

CLASSIFICATION OF LAKES IN UGANDA

A lake is a depression on the earth's surface filled with water. Lakes form when water collects and accumulates in such depression

LAKES DUE TO TECTONIC MOVEMENT

Tectonic movements refer to all crustal disturbances and earth movements, which are lateral or vertical, rapid or slow due to tensional or compressional forces of endogenic origin/beneath the earth's crust, arising from geochemical and radioactive reactions in the mantle. These processes include; folding, earthquake, warping, vulcanicity and faulting. However, Earth movements refer to diastrophic movements caused by internal forces of compression, tension, uplifting, depressing, folding and faulting. It therefore excludes vulcanicity. These processes have resulted into the formation of the following different types of lakes as seen below.

Crustal Warped Lakes/Depression Lakes

These are lakes that are found in saucer shaped, basin-like depressions formed due to the effect of crustal down warping or crustal sagging. These types of lakes are characterized by an irregular shape compared to the fault lakes and are relatively shallow. These lakes are commonly found in areas which have undergone large scale crustal down warping and sagging.

Formation of down warped lakes

Depression lakes were formed through the process of down-warping, up-warping and drainage reversal during Pleistocene period.

Down warping of the central region led to the formation of a saucer shaped shallow basin. Up warping of western rift valley shoulders forced rivers such as Kagera, Kafu, Katonga, etc to reverse their direction of flow, while rivers such as like Nzoia and Nyando were rejuvenated and continued their flow to central Uganda pouring their waters in the down warped basins. These depressions were also filled with water from rain thus forming down warped (depression) lakes as seen in figure 5:.

Examples of depression (down warped) lakes in Uganda include Lake Victoria, Lake Mburo, Lake Kyoga and Lake Wamala in Mityana.

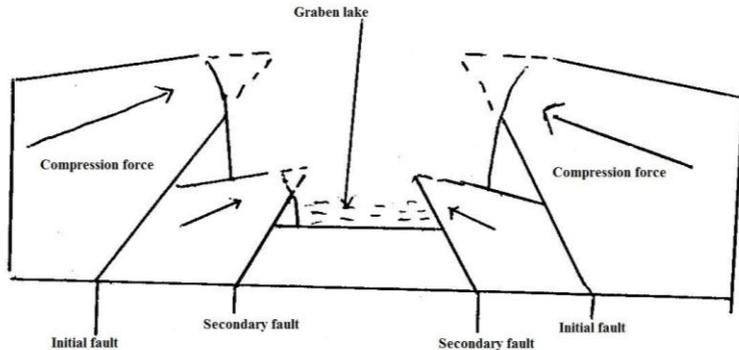
Lakes Formed due to Faulting

These are formed in fault hollows known as grabens on the rift valley floor. These include Lake Albert, Lake George and Lake Edward. Their formation is elaborated below

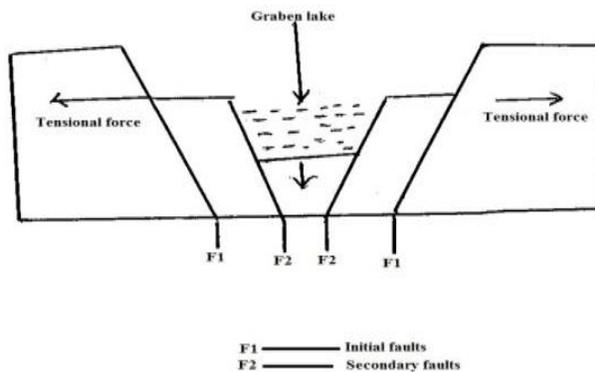
Compressional force theory

The geochemical and radioactive reactions beneath the earth's crust caused convective currents which converged resulting into development of compressional forces. These pushed the earth's crust towards the centre leading to development of reversed faultlines. This was followed by differential uplift where the side blocks rose faster than the middle block. This was further

followed by secondary or localised faulting of the rift valley floor which caused a graben or depression within the rift valley. When the depression was filled by water from the in flowing rivers and rainfall, a rift valley lake was formed for instance Lake Albert was filled by river Semliki and river Nkusi. Other lakes include L. George and L. Edward. See figure 5:



