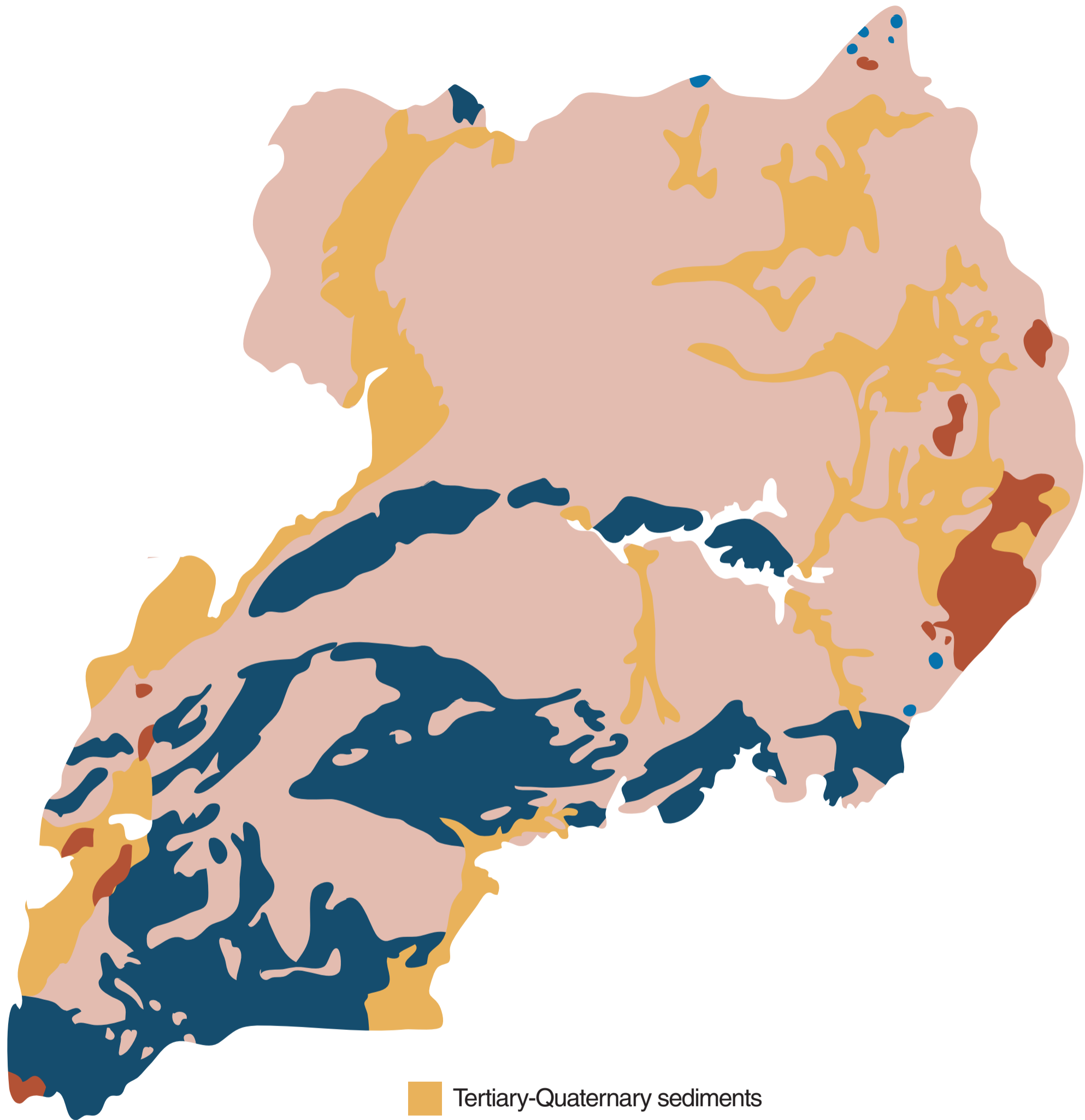







# Simplified Geology of Uganda



0 100km

-  Tertiary-Quaternary sediments
-  Tertiary-Quaternary volcanics
-  Cretaceous-Tertiary carbonatite/alkali intrusive centres
-  Precambrian-Palaeozoic sedimentary cover sequence
-  Crystalline Precambrian basement

 **Back** **Data** 

## Extracts from Mining Journal Uganda Supplement April 1996

### **Economic Geology**

Uganda lies within the borders of the African Plate, one of the largest known regions of continental crust that contains Archaean cratons that date to at least 2,500 Ma. The Plate extends through much of eastern and central Africa, and has been modified by subsequent geological events such as high-grade metamorphism along mobile belts, the deposition of several generations of sedimentary cover, granitic and other intrusions, and the development of rift faulting.

