

Approaches to Bauxite Residue Legacy Issues in Jamaica

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Abstract

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Whilst only a small island developing state, Jamaica has been producing alumina for over 60 years. Within this history, several manifestations of legacy issues for the bauxite and alumina industry have developed – each location with its own attendant administrative and regulatory frameworks. The variation in the bauxite residue (or red mud) disposal practices and site-specific geology/hydrology and environmental conditions as well as historic practices, results in varied potentials for environmental impacts, primarily on water and air quality. The proximity of communities to the operations adds another dimension to the long term impacts of exposure to a degraded environment. The development of closure plans with the specific objective of minimizing environmental risks is not straightforward – and must include engineering considerations, geotechnical factors and achievable objectives of environmental management. The development of closure objectives in Jamaica has capitalized on ecological indicators that point to geochemical characteristics and biodiversity.

Keywords: bauxite residue (red mud) disposal, remediation, ground water impacts, land issues, ecological indicators.

1. Background

Jamaica is the third largest island in the Caribbean, bauxite is a key natural resource and it has been mined and processed for over 60 years. The bauxite industry in Jamaica spans several parishes, relocating ore to a number of refineries for processing. The existence of bauxite in Jamaica had been known for many years and studies by British Government geologists, J. G. Sawkins and C. B. Brown, reported in the 1860s on the presence of large quantities of red earth, terra rossa, rich in alumina and iron from St Ann and St Elizabeth [1].

The bauxite bearing lands occur in the central parishes of the island – St. Ann, Trelawny, Manchester, St. Elizabeth, Clarendon and St. Catherine, and present as valley and plateau deposits (see Figure 1 below). The ore, which is typically developed in karst depressions, can be easily mined from these depressions as they are surface deposits accessed after the removal of 30 to 40 cm of topsoil.

Jamaican bauxite composition is typically a mineral assemblage of oxides of aluminium, iron, titanium and silicon. It is mainly gibbsitic but some amount of boehmite is also present. The Jamaican bauxites tend to be very fine grained unconsolidated material with high free moisture, and a total alumina content typically <45% [2]. Present information reported to the JBI puts total alumina averages at 41%. Another constraint on the bauxite ore quality is the percentage of reactive silica – for the Jamaican refineries, less than 2% is desired as this would otherwise drive up the quantities of caustic soda required.

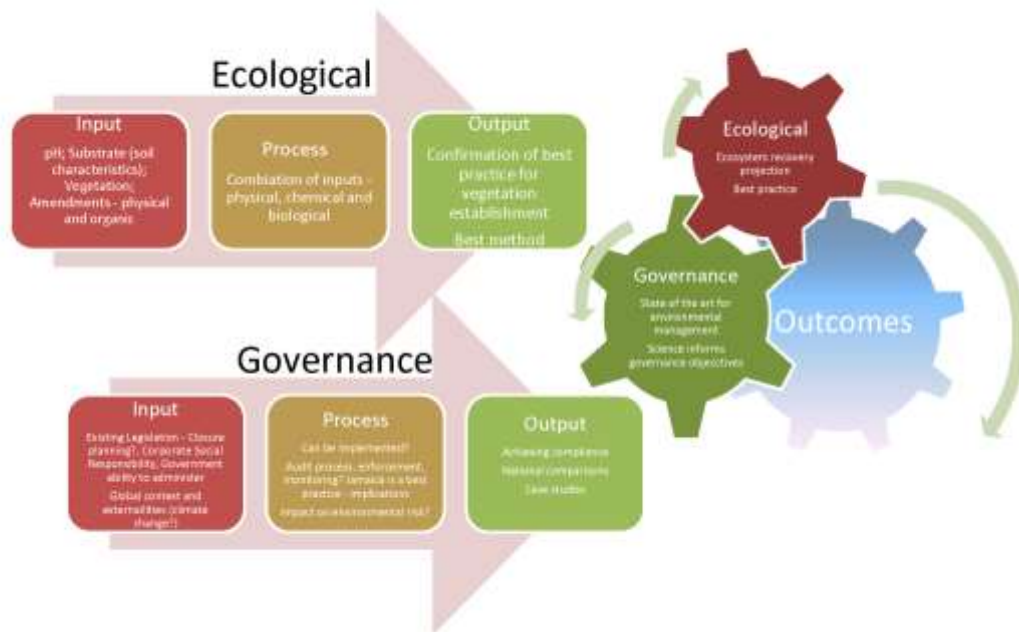


Figure 3. Conceptual framework diagram showing the interdisciplinary approach exploring Ecology and Governance

In conclusion, the Jamaican bauxite and alumina industry has a good technological grasp of the environmental issues related to bauxite residue sites. However, it is important that the environmental management systems used to address the operational environmental impact and legacy issues and the companies align with national objectives and the environmental regulatory framework. Locally, the operating companies have invested in social development and it is hoped that they will continue to be ethical partners. The Government of Jamaica on their part must retain/obtain the technical capacity to contemplate and implement requirements to address environmental impacts, particularly the legacy issues while companies are still operational. For companies that depart our shores, a technical dilemma of addressing a site while no process feeds that site, results in creative governance, including developing trigger alert schemes so that ground water is still protected, even during closure. This has been a success and now translates to other locations in the island through the environmental permitting process.

It is important for Jamaica to balance the concepts of environmental sustainability, taking into account changes (including climate changes), with the use of its natural resources to economically benefit all its people. The establishment of robust environmental protection measures, including best practice rehabilitation strategies, is a key aspect in securing sustainable economic prosperity with minimal adverse effect for Jamaica and its people.

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