Tensional force theory: The geochemical and radioactive reactions in the interior of the earth set off convective currents which diverged leading to development of tension forces. These forces pulled the earth's crust apart resulting into formation of normal fault lines. This was followed by relative sinking involving faster subsidence of the middle block, relative to the blocks on either sides of the earth's crust. This was further followed by secondary faulting (sinking) which caused a graben or depression within the rift valley. When the depression is filled by water from the flowing rivers and rainfall, a rift valley lake is formed. For instance, Lake Albert was filled by river Semliki and river Nkusi. Other lakes include Lake George and Lake Edward. See figure



Volcanic Formed Lakes

Highland crater lakes

These are funnel shaped rounded hollows at the summit of dormant, extinct volcanoes. These are found on summits of dormant or extinct volcanoes such as crater lakes on Mt. Muhavura and Gisozi in Kisoro.

These lakes are formed from the gaseous explosion during a violent volcanic eruption which removes the tops of dormant volcanoes to form wide circular depressions. Due to violent eruption, the top of a volcanic mountain is shattered and blown away. This creates a circular hollow which is later filled with water to form a lake.

Mountain crater lakes may also be formed as a result of subsidence of the material that once occupied the vent into the vacant magmatic chamber below the volcano. This creates a depression on top of the mountain which is later filled with water to form a crater lake.

Explosion craters

These are shallow depressions with flat bottoms surrounded by low rims of volcanic pyroclasts and country rock.

They are formed when the violent explosive eruptions of magma consisting mostly of gases and pyroclasts, is ejected violently into the atmosphere where it loses its gases and falls back onto the earth's surface. It accumulates around the depression to form a rim of pyroclasts and country rock. The depression is later filled with water or may be deep enough to reach the underground water table and so water collects in it to form an explosion crater lake for example Lake Wabikere, Lake Kigere, Lake Katwe, Lake Nyamunuka, Lake Nyungu, Lake Kyamwiga Lake Munyanyange, Lake Kikorongo, lake Nyamusingwire, L. Katunga, Lake Nyungu, Lake Nkuguta, Lake Murambi, Lake Mafuro, etc.

Diagram

Lava dammed lakes

These are lakes formed along rivers whose valleys have been blocked (dammed) by lava flows. These types of lakes are shaped like the valleys in which they are found. Their depth also varies depending on the depth of the valleys, which they occupy.

It is formed when basic Lava from a volcanic cone flowing across a river may block the river valley, forcing the water to back pond. The continuous in-flowing water floods the valley and accumulates upstream behind the lava dam to form a lava dammed lake. Lake Mutanda was dammed by the lava flows from Sagitwe volcanic hills south of Kisoro town. Lakes like Bunyonyi, Chahafi, Kayumbu and Lake Mulehe in South western Uganda, were formed by river damming where the formation of Virunga ranges was associated with the release of lava that blocked river valleys and caused water to collect behind to form lakes of similar shapes to those of their former river valleys.

Diagram

Lakes formed due to Denudation/Sub Aerial/External Processes

Lakes Formed By Erosion

Glacial Lakes

Glacial erosion through plucking, abrasion and ice wedging, creates hollows which trap water which fills them up to form lakes i.e:

Cirque Lake (Tarn).

A cirque is a semi-circular water body with glaciated cut rock. It is common on the steep slopes of mountains where glaciers have been able to over deepen the area due to erosion. Glaciers moving through the depression erode the bed through plucking, abrasion etc. In this, the back walls progressively retreat (eaten away) and steepen. Gradually the lower end of the depression experiences less erosion and this leaves it raised compared on its bed. For instance lac du Speke, lac noir, lac Catherine. These have been filled with water from melting ice to form tarns or cirque lakes.

