

Restoration of Bauxite Lands in Jamaica: Life after Bauxite

Yolanda Drakopoulos

Senior Director, Bauxite Reserves

Jamaica Bauxite Institute, Hope Gardens, Kingston 6, Jamaica W.I.

Corresponding author: ydrakopoulos@jbi.org.jm

Abstract



Bauxite occurrence in Jamaica is somewhat unique among the world's large producers in that Jamaican bauxite deposits occur in numerous small discrete depressions in karst limestone in the central part of the island. The logistics of mining is determined by topography, and by the fact that unlike our South American neighbours, there is population everywhere in among these bauxite deposits. Over the past 70 years, bauxite mining has had to take place with communities in close proximity. The Government had to ensure that citizens' rights were protected, allowing them to co-exist with bauxite mining going on around them while minimizing the potential impacts of dust and noise. Also, Jamaica is a small island and any loss of land is significant, so the land has to be restored to a usable state as soon as mining is completed. The benefits of bauxite mining to the economy of Jamaica are obvious, but these could not be attained to the detriment of the people. To this end, mining regulations were enacted which mandated the time frame within which land restoration had to be completed, and the end use to which the restored lands could be put. These regulations are rigorously enforced to ensure that the island is not left as a post-mining wasteland, and that there will indeed be "life after bauxite".

Keywords: Jamaican bauxite, Restoration, Mining regulations.

1. Introduction

The origin of Jamaican bauxite is thought to be Miocene volcanic ash erupting from volcanic centres possibly in Hispaniola or Central America. The ash fall mantled the thick deposits of karst limestone of middle Eocene to lower Miocene age, accumulating in karst depressions and fault-controlled valleys. The contact between the red bauxite and the Tertiary white limestone is very sharp and irregular. There is no transition zone, and it is likely that the limestone contact is an erosion surface of the reefal limestones which were above sea level at the time. The bauxite is very uniform in appearance, earthy in texture, and is extremely fine grained. Alumina minerals occur mainly in the form of gibbsite (34-46%) and boehmite (1-12%), thus Jamaican bauxite may be classified as 'mixed' trihydrate/monohydrate or gibbsite/boehmite bauxite. The proportion of trihydrate to monohydrate is important as the processing requirements are very different between the two. Blending is encouraged in order to maximize use of the resource. The main impurities are hematite or goethite (17-21%), and silica (1-8%), with minor amounts of titania, phosphorus, zinc, and manganese. Trace elements include the rare earth elements. Some radioactive elements also occur in the bauxite and these, along with the REEs, are concentrated in the red mud residue. Research at the Jamaica Bauxite Institute has proven values of approximately 2 500 ppm REEs in the red mud.

The limestone regions hosting bauxite deposits have a general topography resembling an upturned egg box. Small discrete deposits occur in low-lying areas between rounded limestone hillocks, and thus road construction to access each individual orebody is challenging and forms a major part of mining expenses (Figure 1). The limestone terrain on the northern side of the island is more rugged, with smaller deeper deposits. These can be difficult to both mine and restore. On the southern side, the landscape is more open and undulating, and accessibility to deposits is easier.



Figure 1. Bauxite occurrence in Jamaica.

Population in Jamaica is widely distributed, even in what would appear to be the more remote areas away from population centres. This is likely a legacy from the slavery era, when slaves would escape into the mountains to get away from the plantations, and after slavery they were able to settle on mountainous and other marginal lands that were undesirable for other agricultural activities. Mining in populated areas has created its own set of challenges unique to Jamaica, and the bauxite industry has had to find creative ways to work within this environment.

Bauxite mining began in Jamaica in 1952, and some attempts at restoration began shortly after. In December 1953, the first Certificate of Restoration was issued by the Government of Jamaica. Over the next few years, experiments were carried out in a number of mined out orebodies using orchard crops such as avocado, citrus, ackee, lychee and coffee. However, it soon became obvious that this was not sustainable as it required intensive fertilization and constant extension services which all came at a very high cost. In addition, the need for a rapid vegetative cover to prevent soil erosion on the steep-sided reclaimed pits meant that the use of orchard crops was not the most suitable option. The use of grass in restoration then became widespread, especially given that the mining companies were also engaged in cattle rearing on the unmined lands as a land management strategy[1].

In over 70 years of bauxite mining, the Jamaican industry has seen significant changes in mining practices. Some of these are in a direct attempt to reduce costs, but also very important is the issue of mining in populated areas and the increasing scrutiny of the industry by environmentalists. Mining companies have had to adjust their practices in order to conform to fairly rigid mining and environmental laws, and to be able to co-exist with communities in proximity to the mines.

Main Laws Governing the Bauxite and Alumina Industry

- The Mining Act, 1947
- The Minerals (Vesting) Act, 1947
- The Mining Regulation, 1947
- The Bauxite and Alumina Industries (Special Provisions) Act, 1977 (1982)
- The Bauxite (Production Levy) Act (1974) (1998)
- The Bauxite and Alumina Industries (Encouragement) Act (1950) (1997)
- Natural Resources Conservation Authority Act, 1991
- Natural Resources Conservation (Permits and Licences) Regulations, 1996 (amended 2015)

Jamaican mining companies have to contend with periodic community protests – road blocks, placard demonstrations, sometimes physical altercations, with use of the media (including social media) to air their discontent. In order to help resolve these problems, the bauxite industry has formed community councils with joint representation from community groups, mining company personnel, government agencies such as the Mines and Geology Division, and the Jamaica Bauxite Institute. So far there are 17 active community councils in areas impacted by the bauxite/alumina industry – mines, refineries, ports, and railway lines. Community members have a forum in which to raise the issues of concern to them at monthly meetings and towards obtaining resolution. The success of this problem-solving mechanism led to the councils developing a wider scope of community development, assisted by the Bauxite Community Development Programme, which is administered by the JBI and provides funding for projects in these areas. The BCDP's mantra is "Life After Bauxite" and the long term goal is to prepare residents in mining areas for the day when there is no further income to be had from mining. Communities would have developed skills to allow them to continue to grow and develop sustainable economic activities.

In recent times in Jamaica, there has been a lot of anti-mining sentiment, initiated, funded and sustained by large environmental groups. This environmental lobby is very powerful, and are willing to use litigation to achieve their ultimate desire of shutting down the mining industry. They publish a lot of misinformation and disinformation, making use of social media to manipulate the emotions of Jamaicans at home and abroad. However, people need to realize that as long as they are consumers of goods, they create demand and provide a market, making them a part of the problem. Everyone wants to drive a nice car made of aluminium, but no one want to face the reality that the bauxite to supply the aluminium has to come from somewhere. We can't bury our heads in the sand and pretend that having a new smart phone every year does not have any environmental consequences.

Jamaican bauxite reserves are no longer believed to be infinite. In fact, we now have no unallocated bauxite-bearing areas left. All deposits are now under lease to some mining entity. We can have another good 20-25 years of mining left. To maximize benefits and reduce negative impacts, we must mine responsibly and restore to the highest standards. We have proven that strong legislation facilitates this, as the same company who is a model citizen in one part of the world does not have the same sense of corporate responsibility elsewhere and will basically do whatever they are allowed to get away with. Some mining companies take great pride in their reputations for corporate responsibility. For those who don't, legislation must be put in place to force them to restore the land to its former state as much as possible. This is especially important where bauxite mining is being conducted by multi-nationals who can just walk away when the business is no longer deemed profitable, leaving the host country to deal with the aftermath. Closure plans for the operations should be required by law, including the mining areas. We are part of one planet, and whatever occurs in one location, no matter how remote, will eventually affect us all. We are all accountable.

4. References

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