Much of Uganda's geology has been studied in broad outline only and detailed work remains to be done. The geochronology is as yet incomplete. Two-thirds of the country is underlain for the most part by Precambrian rocks, comprised of Archaean, and Lower and Middle Proterozoic Groups of varied lithology. Tertiary and Cretaceous carbonatite, syenite and alkaline volcanic rocks are also found, and there are Pleistocene and Recent sediments and volcanics in the Rift Valley.

### **Archaean**

The Archaean shield covers much of the southern half of Uganda, to the east of Lake Victoria, forming an extension of the Tanzanian shield. The shield here is composed chiefly of granites and gneisses. Several gold-bearing greenstone belts, comprising Nyanzian volcanics and overlying Kavirondian sediments, extend into Uganda from Kenya and Tanzania, but appear not to be as well developed as in the neighbouring countries.

The granitic metamorphic rocks in the Ugandan portion of the Tanzanian shield have commonly been described by the term "basement complex". This simplification is being replaced by more specific terms as additional information is gathered. Reconnaissance mapping indicates that much of central Uganda, and perhaps two-thirds of the country as a whole, is underlain by

basement complex rocks that are interpreted as being predominantly of sedimentary origin.

The Archaean Nyanzian system comprises a sequence of dominantly mafic volcanic rocks and sediments that form greenstone belts within the basement complex in the east of the country. Also occurring in neighbouring countries, these greenstones are estimated to reach thicknesses of 5,000 m in Tanzania. The Nyanzian greenstones both host precious metals deposits and have the potential for base metals, a feature of the unit being the occurrence of steeply dipping fold axes along an east-west orientation.

Rocks of the Kavirondian system occur in association with the Nyanzian greenstones in eastern Uganda; these comprise conglomerates, coarse arkosic and feldspathic grits and quartzite resting unconformably on the Nyanzian rocks from which they are at least partly derived.

### **Proterozoic**

Uganda's Proterozoic systems require more work on age dating and field mapping to allow better cross-border correlations. Three systems of this geological period have been identified; the Buganda-Toro, Karagwe-Ankolean and Bukoban systems.

The Lower Proterozoic Toro (or Buganda-Toro) system consists mainly of non-calcareous sediments and is found in three areas: along the north shore of Lake Victoria in the east, in the central region and as the core of the Rwenzori mountains in the southwest. A distinguishing feature is that metamorphism is higher in the central and southwestern regions than in eastern Uganda. This system contains the copper-cobalt ores found at Kilembe, and is thus of considerable economic significance to the country.

The Karagwe-Ankolean system lies within the Middle Proterozoic Kibaran Fold Belt that extends southwest from Uganda into Zaire and Zambia. Younger than the Toro system, its

sedimentary features reflect shallow-water deposition with argillites, shales and sandstones in a uniform succession. The thinner sandstones and quartzites are lenticular. The rocks are deformed along north-south axes with circular intrusives of porphyritic granites lying at the cores of the anticlines. Resistant quartzite ridges surround the granite intrusives. The economic importance of this system lies in its veins of tin, tungsten and niobium-tantalum that are found around the periphery of the granites.

The Bukoban system is thought to extend across the Proterozoic-Palaeozoic boundary but there are insufficient age dates as yet to be certain. The rocks are of little economic interest. They are hardly deformed and not metamorphosed, consisting mostly of sandstones, quartzite, shales, some dolomitic limestones, red beds, cherts and lava flows.

### **Palaeozoic To Cainozoic**

Small outliers of Karroo system sediments, ranging in age from Upper Carboniferous to Upper Jurassic or possibly Cretaceous, outcrop in a few locations in Uganda. Although this system hosts major coalfields to the south, these outliers represent the northernmost extent of Karroo sediments, and there are no commercial coal resources in Uganda.

Miocene volcanics outcrop in several areas of eastern Uganda, close to the Kenyan border and are denoted topographically by the prominent mountains of southern Karamoja region. Carbonatite ring complexes, possibly as early as Cretaceous and representing the eroded remnants of volcanoes of a similar geological suite, occur in several eastern locations.

Cainozoic rocks are either of sedimentary or volcanic origin and are found in the western Rift Valley adjoining Rwanda and Zaire. The sediments are thick, exceeding 4,000 m in fault-lined basins. Volcanics have been ejected from vents and there are hot springs in the district.

### **Major Structures**

The major structural controls within Uganda include orogenic fold belts and shear zones in the

Precambrian, and the processes of formation of the Rift Valley and later volcanic centres, followed by crustal warping during the Pleistocene that resulted in the formation of Lake Victoria. The orogenic fold belts usually follow fairly consistent trends.

