

Lead Exposure Risks, Testing Capacity and Mitigation Strategies in Malawi

(Insights from Stakeholder Consultations, Environmental Observations, and Geospatial Mapping)

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Disclaimer

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Presentation Outline

1. Background
2. Objectives
3. Methodology
4. Findings
5. Recommendations
6. Conclusion
7. Acknowledgements

Background

- ❖ Lead exposure is a **major public health concern** in Malawi.
 - ❖ Rapid urbanization, industrial activities, and mining operations have led to significant environmental degradation
 - ❖ Waste management and improper handling of hazardous materials like lead and unsafe used lead-acid battery (ULAB) recycling
- ❖ Modelling study found that nearly **3.5 million children** in Malawi have blood lead levels (BLLs) exceeding 5 µg/dL, with 562,000 children having **levels over 10 µg/dL**
 - ❖ Children are particularly vulnerable, as exposure can irreversibly affect neurological development, leading to **cognitive impairments, behavioral problems, and reduced IQ.**
 - ❖ The economic cost of childhood lead exposure in Malawi is estimated at **\$878 million annually,**
- ❖ About 6.22% of the GDP, due to lost productivity and healthcare costs
- ❖ Adults are also at risk, with lead exposure linked to **reproductive health issues, kidney damage, hypertension, and cardiovascular disease**

Background

- ❖ Environmental lead contamination is widespread, with elevated levels detected in soil, water, and household dust, near ULAB recycling sites, mining areas, and waste disposal sites
- ❖ Lead concentration in Malawi's agricultural soils is extremely high (3.31-16.81 mg/kg)
- ❖ Efforts to mitigate lead exposure in Malawi include regulating lead in paint and remediation initiatives
- ❖ A 2023 study by Lead Exposure Elimination Project (LEEP) and the Malawi Bureau of Standards showed a reduction in lead paint market share from 67% in 2021 to 24%.
- ❖ Despite progress in paint regulation, lead exposure remains a pressing issue due to other sources of contamination and the need for further interventions.

Objectives

We conducted qualitative and geospatial mapping to map high-risk areas, assess lead exposure risks, testing capacity, identify target populations for blood lead level (BLL) testing, and develop actionable strategies for lead mitigation.

Specific objectives were to:

- ❖ identify and map high-risk areas for future environmental and blood lead level testing
- ❖ determine specific populations at-risk for targeted blood lead level testing
- ❖ assess Malawi's current capacity for lead exposure testing,
- ❖ develop a comprehensive Lead Mitigation Action Plan.

Methodology/Approach



Methodology/Approach

Study Sites

- Focus on four major cities: **Lilongwe, Blantyre, Mzuzu, and Zomba.**

These cities represent diverse regional and industrial activities, including **informal Used Lead-Acid Batteries (ULAB) recycling sectors.**

