Mining, Climate Change, and Sustainable Development: Balancing Resource Extraction with Environmental Resilience in Ghana

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Outline

01 Mining’s Double-Edged Sword

02 Impact Pathways

03 Policy & Regulation

04 Industry Best Practice

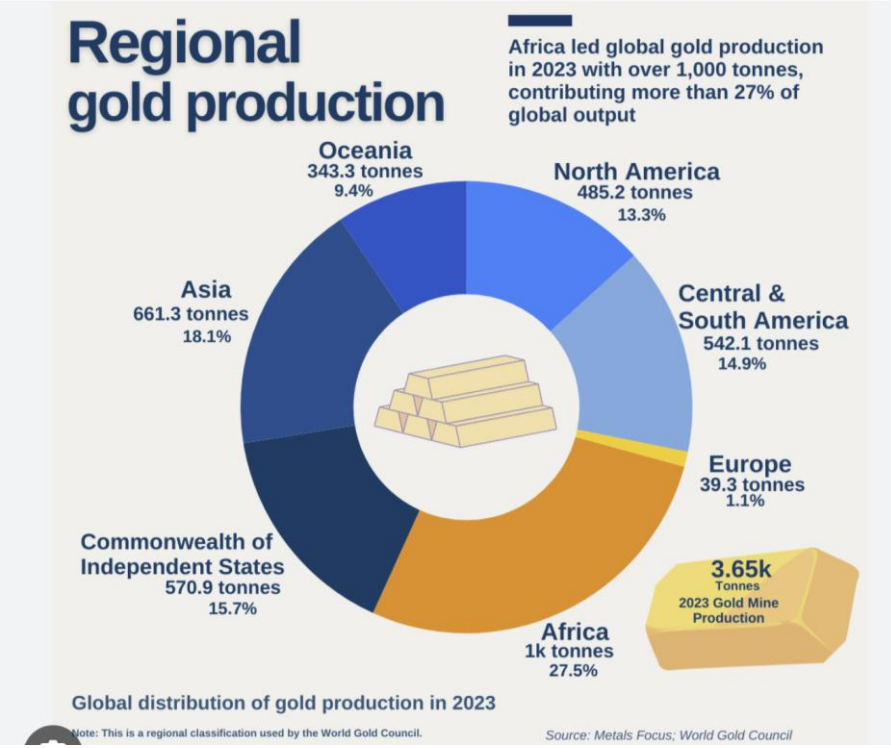
05 Community Solutions

06 EPA Role

01
Mining's Double-Edged Sword

Why This Matters?

- Mining contributes significantly to GDP, employment, and exports.
- However, environmental and social costs are increasing.
- Climate stressors amplify these impacts, demanding integrated responses.

