Waste from the Bauxite and Alumina Industry

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General Problems with the BA Industry

- Land: Mining – interrupts land use, deforestation
- Air: Processing – mainly air emissions from calciners and powerhouse
- Water: Uncontrolled discharges from plant and waste holding areas
- Transportation: movement of Al, Bx, raw materials such as caustic soda, fuel oil
General Problems with the BA Industry

- Bauxite Residue: held in Residue Disposal Areas (RDA’s)
  a. Liquid portion – Liquor
  b. Solid waste - tailings
  c. Dry periods of the year – dust issue
GLOBAL CONTEXT

~ 70 Million tons per year generated worldwide

~ 4 Million tons per year generated in Jamaica
Worldwide disposal practices for bauxite residues

1. Sea disposal
2. Bauxite Residue Disposal Areas
   a. Ponds, unlined and dammed
   b. Lined ponds with drains
   c. Dry mud stacking (pioneered in Jamaica)
COMPARISON OF DISPOSAL TYPES

- Wet disposal, no underdrain
  180000t/Ha
- Wet disposal with underdrain
  210000t/Ha
- Dry stacking
  440000t/Ha
### COMPOSITION OF BAUXITE RESIDUES WORLDWIDE

<table>
<thead>
<tr>
<th>Compound</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Al₂O₃</td>
<td>10-25%</td>
</tr>
<tr>
<td>Na₂O</td>
<td>2-10%</td>
</tr>
<tr>
<td>SiO₂</td>
<td>3-50%</td>
</tr>
<tr>
<td>Fe₂O₃</td>
<td>30-60%</td>
</tr>
<tr>
<td>TiO₂</td>
<td>1-10%</td>
</tr>
<tr>
<td>CaO</td>
<td>1-8%</td>
</tr>
</tbody>
</table>

(Variations limits alternative uses, viability of extraction of other elements)
GEOHAZARD IMPACTS

Coastal Hazards affecting ports:
A. Hurricanes
B. Tsunamis
Jamaican Experience
JAMAICAN EXPERIENCE

Concerns locally:
Spills from the plant – sodium, pH main concerns (other heavy metals in insignificant quantities)
What are the impacts of the ports – movement of materials – caustic soda (sodium in salt water), alumina, fuel oil, what in the future – natural gas?
Oil spills real problem – from ship (via train, pipeline) Early warning systems and emergency responses at the port
OFFSHORE DISPOSAL

Neutralization and disposal of caustic effluent to sea, red mud washing using sea water
done internationally

IS THIS BEST PRACTICE?

Treat on land and create more toxic waste?
Sea water neutralization?
JAMAICA ENVIRONMENTAL MANAGEMENT STRUCTURE

- Specific conditions in environmental permits for:
  - Sediment runoff control from haul roads and mines
  - Ecological inventorying
  - Solid waste disposal
  - Mitigation
LBS PROTOCOL
PREVENT, REDUCE, CONTROL
JBI STRATEGY

ENVIRONMENTAL MANAGEMENT (MONITORING AND ASSESSMENT)

Interagency cooperation –
MOU with NRCA (1994)
WRA expertise,
EHU – Health impacts,
Forestry Department