Diagram

Lakes formed by alluvial deposition

Lagoon lakes (wave Deposition Lake)

These are lakes formed due to sand bars enclosing lake water. Lagoon lakes are formed because of long shore drift building sand bars across bays or gulfs along submerged coasts. The deposited sand bars enclose the drowned bays or gulf, cutting of a lake thus forming lagoon lakes as seen in figure 5:

Diagram

Ox-bow lakes:

An ox-bow lake is horse-shoe shaped water body formed along the flood plain of a river. An oxbow lake is formed when a river creates a meander, due to the river's eroding the bank through hydraulic action, abrasion and corrosion. Due to intense river erosion of concave banks and deposition at the convex sides, the meander necks become narrow and thin. With time, the narrow thin meander neck is broken through by continuous erosion. Cutting it off to form a horse-shoe shaped ox-bow lake as illustrated in figure 6

Diagram

Ox-bow lakes in Uganda are evidenced along rivers like Semliki, river Rwizi, river Nzoia, river Manafwa, river Mpanga in Fortportal, seasonal Ox- bow lakes near Busiu water station and between Mazimasa and Wanghale along river Manafwa in Butaleja district.

Moraine dammed lakes

These are lakes that lie in basins that have been blocked by terminal moraine ridges deposited in mountain valleys. They are formed in depressions caused by the irregular deposition of glacial moraine and in areas of deposition by ice sheets. Terminal moraine is deposited across a valley where they form a ridge. This moraine ridge forms a dam, which blocks the flow of melt water, forming a lake for example Lake Mahoma on the terminal moraine near the junction between River Mubuku and River Bujuku

Man-Made Lakes.

Man's activities are responsible for the formation of lakes as seen below:

Man-made lakes are found in mining areas in pits left behind after excavating minerals. The pits are later filled with water to form lakes such as at Kajansi along Entebbe road in Wakiso district. Excavations such as the Kabaka's lake in Ndebba, Omugabe's Lake in Mbarara and the Namugongo shrine lake near Namugongo Uganda Martyrs' shrine East of Kampala city are vivid examples.

Manmade lakes can be formed when dams are deliberately built across river valleys or a gorge such as Nile Bridge and Bujagali Lake in Jinja district. This creates water reservoirs because of river ponding and flooding low lying areas upstream from the dam

Self evaluation questions 5:

1. To what extent has faulting led to the formation of lakes in Uganda.
(25 marks)
2. To what extent are lakes in Uganda a result of tectonic movements?
(25 marks)
3. Explain the influence of tectonism on the formation of Lakes in Uganda.
(25 marks)

Approach

4. To what extent has earth movements been responsible for the formation of lakes in Uganda?
(25 marks)

FORMATION OF LAKE VICTORIA

It was formed by the warping associated with the formation of the East African rift valley. During the formation of the East African rift valley, the areas currently occupied by the Eastern and Western arms of the rift valley were uplifted. The area between the two upwarped arms was down warped and sagged creating a broad shallow depression. Due to the uplift on either sides of the basin, the rivers that were formerly flowing westwards such as river Katonga and river Kagera, reversed or changed their direction of flow. Rivers such as Nzoia and Mara were rejuvenated. The waters from the rivers and heavy rainfall in the area filled the depression to form Lake Victoria as seen in figure 5: .

Diagram

LAKE KYOGA

Lake Kyoga is a down warped lake.

During the formation of East African rift valley, there was uplifting of western and Eastern Uganda. This was followed by down warping/sagging/sinking of the central part of the country creating a depression which was filled with water from river Kafu and other rivers like Mpologoma, Nile, Tochi, Okere, Sezibwa, etc and other water sources like rain, creating a finger like appearance of Lake Kyoga.

Diagram

FORMATION OF LAKE ALBERT

Lake Albert was formed as a result of faulting. According to tensional theory; tensional forces pulled apart the crustal rocks creating normal faults. This resulted into the sinking of the central block to form a rift valley. Due to secondary faulting and sinking, a small depression (graben) was formed within the main rift valley floor. The depression was filled with water from rivers such as Semliki, Nkusi and Victoria Nile, to form Lake Albert as seen in figure 5:.