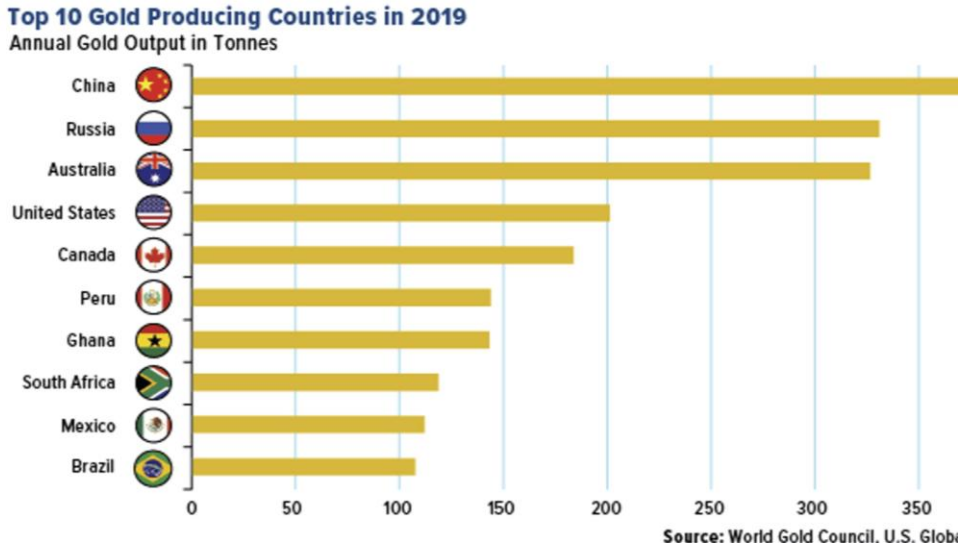


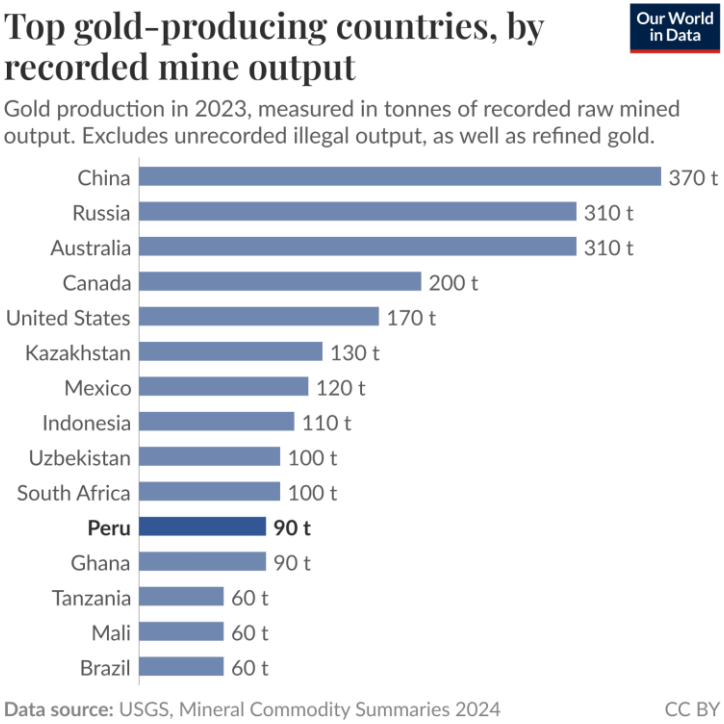
Ghana’s Golden Economic Pillar

- Ghana is Africa’s leading gold producer, with mining contributing significantly to the economy through exports of gold, bauxite, manganese, and diamonds.

Figure 1. Top 10 gold producing countries in 2019.

Source: World Gold Council (2020).





- Deforestation, river siltation and contamination, land degradation, community health issues, Resettlement challenges and inequitable benefit creating a tension between economic benefits and environmental integrity.

Climate Change Amplifies Risk

Climate Threats

- Rising temperatures, erratic rainfall, and extreme floods threaten mining infrastructure and community livelihoods, making climate resilience a strategic necessity.

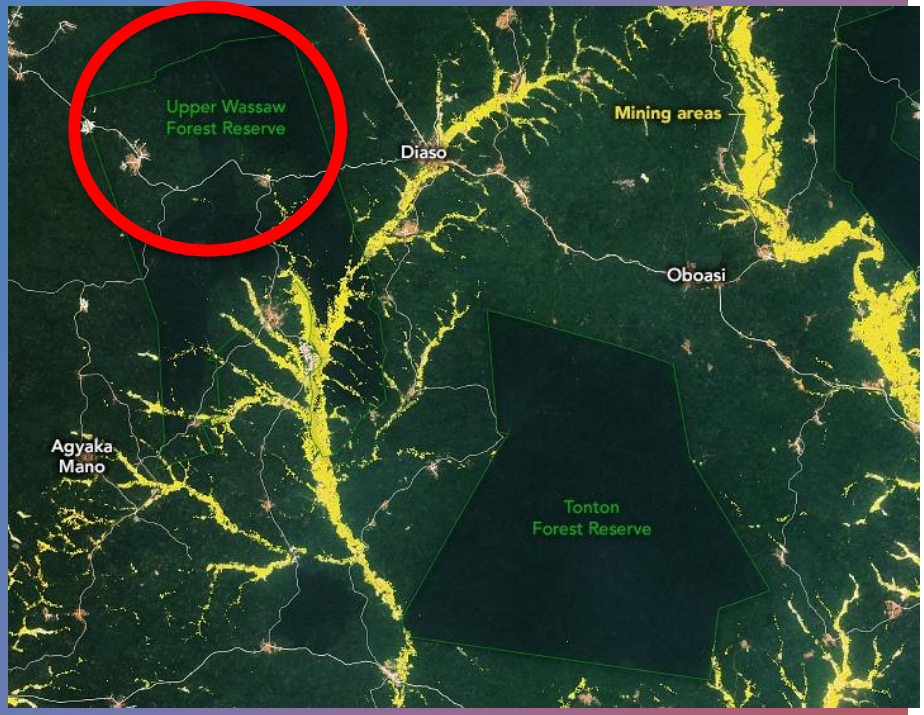
Compound Risks

- Droughts reduce water availability for mining processes, while storms overwhelm tailings controls, potentially erasing production gains and deepening poverty.

