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The Geology, Mineral Resources of Sierra Leone and how the Resources can be used to develop the nation

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Abstract

Sierra Leone forms part of the West African Craton whose counterpart is the Guyana shield. Two main structural divisions are recognized; (a) the Liberian granite-greenstone terrain and (b) the pene-contemporaneous Kasila group mobile belt. Radiometric ages from both divisions show a spread from 2100 Ma to over 3400Ma. The rocks in the country are predominantly Archaean consisting of a granitic basement containing elements of sedimentary, mafic formations and a group of supracrustal greenstone belts with banded ironstones and detrital sediments. In common with most Archaean terrains, the country has considerable mineral deposits and reviews of these deposits have been based on similarities between the Archaean of Sierra Leone and that of the Superior province in Canada or the Rhodesian craton in South Africa. In this study, the country's primary mineral resources which are diamonds, rutile, gold, bauxite, and iron ore are discussed. The production or mining of these resources contributed about 20% of GDP and up to 15% of fiscal revenues until the closure of some mines before the civil war and the others during the war. It is believed that if the economy of this post conflict nation is to grow stronger the mining industry will have to serve as an engine to its economic growth. Four recommendations have been proposed on how current and prospective Sierra Leonean governments will achieve their developmental objectives using revenue generated from the mining of these mineral resources.

1. INTRODUCTION

The Republic of Sierra Leone is a small coastal West African country bordered by Guinea in the North and East, Liberia in the South and the Atlantic Ocean in the West. Almost half of the country consists of coastal lowlands with extensive mangrove swamps. To the east of the coastal plains are rolling wooded hills, leading into mountainous plateau areas. The climate is hot and humid with annual precipitation reaching more than 3,000 mm. The country has an area of 71,620 square kilometers (km²) and had an estimated population of approximately 6.5 million in 2007. The country was ravaged by a brutal civil war from 1991 to 2002 which had catastrophic impacts on human lives, properties, and the economy.

However, the country is endowed with a large resource base. This research emphasis on the mineral sector and the primary mineral resources are diamond, rutile (Titanium Oxide), bauxite, gold, Iron ore plus the recently discovered Oil and Gas deposit on the shores of the country in Sulima towards the boundary with Liberia. Figure 1 shows the

country's primary mineral distribution. Before the civil war, the country had established an active mining sector built upon significant exports of diamonds, rutile, gold, iron ore and bauxite. Although relatively modest by global standards, the mining sector was significant in terms of the country's population and GDP. It underpinned much of the country's formal economic activity, contributing 20% of GDP, as much as 15% of fiscal revenues and accounting for over 90% of exports.

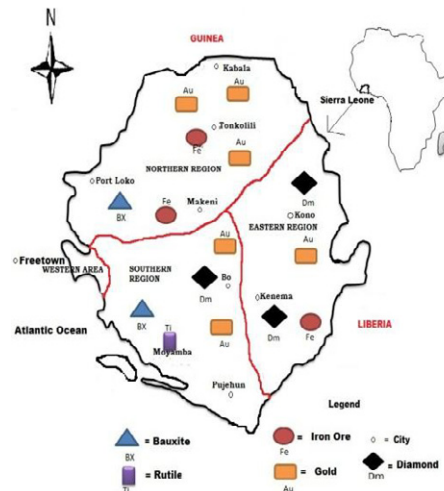


Fig 1 The map of Sierra Leone, its mineral distribution and its position in Africa.

Mining and quarrying provided a livelihood for over 250,000 people, and employed about 14% of the total direct and indirect labor force. Despite the sector operating at only a fraction of its potential, its contribution was significant enough to qualify Sierra Leone as a resource-rich country.

The return to political stability in 2002 coupled with positive global developments in the mining sector has now seen the rejuvenation of the domestic mining sector and it is hoped that this rejuvenated sector will once again underpin the economy and support the government's developmental objectives.

This research is aimed at reviewing the country's geology, its mineral resource endowment and how the mining of these resources could be useful in alleviating poverty and develop this post conflict country.

2. GEOLOGICAL STRATIGRAPHIES AND THEIR ASSOCIATED MINERAL DEPOSITS

About 75% of the country is underlain by rocks of Precambrian age, with a coastal strip of about 50 km in width comprising marine and estuarine sediments of Tertiary and Quaternary to recent age. Figure 3 shows the seven major structural units recognized in Sierra Leone. These structural units are discussed below as follows:

a) The Granite-Greenstone Terrain.

It represents parts of an ancient continental nuclei located on the edge of the West African Craton. Regional reconnaissance mapping indicates supracrustal rocks and basic and ultrabasic intrusions. The infracrustal gneisses and granitoids were formed and reworked during two major orogenic events, an older Leonean event (2950-3200 Ma) and a younger Liberian event (2700 Ma). The Leonean event commenced with the intrusion of a basic igneous suite and by the formation of a greenstone belt represented by the Loko Group which is now deeply eroded. Other volcano-sedimentary sequences are preserved within the granites, gneisses and migmatites. Highly folded greenstone belts predominate in the north and central Sierra Leone. Figure 2 shows a folded Quartz-Mica Schist in northern Sierra Leone. These greenstone belts are the principal hosts of the gold mineralization in the country. Other associated mineral deposits include molybdenite, columbite-tantalite and chromite.

b) The Kasila Group

The Kasila group is a high grade metamorphic belt with rocks trending in the NNW direction. It comprises a high-grade series of granulites, consisting of garnet, hypersthene and hornblende gneisses, quartzites and associated migmatites. In Sierra Leone, this group bounds the main part of the West African craton on its west and southwestern margin. Where the Kasila Group is eroded, significant secondary deposition of titanium minerals (Rutile and Zircon) have been formed. Weathering of this Group has also deposited bauxite.

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