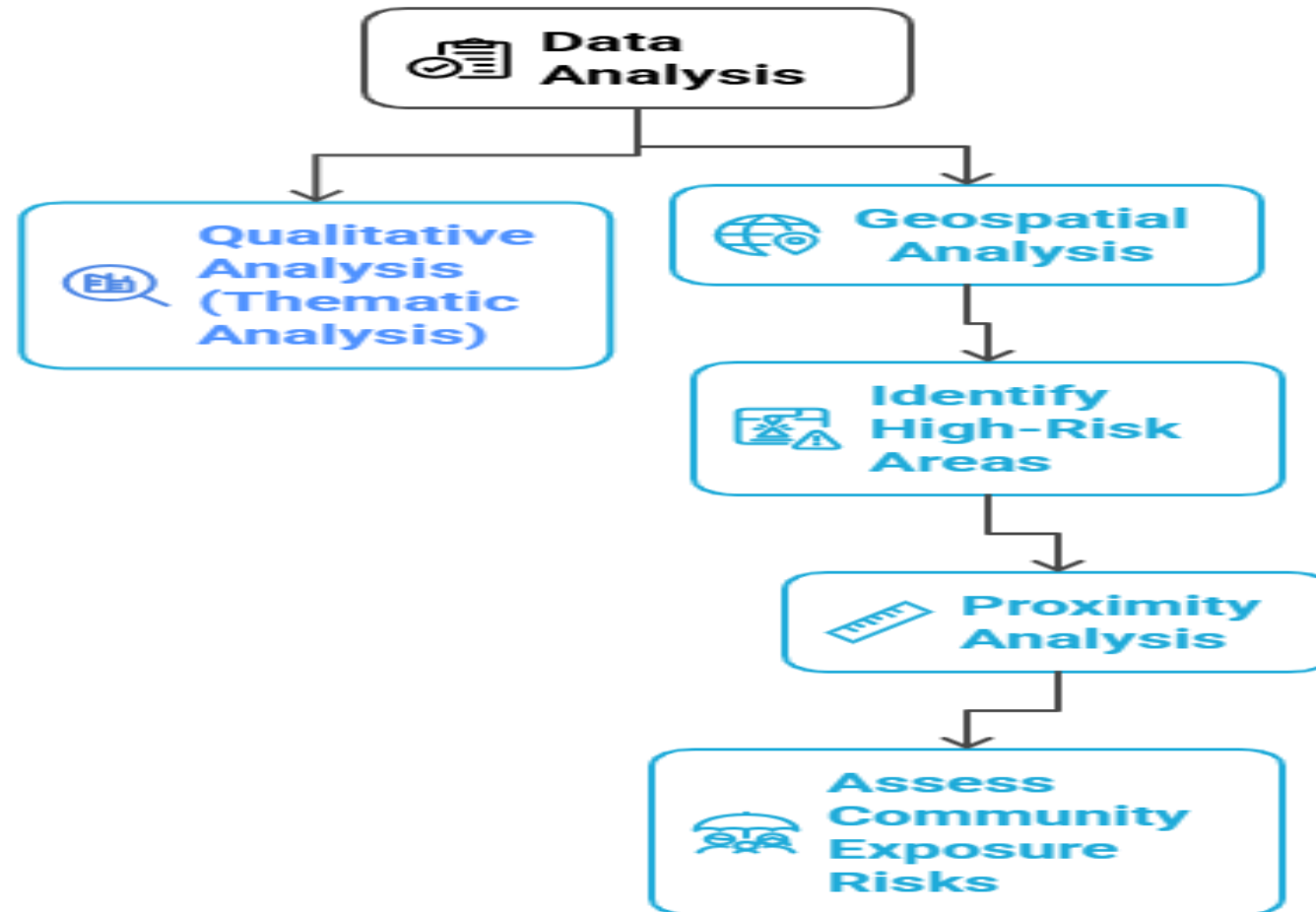
Environmental and Geospatial Observations

- **Systematic observations** conducted at ULAB recycling and waste disposal sites.
 - Documented conditions, safety practices, and potential lead contamination sources.
- **Geospatial Mapping:**

Recorded XY coordinates for ULAB recycling and waste disposal sites.

- Mining locations verified using literature and Google Earth
- Water points and schools near ULAB sites sourced from national data
- GPS coordinates saved in Excel, converted to CSV, and imported into QGIS to generate geospatial maps.
- XY data points coded by site type (ULAB recycler, mining site) for thematic analysis.
- Created geospatial maps using **QGIS.**