Policy Debate

- The policy debate centers on balancing mining's economic contributions with the need to protect the environment, ensuring sustainable development for future generations.

02
Impact Pathways



Forest Loss & Carbon Debt

- Surface mining in forest zones clears vast hectares, eliminating above-ground carbon stocks and fragmenting habitats, leading to biodiversity loss.
- Deforestation results in local micro-climate shifts, reducing rainfall and increasing runoff velocity, which accelerates erosion and river sedimentation.
- Lost biodiversity undermines ecosystem services that buffer communities against climate shocks, exacerbating vulnerability.
- The loss of forest cover reduces carbon sequestration, contributing to Ghana's overall carbon debt and undermining climate mitigation efforts.

DEFORESTATION: UPPER WASSAW FOREST RESERVE

LOCATION: BIBIANI ANHWIASO BEKWAI MUNICIPAL- WESTERN NORTH REGION AND WASSA AMENFI CENTRAL, WASSA AMENFI EAST MUNICIPAL OF THE WESTERN REGION

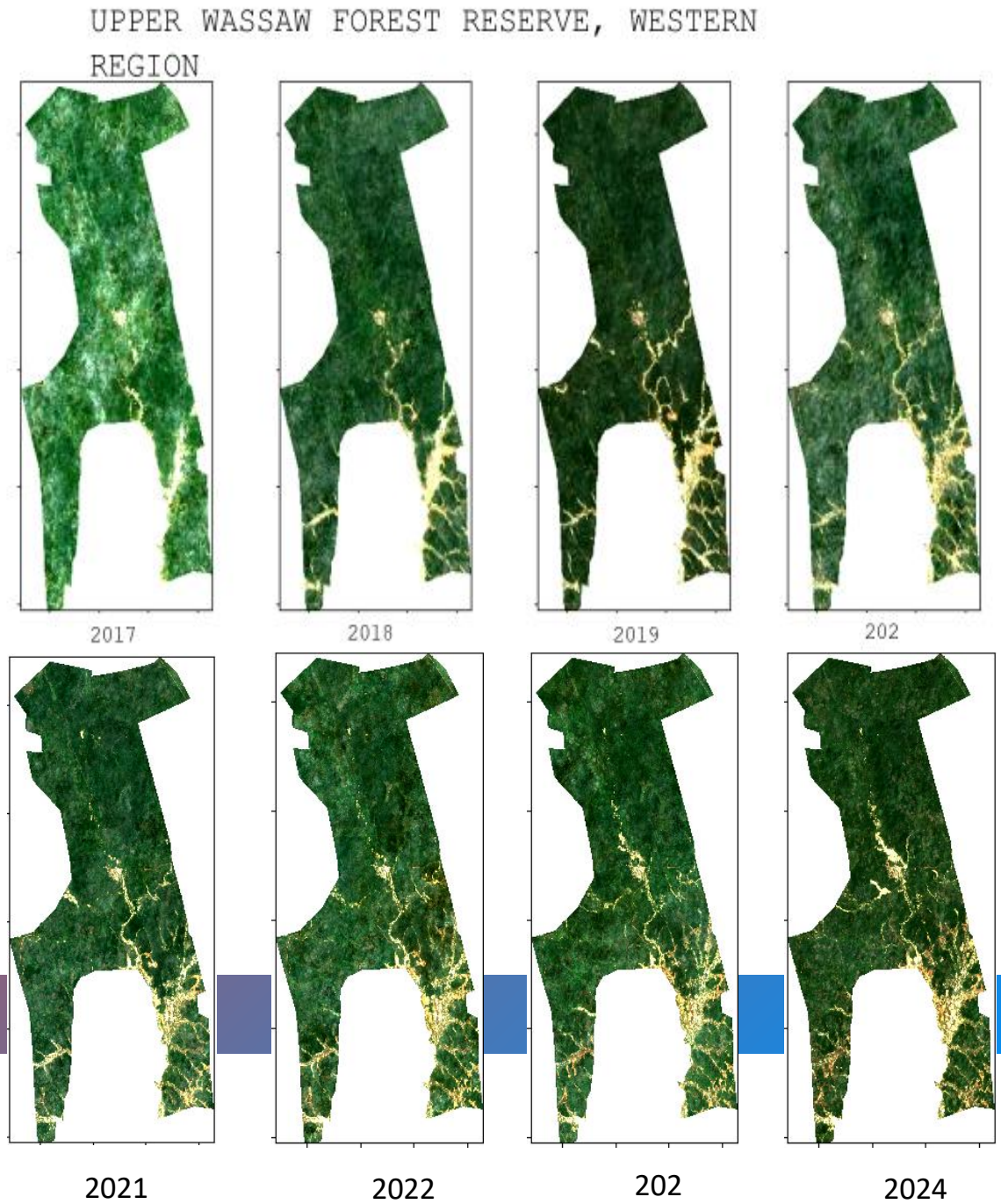
ECOLOGICALLY : MOIST SEMI-DECIDUOUS FOREST ZONE IN GHANA.