Shear belts occur in the Precambrian in several areas of the country. The Aswa shear belt is the most extensive, following a northwesterly trend for over 300 km through northern Uganda and into southern Sudan. Other belts, probably of Late Precambrian age, run through the Karamoja region, Acholi and the West Nile district.

The Rift Valley extends along the western border with Zaire and encompasses Lake Albert, Lake George, Lake Edward, and the Rwenzori Mountains horst block. Sediment thicknesses of 1,800 to 4,000 m are estimated to lie within the Rift Valley, which is still locally active.

### **Mineral Occurrences**

Extensive portions of Uganda have been exposed to prolonged and intense weathering. These processes have led to some materials being concentrated into ores, most notably gold, tin, pyrochlore (niobium, tantalum and rare earths), and apatite.

Mineral occurrences include gold in Busia in the southeast, hosted by an Archaean greenstone belt (Nyanzian-Kavirondian), whilst in the southwest at Buhweju and Kigezi, gold occurs in Lower to Middle Proterozoic metasediments.

Gold mining has taken place at Busia in both alluvial and quartz vein occurrences. However, it appears that much of the so-called alluvials are actually lateritic formations formed by weathering of huge volumes of the underlying Archaean greenstones. The lateritic profile in many areas approaches 20 m and extends over tens of square kilometres. This lateritic gold may lead to the discovery of primary sources in the greenstones beneath.

Recent exploration in the southwest in the Buhweju-Mashonga area indicates that much of the gold being extracted by artisans derives from

lateritic gravel lying on kaolinised bedrock. The weathering profile in most parts of this area is 10 to 20 m thick. Quartz veins have also been noted and some are being worked.

In addition to Busia and Buhweju-Mashonga, other potential gold areas include Kigezi, Mubende and Karamoja. Karamoja, in the northeast, is of particular interest since favourable gold potential may exist in the intrusive and volcano-sedimentary rocks of Proterozoic and possibly Archaean age.

The most prospective district for base metals is in the Kilembe belt, where the volcano-sedimentary Lower Proterozoic series extends for over 90 km. The stratabound massive sulphides at Kilembe, containing copper and cobalt mineralisation, are hosted in rocks of the important Buganda-Toro system.

Apart from Kilembe, there are copper showings in the northeast at Bobong and Kaabong in Karamoja region, occurring within Karasuk Group rocks. There are also chromite occurrences in ultramafic rocks at Nakiloro, in the Karamoja district. An ultramafic rock assemblage identified at Moroto by the DGSM for further study may represent a Lower Proterozoic or Archaean layered intrusion, and in consequence holds potential as a new target area for nickel, chromium, copper and platinum-group metals mineralisation.

Other base metals have been noted. Lead, zinc and gold have been found in the Buganda-Toro Complex at Kitaka, within the Buhweju gold district. The Muko iron ore deposit occurs in Middle Proterozoic Kibaran rocks, whilst magnetite occurrences in the east, such as at Sukulu, are found in Tertiary carbonatites. Most of the cassiterite, tungsten, columbo-tantalites, beryl and lithium mineralisation is hosted by pegmatites and granites of the Buganda-Toro and Kibaran Complexes.

Amongst industrial minerals, phosphates are found in the east in Tertiary carbonatites that also host limestone, titanium and rare-earth elements. There is also limestone at Hima in the southwest, in a secondary deposit derived from calcareous tuffs and hot springs. Other industrial minerals include clay, kaolin, feldspar, diatomite, silica sand and various types of dimension stone.

### **Geophysical Interpretation**

Geophysical surveying has revealed the potential for a number of significant features that may prove of interest in the search for further mineral resources in Uganda. Some of this information has been extrapolated from regional airborne surveying, and evidence for some of the features suggested has yet to be confirmed on the ground.

Amongst these potential targets are a regionally extensive dyke swarm hypothesised as running from Tanzania into Uganda and lying in a series of semicircular arcs through the south of the country. Aeromagnetic data suggest the presence of this feature, which has a diameter of some 600 km. Also running northwards from Tanzania are two arcuate belts of magnetic anomalies that may be related to the nickel- and cobalt-rich ultramafic bodies that occur in the border region between Tanzania and Rwanda.

Interpretation of aeromagnetics also suggests that there is potential for further copper and other base metal discoveries to the east of the Kilembe district, while other features are considered to represent the tantalum, tin, tungsten and gold mineral belt on the Uganda-Rwanda border. Furthermore, it is also possible that the gold-bearing Nyanzian greenstones are more extensive than currently known, with large areas being overlain by superficial cover.