Methodology



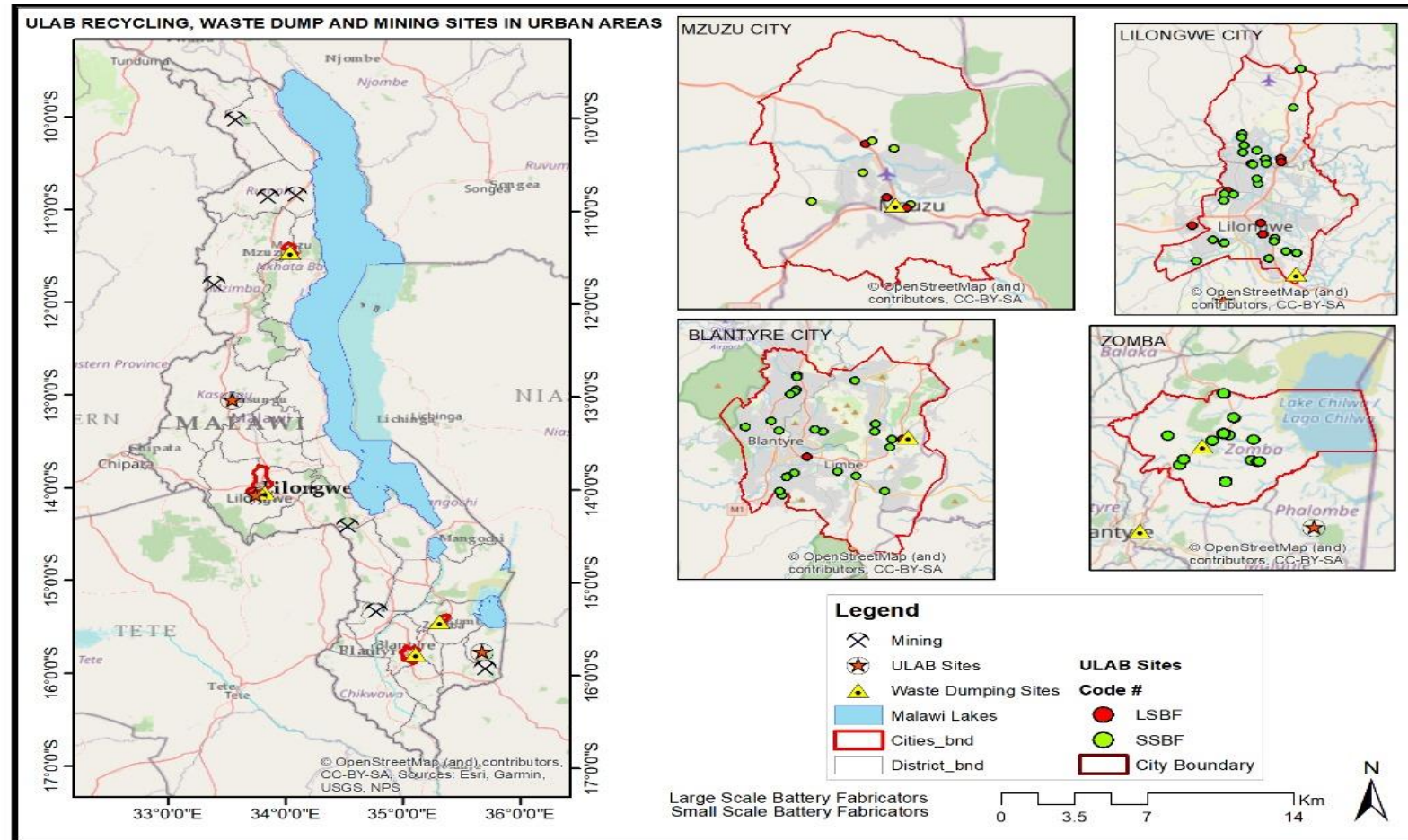


Key Findings: Geospatial Mapping

Identified ULAB Recycling, Waste Disposal and Mining Sites in Malawi

- ❖ **ULAB sites: 92 (14 LSBF; 78 SSBF)**
 - ❖ Mzuzu: 10 (3 LSBF; 7 SSBF)
 - ❖ Lilongwe: 34 (7 LSBF; 27 SSBF)
 - ❖ Blantyre: 30 (3 LSBF; 27 SSBF)
 - ❖ Zomba: 18 (1 LSBF; 17 SSBF)
- ❖ **Water points and schools close to ULABs:605 ; 484**
 - ❖ North: 164; 90
 - ❖ Central:171; 186
 - ❖ South: 125; 163
 - ❖ Eastern: 145; 45
- ❖ **Waste disposal sites: 4 (1 site in each city)**