RENEWABLE RESOURCE : TIMBER, HERBS OF MEDICINAL VALUE & FUEL WOOD.

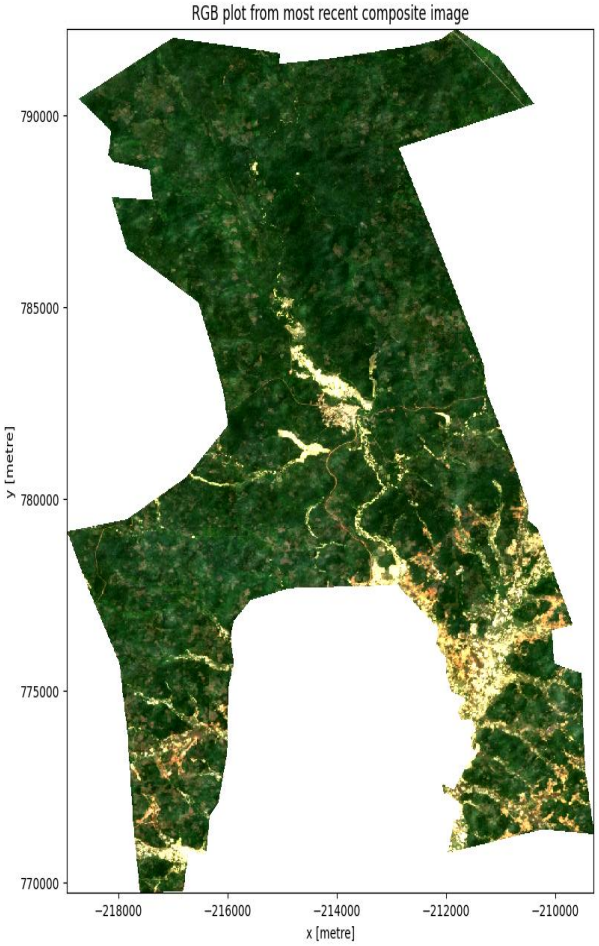
NON RENEWABLE RESOURCE : RICH DEPOSITS OF GOLD.

