Iron is the most needed ingredient in manufacturing steel. Steel is by far the most adaptable, significant and widely used of all metals and has found many applications viz., construction of motor cars, machines, pipelines, military equipment, electrical appliances, etc. For without steel, modern civilization will be absolutely impossible. Thus, iron ore has been mined for the past 3000 years by ancient and modern mankind. However, mining of iron ore has copious negative impacts on the environment. It degrades natural landscape, surface and ground water quality, flora and fauna, as well as the ambient air within the mining area and its environs. Iron ore tailings usually contain large amount of silica, iron, traces of Si, Co, Cu, Zn, As, Mn etc, that are harmful to humans even at low levels. In the present research work, the air and water quality of two different mining areas of India and Liberia are investigated and the quality of each compared against relevant water quality standards, (ISO 9001). Moreover, OB, tailings and blue-dust samples were collected from both mining areas, prepared as per relevant standard, characterized and tested to investigate their chemical composition and long term behavior. Characterization of OB, tailings, and blue-dust was carried out by a combination of several analysis viz., XRD, ICPMS and EDS while the leaching behavior was assessed under two separate leaching conditions: (i) double distilled water and TCLP (US EPA method USE 3050B-Lead). ICPMS analysis was carried out on air borne particulates sampled in the mining area of India. Coagulation studies was carried out using two coagulants, Alum and Ferric Chloride (concomitantly) to study the settling behaviour of suspended solids derived from Iron Ore Mining. The results from all investigations carried out indicated that the air and water quality of both mining areas are degraded by iron ore mining. Results from elemental characterization revealed harmful trace elements viz. Hg, Pb, Cu, As, Cd, Cr, Cu, Fe, Mn, Zn, Ni, Al, Ru, Re, etc. Therefore, both mining areas are polluted due to iron ore mining but the regions of Liberia is the most polluted.

ABSTRACT

Iron is the most needed ingredient in manufacturing steel. Steel is by far the most adaptable, significant and widely used of all metals and has found many applications viz., construction of motor cars, machines, pipelines, military equipment, electrical appliances, etc. For without steel, modern civilization will be absolutely impossible. Thus, iron ore has been mined for the past 3000 years by ancient and modern mankind. However, mining of iron ore has copious negative impacts on the environment. It degrades natural landscape, surface and ground water quality, flora and fauna, as well as the ambient air within the mining area and its environs. Iron ore tailings usually contain large amount of silica, iron, traces of Si, Co, Cu, Zn, As, Mn etc, that are harmful to humans even at low levels. In the present research work, the air and water quality of two different mining areas of India and Liberia are investigated and the quality of each compared against relevant water quality standards, (ISO 9001). Moreover, OB, tailings and blue-dust samples were collected from both mining areas, prepared as per relevant standard, characterized and tested to investigate their chemical composition and long term behavior. Characterization of OB, tailings, and blue-dust was carried out by a combination of several analysis viz., XRD, ICPMS and EDS while the leaching behavior was assessed under two separate leaching conditions: (i) double distilled water and TCLP (US EPA method USE 3050B-Lead). ICPMS analysis was carried out on air borne particulates sampled in the mining area of India. Coagulation studies was carried out using two coagulants, Alum and Ferric Chloride (concomitantly) to study the settling behaviour of suspended solids derived from Iron Ore Mining. The results from all investigations carried out indicated that the air and water quality of both mining areas are degraded by iron ore mining. Results from elemental characterization revealed harmful trace elements viz. Hg, Pb, Cu, As, Cd, Cr, Cu, Fe, Mn, Zn, Ni, Al, Ru, Re, etc. Therefore, both mining areas are polluted due to iron ore mining but the regions of Liberia is the most polluted.

METHODOLOGY

A critical Review of Literature
- Sample Collection, Handling, Transportation & Storage – from Liberia & India Iron Ores Mines – Water & Solid (OB, Tailings & Blue Dust) Samples.
- Samples Analyses
- Water Quality Indicating & Classification, as per sampling stations
- Air quality monitoring for PM10 & PM2.5 & characterization; at Iron ore mines (INO & Barsua, India),Koldas, Liberia
- Characterization of Filter Papers, used for monitoring PM10 and PM2.5, XRD, SEM-EDS Analyses; Solid Samples Leaching using Toxicity Characteristics Leaching Procedures (TCLP) & Dissolved Organic Carbon
- Coagulation Studies
- Interpretation of Findings

RESULTS AND DISCUSSION

- Laboratory Testing of Raw Water Samples
- Top and Left Right Semi (India); Bottom Left & Right (Liberia)
- Air Quality Sampling
- Indicating Water from Surface Ground Water Sampling
- Coagulation Test Results: OB (India); PM & EDS - IR Mt.
- EDS Analysis of OB (a) Liberia; (b) India
- LIBERIA - XRD Analytical Result
- Iron Ores of India
- XRD - Iron Ores of Liberia
- Samples Analysis of OB: Fe, Pb, Hg, etc.
- PM10 & PM2.5 Monitoring Results
- All Sampling Stations revealed highest concentration of PM10 & PM2.5 at various
- Characterization result of PM Sampled (Barsua Iron Mines, India)

STUDY AREA

Liberia: China Union Iron Ores Mines

India: Barsua Iron Mines (INO)

BRIEF REVIEW OF LITERATURE

- Singh & Premchand 2015: Discusses the transportation of trace iron as the most important activity in two iron ore regions (India) and their impact on air quality. He states that the anticipated value of all emissions
- Ashok & Kishor 2015: Discusses the functional impact of iron on the process of soil formation and its role in reducing soil productivity. It also suggests the use of iron ore waste as a possible substitute for iron in the production of steel.
- Mohanty et al. 2016: Studies the behavior of iron in soils and its effect on soil fertility and crop productivity. It shows that iron can improve soil quality and increase crop yield.
- Aggarwal et al. 2016: Studies the toxicity of iron in plants and its impact on root growth. It shows that iron can cause root damage and reduce plant growth.

AUTHOR

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<thead>
<tr>
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<th>FINDINGS</th>
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<td>2014</td>
<td>Environmental impact of iron ore mining on the quality of air and water in India and Liberia.</td>
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CONCLUSION

From the above findings, it is worthy to note that both mining regions are polluted due to iron ore mining but the regions of Liberia is the most polluted. Moreover, the air and water quality of both mining areas are degraded by iron ore mining. Results from elemental characterization revealed harmful trace elements viz. Hg, Pb, Cu, As, Cd, Cr, Cu, Fe, Mn, Zn, Ni, Al, Ru, Re, etc. Therefore, both mining areas are polluted due to iron ore mining but the regions of Liberia is the most polluted. Therefore, both mining areas are polluted due to iron ore mining but the regions of Liberia is the most polluted.

SUGGESTION FOR MITIGATION:
PM10 & PM2.5: Dust suppression measures are carried out within the limits (Little attention is given to residential areas). Different dust control measures, including water spraying on the land surfaces outside the mine boundary should also be carried out.

Steps should therefore be taken by the respective mine managements to control the effluents and runoff generated within the mine limits itself.