Metal Mining Pollution

For Prelims: Metal Mining Pollution, **Metal Mining Sites**, Metallic Ores, Tailings, Waste Disposal, **Water Pollution.**

For Mains: Metal Mining Pollution and its Ramifications on Ecosystem.

Source: DTE

Why in News?

Recently, the University of Lincoln, the United Kingdom, has published a study, spotlighting the **extensive ramifications of Metal Mining Pollution** in rivers and Floodplains worldwide.

What is the Research Methodology of the Study?

- The research simulated **contamination from both operational and decommissioned** Metal Mining Sites, encompassing critical aspects such as tailings facilities designed for waste storage.
- The study meticulously evaluated **hazardous substances** including **lead, zinc, copper, and arsenic.**
  - These elements, **detrimental to both ecosystems and human health**, tend to accumulate downstream from mining sites over prolonged durations.
  - This underscores the lasting and far-reaching consequences of mining pollution.
- The research team, acknowledging data limitations in certain countries, considered the figures **presented to be conservative estimates.**
  - This signifies the potential for the actual impact to be even more extensive, underlining the need for comprehensive and accurate data for a thorough assessment.

What are the Key Highlights of the Study?

- **Extent of Pollution Exposure:**
  - Pollution stemming from the **continuous discharge of mining waste into rivers** affects an astonishing number of people, **nearly 50 times more than those immediately impacted** by tailings Dam (embankment used to store byproducts of mining) Failures.
- **Population and Ecosystem Impact:**
  - The impacted floodplains due to the Mining Waste house a **substantial population of about 23.48 million people,** in addition to sustaining a significant livestock population of 5.72 million.
  - Moreover, these **regions cover an expansive area exceeding 65,000 square** kilometers of irrigated land.
- **Significance of the Study:**
  - The provides a groundbreaking predictive model to **assess the far-reaching offsite and downstream impacts of mining** on ecosystems and human health.
  - It offers a **critical tool for governments, environmental regulators,** the mining industry, and local communities to make informed decisions, emphasizing the necessity to

- prioritize environmental sustainability.
  - This research is paramount in guiding the global transition to green energy while mitigating the ecological footprint of mining, **particularly in the modern era where sustainable mining practices are increasingly prioritized.**
- **Call for Action:**
  - The study concluded by advocating for enhanced global data collection and monitoring systems to better comprehend the ecological and health impacts of the metal mining industry.
  - This highlights the need for a more comprehensive understanding to address the associated hazards effectively.

What is Metal Mining Pollution?

- **About:**
  - Metal mining pollution refers to the **contamination and environmental degradation** caused by the **extraction and processing of** Metallic Ores **to obtain valuable metals.**
  - It involves various activities associated with **mining, including exploration, extraction, transportation**, processing, and waste disposal.
  - These processes often **release harmful substances into the air,** water, and soil, leading to adverse effects on ecosystems, human health, and wildlife.
- **Sources of Metal Mining Pollution:**
  - **Tailings:** Tailings are finely ground rock particles left over after the valuable **metals have been extracted** from the ore. These tailings often contain hazardous elements like mercury, arsenic, lead, cadmium, and other toxic substances that can contaminate nearby water sources and soil.
  - **Acid Mine Drainage (AMD):** AMD occurs when **sulfide minerals in the mined rocks are exposed to air and water,** leading to the production of sulfuric acid.
    - This acid can contaminate rivers, streams, and groundwater, posing a significant threat to aquatic life and ecosystems.
  - **Airborne Pollution:** Dust and particulate matter generated during mining operations can become airborne, spreading pollutants **such as heavy metals and other harmful compounds**. Inhalation of these pollutants can pose health risks to both miners and nearby communities.
  - **Chemical Usage:** Chemicals such as cyanide and sulfuric acid are often used in metal extraction processes. **Accidental spills or inadequate containment** of these chemicals can result in contamination of soil and water, causing serious environmental damage.

How can Metal Mining Pollution be Addressed?

- **Stringent Regulations and Compliance:**
  - Implement and enforce strict environmental regulations and standards that govern metal mining operations.
  - These regulations should cover waste disposal, emissions, water management, and reclamation to ensure compliance and minimize pollution.
- **Advanced Waste Management:**
  - Encourage the use of modern tailings storage facilities and waste disposal methods that minimize the risk of pollution. Employ strategies to prevent tailings dam failures, such as proper design, monitoring, and periodic assessments.
- **Responsible Chemical Usage:**
  - Promote the **responsible and controlled use of chemicals** in mining processes. Alternative, less toxic chemicals should be explored and utilized to reduce the environmental impact.
- **Water Management and Treatment:**
  - Implement **effective water management strategies** to control and treat water discharged from mining operations. Employ water treatment technologies to remove harmful substances before releasing water into the environment.
- **Mine Reclamation and Rehabilitation:**
  - Make mine **reclamation and rehabilitation an integral part** of mining operations. Restore mined areas to their natural state, promoting ecosystem recovery and biodiversity.

UPSC Civil Services Examination Previous Year Question (PYQ)

Prelims

Q. Which of the following is/are the possible consequence/s of heavy sand mining in riverbeds? (2018)

1. Decreased salinity in the river
2. Pollution of groundwater
3. Lowering of the water-table

Select the correct answer using the code given below.

(a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Ans: (b)

- Sand mining is the process of extracting sand from the river bed or from the coastal region.
- Excessive sand mining results in pollution of river water by lowering the pH value of water, mixing of various metal oxides, reduction of oxygen and thus, increasing the Biological Oxygen Demand (BOD). Polluted river water causes pollution of ground water. **Hence, 2 is correct.**
- Due to increased metal oxides and their mixing in river water, the salinity of the water increases. **Hence, 1 is not correct.**
- Volume of water flow in the river is decreased, thus it results in lowering of the water table. **Hence, 3 is correct. Therefore, option (b) is the correct answer.**

Mains

Q. Coastalsand mining, whether legal or illegal, poses one of the biggest threatsto our environment. Analyse the impact of sand mining along the Indian coasts, citing specific examples. **(2019)**

Q. "In spite of adverse environmental impact, coal mining is still inevitable for development". Discuss. **(2017)**

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