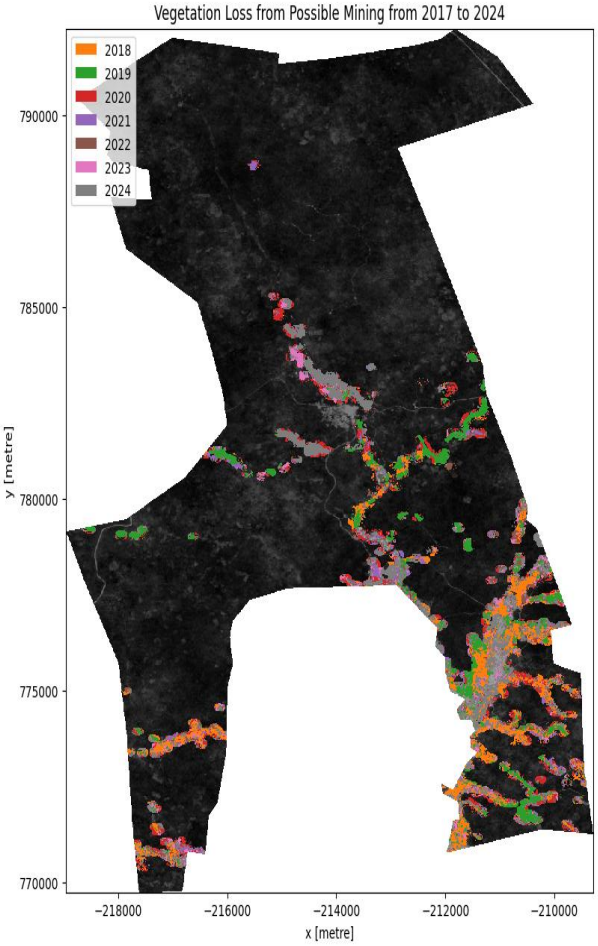
UPPER WASSAW FOREST RESERVE

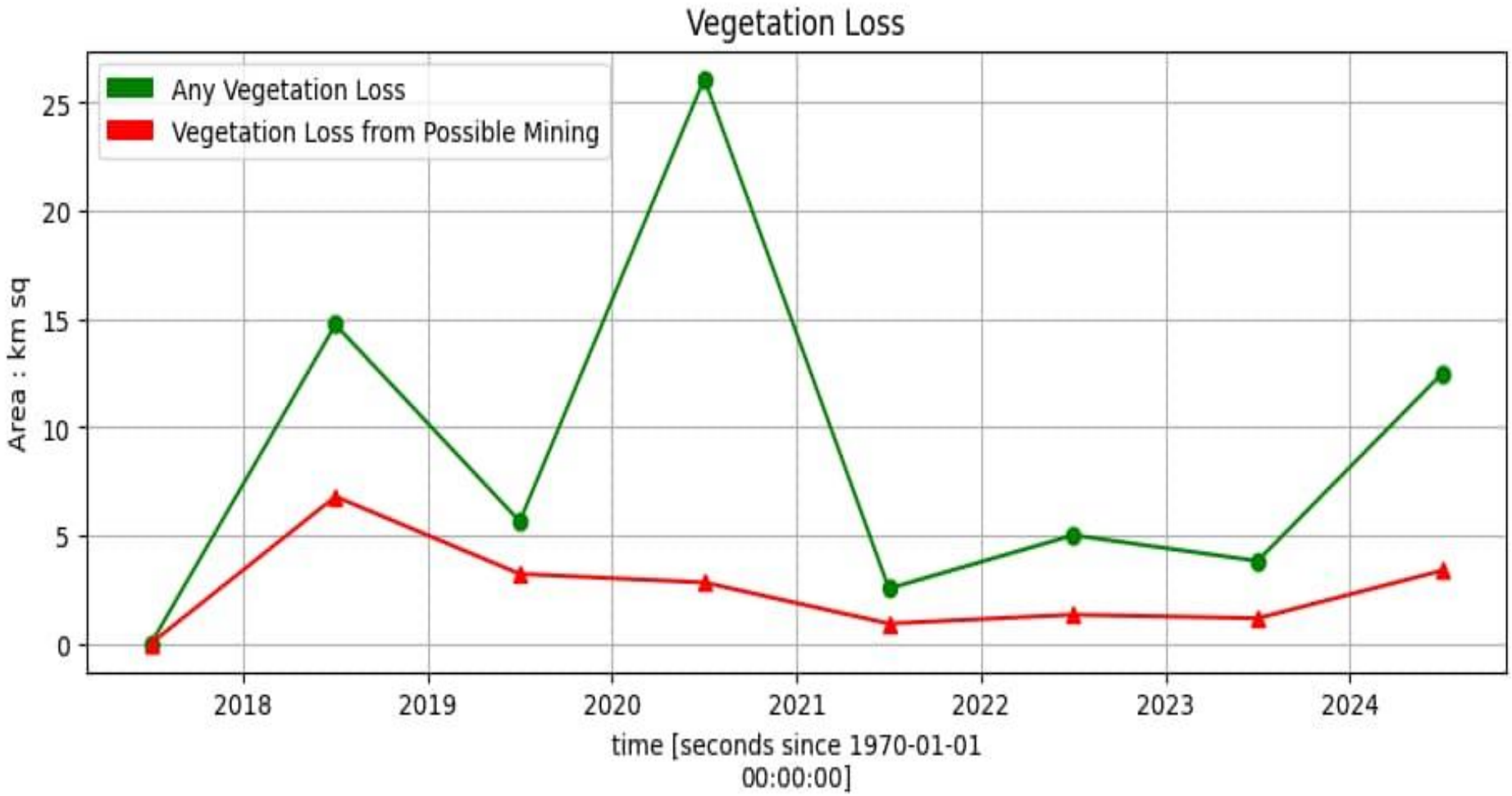
These images show the rate of the deforestation from the 2017-2024 due to mining activities.



