

Preface

Mining, which supplies materials thought essential for modern living, has serious environmental impacts to land, sea, and air. Open-cast mining impacts all ecosystem components. This book has two objectives: (a) To provide an environment-friendly approach to reducing toxicity caused by mining, and (b) to discourage the expansion of mining to hitherto unmined and pristine areas in the Caribbean. Hence, in addition to catering to the academic audience, the aim is to increase the readability for users such as stakeholders in government departments, private industry, and other concerned individuals. Thus, the use of technical jargon is reduced as far as is feasible; explanations for abbreviations are included, and it is hoped that several color photographs of the impacts of mining increase the awareness of the problems.

Without efficient methods to neutralize toxic mine wastes, the impacts on the environment can be long-lasting. Groundwater has the longest recovery times from pollution due to low flow, dispersion and dilution, colder temperatures, and lower bacteria (degrading) levels. It may take thousands of years to cleanse itself of degradable wastes, and non-degradable waste is permanent. Through peer-reviewed updated research articles, the author studies sustainable geobiotechnological modes of amelioration, remediation, and recycling of toxic mine wastes. The ensuing chapters in this volume are comprised of thirteen, updated and/or new, journal articles, published during the last 15 years. Below the updated articles in the table of contents are the titles of the original articles on which they are based.

The following Caribbean countries are engaged in open-cast, or other forms of mining: Jamaica, Guyana, Virgin Islands, and Haiti (bauxite); Guyana, Dominican Republic, Jamaica and Cuba (one or more of gold/silver/lead/zinc); and Trinidad (Petroleum, mined in deep wells but also forming surface seepages, thereby impacting soil and water) and Barbados (petroleum). Mining, by increasing slope cuts and degrading soils, increases the likelihood of landslips, water erosion, and dust production. An integrated management strategy of topography, surface cover, and vegetation is required (Part I: Open-Cast Mining: Some Problems and Solutions).

The waste from mines creates disposal problems. Some of these wastes contain materials which can help to increase efficiencies of certain industrial products. Chapters titled: “[Geotechnical Stability of Two Gypsum-Treated Bauxite Red Muds and ‘Marl’ as a Road Base Under Submerged Conditions](#)” and “[Uniaxial Compressive Strength of Some Un-calcined Red Mud Mortars: Geotechnical Implications](#)” (Part II) examine the use of red muds as road surfaces and as an ingredient in concrete. Hydrocarbon contamination can create water repellence in soils. This often results in high infiltration rates which can cause rapid spreading of aqueous toxicants. This section includes a study of the use of bauxite waste to reduce hydraulic conductivity via clay dislocation, using field soils taken from a hydrocarbon-contaminated area in Trinidad.

Aqueous toxic contaminants such as acid mine drainage inflict arguably the greatest damage on aquatic systems. The Camaguey region of Cuba and Pueblo Viejo in Dominica Republic produce vast quantities of acid mine drainage, polluting several freshwater sources. Part III presents non-toxic bioremediation methods to neutralize acid mine drainage.

The caustic soda used in the Bayer process to extract aluminum oxide remains in the ground, disaggregating (hard-setting) soils and increasing alkalinity and the sodium concentration in ground waters. Part IV (the last five chapters) examines the following: (1) the ability of gypsum with or without the addition of N-rich decomposable phyto-organics to increase soil aggregation in poorly structured sodic subsoils, and, by extension, sodic bauxite waste; (2) the role of phyto-organics and biosolids in reclaiming acid sulphate soils; (3) the preparation of a mine capping for disused mine sites; and (4) phosphorus quenching.

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