Diagram

Alternatively, Lake Albert was formed as a result of compressional forces. These forces pushed the crustal rocks together, creating reversed faults. The side blocks were uplifted and raised above the central block, to form a rift valley. Due to secondary faulting and sinking, a small depression (graben) was formed within the main rift valley floor. The depression was filled with water from rivers such as Semliki, Nkusi and Victoria Nile to form Lake Albert.

Diagram

LAKE KATWE

Lake Katwe is an explosion Crater Lake that was formed due to violent volcanic eruption. The top part of the earth's crust was blown off. This created a depression (crater) which was later filled with water from rivers like Nambahu, Kyabamba, Kakindo, Kasabuni, etc and other sources, to form Lake Katwe as seen in figure 5:.

Diagram

THE IMPORTANCE OF LAKES TO THE DEVELOPMENT OF UGANDA

Positive effects of lakes

Lakes provide water for both domestic and industrial use. Industries such as Nile Breweries, Nytil, BIDCO industry and Uganda breweries, draw water from Lake Victoria. Lake Bunyonyi in Kabale is main source of water in Kabale district.

Lakes lead to the modification of climate of the surrounding areas by inducing heavy rainfall for instance Mukono, Jinja, Busia, Masaka and Buikwe around Lake Victoria. Lake Kyoga contributes to rainfall formation in areas like Masindi, Serere and Kaliro.

Lakes promote agricultural development by providing water for irrigation. For instance Kakira Sugarcane estate depends on the assured reservoir for continued supply of water from Lake Victoria.

Lakes are fishing grounds in form of fish rich in food protein leading to improved health to millions of Ugandans for example Nile perch, tilapia and silver fish from lakes such as Lake Wamala, Lake Victoria Lake Kyoga, Lake George, etc.

Lakes in Uganda provide minerals such as salt from Lake Katwe, petroleum around Lake Albert and extraction of sand and clay in

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various points on the fringes of Lake Victoria and Lake Kyoga which is used in the manufacture of bricks and tiles for the construction industry like Uganda clays at Kajansi, Lweza clays as well as Lwera sand extraction near Lake Victoria.

Lakes promote inland water transport and communication. Water bodies offer the cheapest mode of transport for goods and passengers for example Lake Victoria provides a link between Uganda and the three East African countries where canoes, boats and bigger vessels are often used for navigation.

Lakes promote the development of tourism. Volcanic crater lakes such as Lake Nyamunuka, Lake Katwe and Lake Saaka are important tourist attractions. Lake Victoria is associated with beaches such as Ggaba, Kasenyi, Lido, Lutembe and Munyonyo beach promote sun bathing which further boosts the tourist industry. Lake Bunyonyi is of great interest to tourists leading to generation of foreign exchange.

They act as catchment areas of rivers which facilitate hydro electric power production because they act as reservoirs of water for instance Owen falls dam and Kiira hydro power station depend on Lake Victoria as a reservoir for their continuous supply of water.

Many of Uganda's lakes like Lake Victoria and Lake Kyoga have associated papyrus vegetation which promote the development of art and craft industry for making mats and hats in places like Mukono, Buikwe, Masaka, etc.

Some lakes in Uganda provide ideal conditions for the development of forests for example Lake Victoria provides ideal conditions for the growth of Mabira forests leading to development of the forestry industry.

Uganda's lakes give opportunities for research in fisheries at Entebbe based on Lake Victoria. They act as sources of research grounds for students especially in higher institutions of learning like Entebbe fisheries institute and scientists in places like Jinja (naFIRI).

Lakes promote recreational facilities for instance Lake Victoria and Lake Kyoga act as recreational grounds in form of swimming and spot fishing.

Lakes control floods since they regulate the flow of rivers. They act as natural water reservoirs since they provide basins in which rivers discharge their waters as the cases of Lake Victoria, Lake Wamala, Lake Albert, etc.

Lakes shared with other countries such as Lake Victoria, Lake Albert and Lake Edward encourage inter-regional trade and promote international relationships.