A Composite map of the forest reserve showing the rate of vegetation loss from 2017-2024 as a result of the mining







- Agriculture
- Logging
- Firewood

Years	2017	2018	2019	2020	2021	2022	2023	2024
Any Vegetation Loss(kmsq)	0	14.741	5.6358	26.1156	2.5334	4.9976	3.8081	12.4772
Any Vegetation Loss(%)	0	12.85129	4.913325	22.76774	2.208634	4.356938	3.319925	10.8777
Vegetation Loss from Possible Mining(kmsq)	0	6.7861	3.2081	2.8109	0.9086	1.3226	1.1543	3.363
Vegetation Loss from Possible Mining(%)	0	5.916164	2.796841	2.45056	0.792123	1.153051	1.006326	2.931884
Total Area(kmsq)	114.7044							

Water Stress & Pollution

Pollution

Floods mobilize arsenic, mercury, and sulphide-laden silt downstream, contaminating rivers like the Pra, Ankobra and Birim, forcing higher water treatment costs.

Health Risks

Contaminated water forces poorer households to consume unsafe water, posing significant health risks to local communities.

Operational Climate Vulnerabilities

Tailings Dam Risks

Legacy tailings dams are at risk of failure due to heavy rainfall events, which could release toxic waste into rivers and underground waters.

Worker Health

Rising wet-bulb temperatures increase heat-stroke risks for underground workers, while flooded roads interrupt production schedules, raising operational costs.

03

Policy & Regulation

Tighten Upfront Conditions

Reclamation Bonds

Mandate reclamation bonds calibrated to full closure costs before ground-breaking to ensure financial resources for environmental restoration.

Environmental Assessment Regulation LI 2504

Climate Projections

Embed down-scaled climate projections in Environmental Impact Assessments to account for future climate risks in project planning.

Flood Models

Require updated flood-frequency models for tailings and heap-leach designs, making permit renewal contingent on demonstrated resilience to extreme weather events.

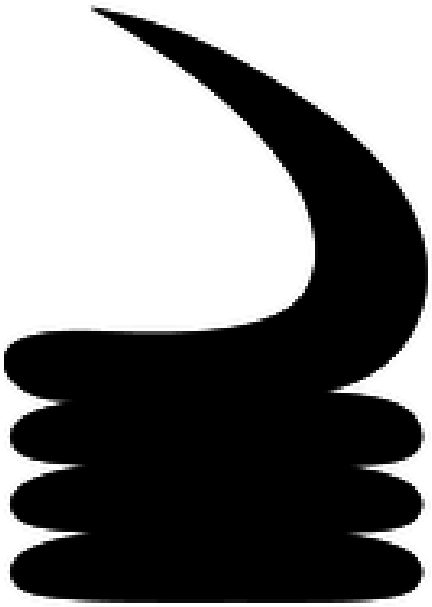
Reclamation Bond

The reclamation bond mechanism was instituted to provide financial guarantees for rehabilitation/ reclamation after resource extraction and protect the environment and the general public.

Regulation 40 of the Environmental Protection (Environmental Assessment) Regulations, 2025 (LI 2504) obliges all mining sector undertakings to post a reclamation bond and sign a Reclamation Security Agreement (RSA) with the Authority.

- The then Agency initiated actions for instituting the reclamation bonding mechanism in the year 2000 by developing the reclamation criteria and the legal framework.
- Mining companies began posting the bonds towards the end of 2000 and early 2001.
- Currently, all the large-scale mining companies have posted reclamation bonds comprising cash deposits, bank guarantees and/or insurance premiums.

AKOBEN PROGRAMME



- The Akoben Adinkra symbol stands for vigilance, alertness and a call to action.
- The environmental performance of mining operations is assessed using a five- colour rating scheme;
- The five colors are **GOLD**, **GREEN**, **BLUE**, **ORANGE** and **RED**, and it encompasses the full spectrum of environmental performance ranging from excellent to poor;
- These ratings are then disclosed to the Public and the general media.