Identified ULAB Recycling, Mining, and Waste Disposal Sites



Identified Potential High Risk Areas (where to focus for future environmental & Blood lead testing)

Potential High-Risk Areas for future Environmental and Blood Lead Level Testing	Locations for Targeted Lead Testing
Lilongwe	
<p><i>ULAB Recycling Areas:</i> Area 25, Area 49, and Kawale, where informal ULAB recycling activities take place within residential areas. About 61 Schools and 31 water sources are within 100-1000 meters of these ULAB recycling sites. <i>General waste disposal sites:</i> Area 38 site</p>	<ul style="list-style-type: none"> ● Area 25, Kawale, Area 36, Area 23, and Kawale 2, where ULAB recycling sites are in close proximity to residential neighborhoods, schools, and water sources ● Area 38 site
Blantyre	
<p><i>ULAB Recycling Areas:</i> The neighborhoods of Chilomoni, Ndirande, and Machinjiri have 66 schools and 8 water sources within 100 to 1,000 meters of these ULAB recycling sites. <i>General waste disposal sites:</i> Mzedi waste disposal site at Kachere</p>	<ul style="list-style-type: none"> ● Ndirande, Makata, Chigumula, and Bangwe, where substantial ULAB activities and waste disposal practices are prevalent ● Chemusa and Zingwangwa, known for smaller-scale informal recycling operations near densely populated residential zones ● Mzedi general waste disposal site at Kachere

Identified Potential High Risk Areas/where to focus for future environmental & Blood lead testing

Potential High-Risk Areas	Locations for Targeted Lead Testing
<p>Mzuzu</p> <p><i>ULAB Recycling Areas:</i> Informal ULAB sites in the neighborhoods of Chibanja and Zolozolo are very close to residential homes, schools, and water sources, with 21 schools and 16 water points within 0-1000 meters of these ULAB recycling sites.</p> <p><i>General waste disposal site :</i> Nsilo site</p>	<ul style="list-style-type: none"> ● Mzuzu City Center, Zolozolo, and Chibanja, where informal ULAB recycling sites are near critical water points and residential neighborhoods ● Nsilo general waste disposal site
<p>Zomba</p> <p><i>ULAB Recycling Areas:</i> In Chinamwali and Matawale, informal ULAB recycling is conducted near where children play and families draw water, with 11 schools and 55 water points within 0 to 1000 meters.</p> <p><i>General waste disposal:</i> Chambo site at five miles along the Zomba-Blantyre Road</p>	<ul style="list-style-type: none"> ● Chinamwali, Chikanda, and Mtiya, where ULAB recycling is taking place near residential areas and water sources ● Chambo general waste disposal site situated at five miles along the Zomba-Blantyre Road
<p>Other Areas</p> <p><i>Mining Sites:</i> Communities like Kayelekera in Karonga District, Mchenga and Kaziwiziwi in Rumphi District are particularly at risk due to mining activities, especially for minerals like uranium, galena, cerussite, anglesite, pyromorphite, and mimetite.</p>	<ul style="list-style-type: none"> ● Kayelekera in Karonga District where mining activities, particularly those involving uranium and other minerals, present a significant risk of lead exposure.

Identified Populations for Targeted Blood Lead Level

- In Lilongwe, Zomba, Blantyre and Zomba cities,
 - ULAB recycling workers and their families
 - Children attending nearby schools and women of reproductive age in the ULAB recycling areas
 - Residents in close proximity to ULAB recycling sites, general and ULAB waste disposal sites , in particular pregnant women and children
 - General waste pickers and site workers and their families
- In other areas
 - Miners and their families
 - Workers involved in ore processing (crushing, milling, smelting, etc.) and their families
 - Residents living near the mining sites, in particular children

Photos taken during observation



A



B



C



D

- A. ULAB recycling activities done within someone's living compound, maize flour dried on a mat close to where lead acid batteries are recycled.**
- B. Water buckets for drinking and other uses kept at a ULAB recycling site.**
- C. A ULAB recycling worker not using PPEs or following protective guidelines**
- D. Children visiting and playing at their parents' ULAB recycling shop**

Photos taken during observation



D & E show the cracked hands of a ULAB recycler who handles acid and lead from the batteries without use of personal protective equipment (PPE).