They promote wild life conservation through provision of habitats for aquatic life for instance Lake Edward and Lake George have a high number of hippos, elephants and crocodiles.

Lakes promote the development of urban centres especially in ports and landing sites for instance Entebbe, Ggaba, Luzira, Kasenyi, Jinja, Bukakata and Busia around Lake Victoria and Katwe-Kabatooro town on Lake Edward.

Hindrances of lakes to the development of Uganda

Lakes and the associated swamp vegetation promote the spread of diseases since they are habitats for disease causing vectors. For instance, Lake Kyoga, Lake Bisina, Lake George and Lake Victoria are ideal breeding grounds for mosquitoes causing malaria, snails causing Bilharzia leading to the loss of human lives.

Lakes and the associated swamp vegetation limit transport development in that they act as social and economic barriers between people of opposite shores for instance Ssese and Buvuma Islands on Lake Victoria are cut off from the main land.

Some lakes cause pollution of the environment like Lake Nyamunuka and Lake Katwe that emit bad smell of ammonium sulphids polluting the environment.

Low lying areas around lakes are vulnerable to seasonal flooding during seasons of heavy rains resulting into loss of lives and destruction of property for instance the El-Nino weather phenomena of 1997–1998, which led to prolonged rains, caused many lakes like Lake Victoria, Lake Kyoga and Lake Albert to burst their banks resulting in the flooding of the surrounding areas like Entebbe, Masese, Serere, Bukungu, etc.

Lakes are associated with dangerous wild animals which are a threat to human life for instance a number of people have been eaten by crocodiles at the shores of Lake Victoria and Lake George.

Conflicts often occur where lakes are shared with other countries over boundaries as the Migingo incidence on Lake Victoria attests. The conflict between Uganda and D.R Congo over the ownership of Lukwanzi Island on Lake Albert.

Lakes such as Lake Victoria and Lake Kyoga promote piracy and insecurity since it is difficult to ensure security on the open waterbodies.

They are associated with accidents especially on large lakes such as Victoria, Kyoga and Albert. These experience storms which lead to capsizing of boats leading to the loss of human life and destruction of property.

They encourage smuggling since it is difficult to monitor movement across borders. Large quantities of products such as fish, cigarettes and petroleum products are smuggled to Kenya, Tanzania and D.R Congo and vice versa via shared lakes such as Victoria and, Lake Edward and Lake Albert.

They encourage urban growth with its associated problems like high crime rates, poor sanitation and gambling. This is evident in areas around landing sites such as Akokor, Lwampanga, Galiraya and Bukungu on Lake Kyoga, Katosi, Masese, Port Bell, Bukakata and Nakiwogo on Lake Victoria and Katwe-Kabatooro on Lake Edward.

Self evaluation exercises 5:

1. (a) Discuss the formation of Lake Victoria and Lake Kyoga basins.
(b) Assess the economic viability of these lakes to Uganda's economy.
2. (a) Describe the processes that led to the formation of Lake Kyoga.
(b) Explain the contributions of the lake to the region where it is found.

3. (a) Explain the formation of Lake Victoria and Kyoga.
 (b) With reference to Uganda, discuss the significance of the two lakes named in (a) above.
4. (a) With reference to either Victoria or Lake Albert, explain the mode of formation.
 (b) Assess the importance of the lake to the region where it is found..
5. (a) Describe the processes responsible for the formation of either Lake Victoria or Lake Albert. (10 marks)
 (b) Assess the contribution of Lakes to the development of Uganda.

Approach

- ✓ Choose one Lake and explain the processes which led to its formation.
- ✓ Come up with both positive and negative contributions which are illustrated with examples or names of lakes.

6. (a) Account for the formation of **either** Lake Kyoga **or** Lake Katwe. (10 marks)
 (b) Explain the contribution of Lakes to the development of Uganda. (15 marks)

Approach

- ✓ The lake should be identified
- ✓ Describe the lake and processes for its formation
- ✓ Draw the diagram
- ✓ Explain the positive and negative importance of Lakes.

All points should be well explained and illustrated with names of lakes.