Benefits of Environmental Ratings and Disclosure

# 1	Improve Administrative Efficiency and reduce cost
# 2	Increase Transparency
# 3	Strengthen Institutional Discipline
# 4	Beneficial for Companies and Mining Sector (clear guidance, regulatory clarity and recognition)
# 5	Reduce Risk of Disputes by Equalizing Information Across Stakeholders
# 6	Improved environmental performance
# 7	Ratings make owners and senior managers aware of environmental performance of their site
# 8	Ratings provide clear information about how to improve environmental performance

04

Industry Best Practice

Progressive Rehabilitation

Concurrent Reclamation

Backfill and vegetate worked-out pits in phased slices concurrent with ore extraction to reduce final liability and restore evapotranspiration cover.

Social Responsibility

Early rehabilitation sequesters carbon, shortens land-use conflict, and signals social responsibility to regulators and host communities.

Renewable Energy Shift

Solar Micro-grids

Replace diesel gensets with solar-plus-storage micro-grids on site, cutting fuel costs by up to 40% and reducing CO_2 intensity per ounce of gold.

Operational Resilience

Hybrid systems deliver stable power for crushers and pumps, enhancing operational resilience during grid outages triggered by climate-related failures.

Economic Benefits

The shift to renewable energy not only reduces emissions but also provides long-term cost savings, improving the sector's economic sustainability.

Transparent Water Monitoring

Automated Monitoring

Install automated stations measuring pH, turbidity, conductivity, and heavy metals, publishing real-time data on open portals to ensure transparency and accountability.

05

Community Solutions

Empowering Local Stakeholders

Mercury-Free Technologies

Distribute mercury-free retorts and gravity concentrators to artisanal miners, paired with micro-credit and training to reduce environmental harm.

Citizen Monitoring

Establish citizen monitoring committees equipped with simple test kits to report water discolouration, ensuring accountability continues after corporate exit.

Alternative Livelihoods

Promote agroforestry on reclaimed benches and fish farming in abandoned pits to diversify incomes and ensure sustainable land use post-mining.

Community Empowerment

Empower communities through formalized ASM rights and alternative livelihoods, fostering local ownership and sustainable development.

06

ROLE OF EPA

EPA INTERVENTIONS

Institutional Strengthening

- Prioritized staff expansion to improve field monitoring and enforcement.
- Establishment of District Offices.
- Capacity building of staff
- Provide staff with the needed tools for monitoring.

Community Sensitization & Stakeholder Engagement

- Intensified awareness creation through community programs
- Encourage Traditional Authorities to form local environmental task force.

Technological and Digital Interventions

- Deploy Remote sensing and GIS software's for monitoring.
- Develop a centralized database for compliance reporting.
- A digitized e-permit management system

EPA INTERVENTIONS

Legislative and Regulatory Reform

- A 60 day turn around time for Environmental Permit approvals.
- Passing of LI 2504, 2506 and 2507

Reclamation & Restoration Initiatives

- Directives to small scale miners to reclaim the degraded land
- Through Ghana Landscape Restoration and Small-Scale Mining Project.

Mercury-Free & Environmental Safe Mining

- Comply with the Minamata Convention.
- Planet Global Opportunity for Long-term Development (Planet Gold)
- African Environmental Health and Pollution Management Programme.

EPA INTERVENTIONS

Akoben performance Rating

- Rating of the Large scale mining companies with five color codes.

Chemical Tracking Port Controls

- Established a chemical tracking and escort unit in collaboration with GRA Customs and Narcotics Control Commission.
- Import controls to phase out mercury

Inter-Agency Collaboration

- Works closely with Minerals Commission, Forestry Commission, Water Resources Commission etc.

Conclusion

- Mining drives Ghana's economy but must align with environmental protection to ensure sustainable growth.
- Integrating climate projections into mining operations and permits is crucial to minimize future risks.
- Enforcing LI 2504, the Akoben Programme, and reclamation bonds enhances accountability and compliance.
- Engaging traditional authorities, promoting mercury-free mining, and supporting alternative livelihoods build local resilience.
- Adopting renewable energy and digital monitoring technologies will make Ghana's mining sector more efficient, transparent, and climate-smart.