Photos taken during observation



Residential place used as a ULAB recycling site



Findings from stakeholders consultations

- ❖ 143 stakeholders were consulted
 - ❖ 92 informal ULAB recyclers
 - ❖ 15 community leaders
 - ❖ 18 government representatives
 - ❖ 3 academicians
 - ❖ 3 development partners
 - ❖ 9 private sector representatives
 - ❖ 3 national association members

Findings from stakeholders consultations

- ❖ **Regulatory Gaps:** Policies for hazardous substances exist, but lead-specific regulations and enforcement, especially in ULAB recycling, are inadequate.
- ❖ **Lead Exposure Risks:** Key sources include informal ULAB recycling, mining, and poor waste management, living in low-lying and flood-prone zones with children, pregnant women, and nearby communities most at risk.
- ❖ **Testing Capacity:** Limited public health testing for lead, but research and veterinary labs offer potential for expansion with training and collaboration.
- ❖ **Awareness and Collaboration:** Critical low awareness of lead risks among stakeholders; multi-sectoral collaboration and public education are essential.

Findings from stakeholders consultations

❖ Policy Landscape

*Malawi has several laws and regulations that address environmental management and hazardous substances... There are no specific regulations for lead mitigation in Malawi,..”-Government Official
-Ministry of Natural Resources*

❖ Perceived Sources of Lead Exposure

“Lead-acid batteries, lead wastes, poor waste management systems, some plastics, and paint are primary sources of lead exposure in Malawi.”-Academicians

❖ At-Risk Populations

“Workers at battery recycling companies and people living in flood-prone areas such as those near waste disposal sites are at high risk of lead exposure.” -Government Official, City Council

“Children are more vulnerable to lead poisoning due to their developing systems. Exposure to lead, especially in school environments, can have detrimental effects on their health.” Government Official, Ministry of Education

Environmental and Blood Lead Screening Capacity Needs

	Environmental	Blood
Current Capacity	<ul style="list-style-type: none"> Institutions such as the Malawi Bureau of Standards (MBS), Ministry of Water and Sanitation and academic institutions have advanced testing equipment like ICP-MS, AAS, and XRF for analyzing lead in environmental samples (soil, water, air, and paint). 	<ul style="list-style-type: none"> Lead testing in blood is limited in Malawian healthcare institutions. Some central healthcare facilities are equipped with testing equipment, and trained personnel are available.
Challenges	<ul style="list-style-type: none"> Limited coverage due to resource constraints, including insufficient reagents and functional equipment, particularly for water testing in some government labs. 	<ul style="list-style-type: none"> Blood lead testing is rarely conducted due to reagent shortages, malfunctioning equipment, and low demand. Most health facilities are not equipped to conduct BLL tests. Satellite health centers are under-equipped, and remote areas lack accessible screening options.
Needs	<ul style="list-style-type: none"> Expand testing capacity through investment in resources, training, and geographic coverage. 	<ul style="list-style-type: none"> Train healthcare professionals Implement lead testing in routine care, repair equipment, and secure reagents.

Recommendations (Next Steps)

Mitigating lead exposure in Malawi requires a multifaceted approach.

Strengthen Regulatory Frameworks

- Develop specific regulations for informal ULAB recycling and mining activities.
- Enforce environmental and safety regulations, especially in high-risk areas identified through geospatial mapping.
- Formalize the informal ULAB recycling sector through certification and regulatory oversight to reduce contamination.

