on dangers and means of controlling mass wasting

3. Soil erosion measures like ridges, terraces, growing of cover crops are adopted on hilly areas
4. In towns like Kampala concrete walls are being constructed along cliffs and road cuttings
5. Where roads are constructed in hilly areas like Kigezi, Civil Engineering is reduces steepness of the roads by excavation and planting grasses along the road cuttings.
6. Settlement is discouraged in areas prone to land slides
7. Mining and quarrying safety regulation are put in place by NEMA

Revision questions

1. (a) Account for the occurrence and effects of mass wasting in East Africa
(b) Describe the steps being taken to control mass wasting in East Africa.
(a) Define mass wasting, identify types, then explain the factors that cause mass wasting as well as the effects. Diagrams may be drawn where applicable,(b) explain the steps being done to control mass wasting. Note candidates tend to fail this section because they always tend **instead to suggest solution by using phrases like “should”**
2. (a)Distinguish between rock slumping and rock solifluction.
(Define the term rock slumping and rock solifluction, identify where and describe how each occurs, draw diagrams for illustration)
(b) Examine the effects of rock slumping on human activity.
(give positive and negating importance of mass wasting)
3. (a) Draw a sketch of East Africa and show areas affected by landslide
(sketch map should have a frame, tittle, key, and compass direction and must be labeled inside)
(b) Account for the occurrence of landslides in East Africa
(Define landslides and identify the types. Remember that mass wasting and landslides are often used interchangeably, types of landslides are to be explained and factors affecting landslide, diagrams to illustrate)
4. To what extent is man responsible for occurrence of mass wasting in East Africa
(Define mass wasting and describe types i.e. both slow and fast, explain man’s activities that promote mass wasting then addition factors that promote mass wasting)

Thank you
Dr. Bbosa Science