Other Interventions

- Repositioning Traditional Authority to Fight Illegal Gold Mining in Dunkwa-Offin in the Upper Denkyira East, a PhD thesis at Antoich University in US, by Manaseh Mawufemor Mintah.

(Afrocentric principles: The ethical reflections rooted in the values of Sankofa and Nkrumahism: the call to retrieve ancestral wisdom in order to move forward, and the insistence on collective dignity, justice, and resistance to neocolonial domination)

- National Anti-**Illegal Mining** Operations Secretariat (**NAMOS**)/Water Police
- rCOMSPED promotes the formal organization of small-scale miners into cooperatives, ensuring they operate under legal frameworks compliant with the **Minerals and Mining Act (Act 703)** and **Environmental Assessment Regulations (LI 2504)**.

- Involve **CSOs** in community sensitization, environmental monitoring, and advocacy for human rights, gender inclusion, and environmental justice within mining areas.

- Partner with CSOs, academia, and local institutions to train miners and communities in sustainable mining, climate adaptation, and cooperative governance.

- Engage women, youth, and marginalized groups in consultations and policy dialogues to ensure mining governance reflects community priorities and social equity.

THANK YOU

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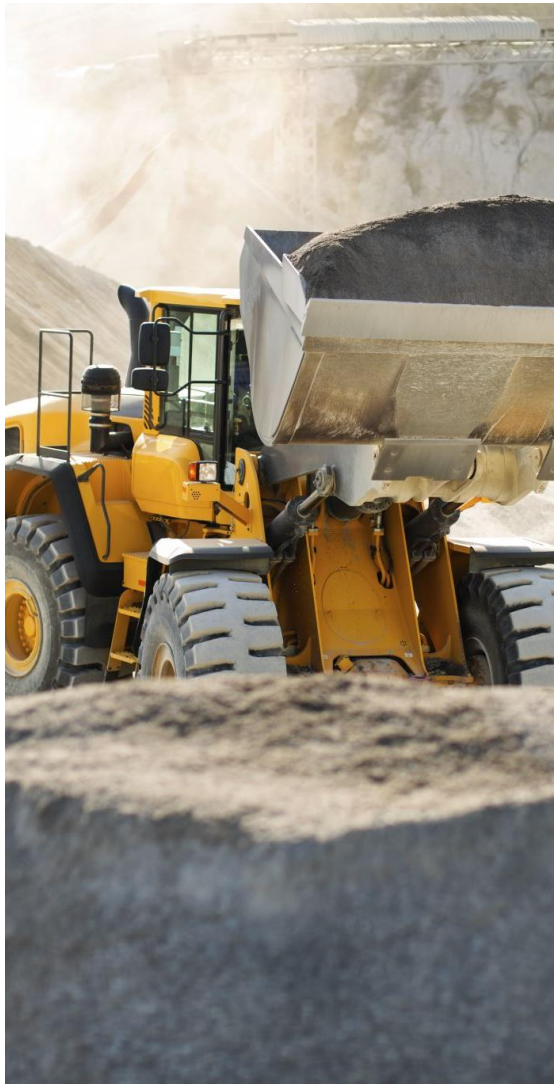
SOME ACTIVITIES OF THE DEPARTMENT



- **Screening/ Verification Visits**

- **Compliance Enforcement Monitoring**

  - **OPERATIONAL AREAS:**

Large impact Scale undertakings
[Gold, Manganese, Bauxite & Lithium]

Medium- and Small- impact scale undertakings
- Gold Mining;
- Quarries (limestone, granite, etc);
- Sand/Gravel and Salt Winning
- others (kaolin, mica, etc)

Exploration Projects
- Reconnaissance and Prospecting

  - **TOOLS:**

- Environmental Performance Rating and Disclosure Programme (**AKOBEN**)

- Reclamation Security Agreement (RSA) /Reclamation Bond

ACTIVITIES CONT'D

- **Evaluation of Applications and Review of Environmental Assessment Reports (EISs, PERs, EMPs)**
- **Conduct Public Hearings**
- **Undertake Stakeholder consultations (**including Reconnaissance visits and Stakeholder Meetings**)**
- **Environmental education and community sensitization**
- **Liaison Group activities (covering mining in Forest reserves)**
- **Investigations of mining related public complaints** (eg noise, water pollution, air pollution, cracks in building, improper citing of facilities, compensation / resettlement issues etc.)