Enhance targeted Testing and Monitoring Capacity

- Equip healthcare facilities with portable BLL testing equipment and reagents, especially in high-risk areas such as ULAB recycling and mining regions.
- Deploy mobile screening units in remote high-risk areas like Kayelekera and Mchenga to increase testing accessibility.
- Establish centralized lead testing facilities in major hospitals, with satellite units in health centers to monitor lead exposure in at-risk populations.

Recommendations (Next Steps)

Improve Public Awareness and Education

- Launch public awareness campaigns in high-risk communities about lead exposure dangers and safe practices for ULAB recycling workers.
- Implement school-based programs to teach children in high-risk areas about lead risks and prevention methods.
- Educate communities near mining operations on lead exposure risks and establish buffer zones around mining areas

Collaborate with Stakeholders for Multi-Sectoral Action

- Form a multi-sectoral lead mitigation working group to coordinate efforts between government bodies, private sectors, academia, and communities
- Strengthen partnerships with international organizations to access funding and technical expertise for large-scale mitigation projects.
- Engage ULAB recyclers, miners, and communities in policy discussions for feasible regulations and alternative livelihoods.

Future Research Direction

- **Longitudinal Health Impact Study in Affected Communities**
Investigate the long-term cognitive, neurological, and reproductive health outcomes of chronic lead exposure among vulnerable populations through periodic blood testing and health monitoring.
- **Socioeconomic Mapping of Informal ULAB Recycling Networks**
Explore the economic structures, gender dynamics, and risk perceptions within informal lead-acid battery recycling communities to inform more equitable and sustainable transition pathways.
- **Lead Exposure Pathways in Artisanal and Mining Communities**
Conduct integrated environmental sampling (soil, water, dust) and blood lead level testing in mining communities to trace contamination sources, assess cumulative risk, and inform place-specific interventions.

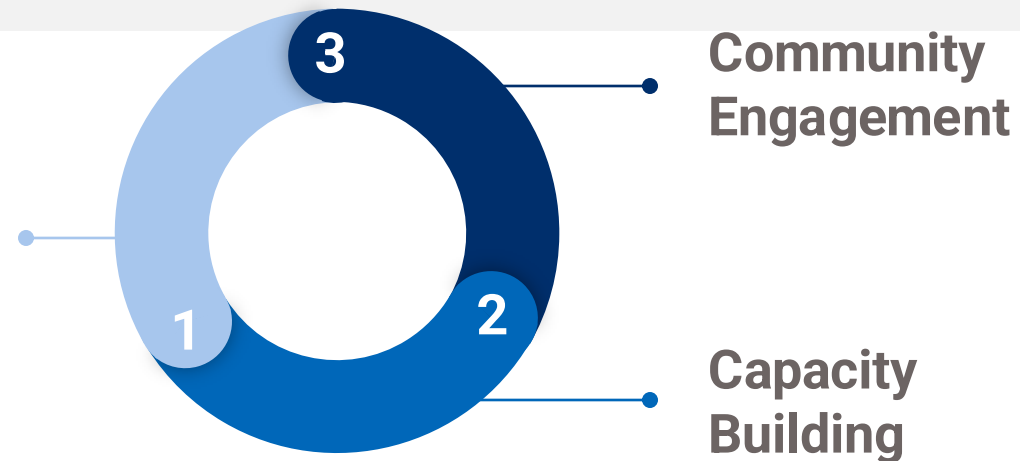
Conclusion: A Call to Collective Action for a Lead-Free Malawi

Urgency of the Challenge

Lead contamination in Malawi is not just an environmental issue—it's a public health crisis affecting the most vulnerable, especially children. The time for action is now.

A Multi-Pronged Solution is Required

Revise current hazardous Regulations to include lead and Strengthen the Existing Policies



A Path Forward

Together, through coordinated efforts between government, private sectors, and international partners, we can turn this challenge into an opportunity for transformation—creating healthier, lead-free communities for future generations.

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Attention**

