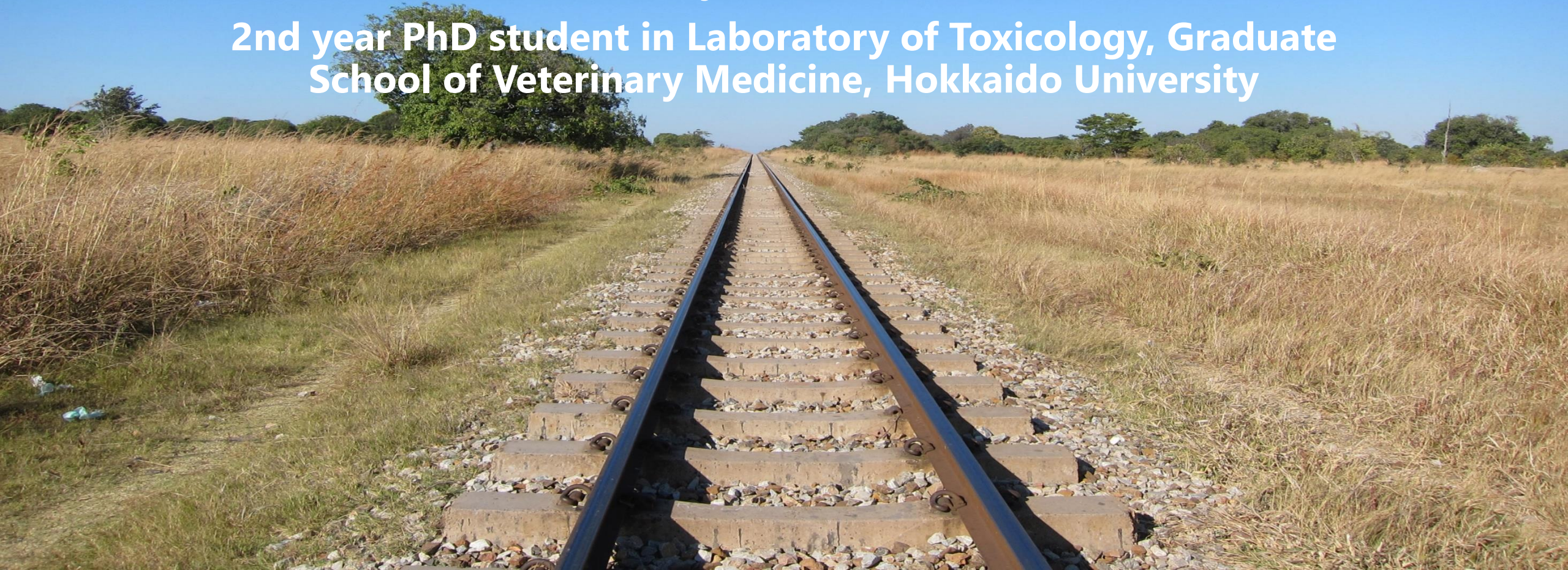


KAMPAI Project

Group 2 activities in 2016

Haruya TOYOMAKI

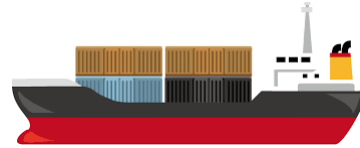
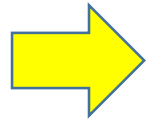
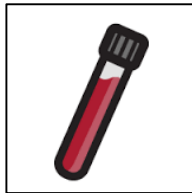
**2nd year PhD student in Laboratory of Toxicology, Graduate
School of Veterinary Medicine, Hokkaido University**



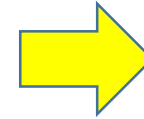
Current Method of Measuring Blood Lead Levels (BLLs)



Sampling



Transport



Measurement in the lab using Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

Feedback to the field

It takes at least 1 month

The problems are.....

- ✓ Taking time to feedback
- ✓ Not acceptable Emergency Case

Measuring BLLs in the field

LeadCare® II



- Measure for 3 minutes with batteries
- Only **50 µl** whole blood
- Range 3.3 – 65 µg/dL (Limit of detection)
 - ✓ Measure more than 65 µg/dL with dilution method

Rapidly measurement of BLLs in the field!

It 's not available in Japan.....

KAMPAI Project: KAbwe Mining Pollution Amelioration Initiative

KAMPAI Project

Japanese side:
Hokkaido University



Zambian side:
University of Zambia
and Ministries

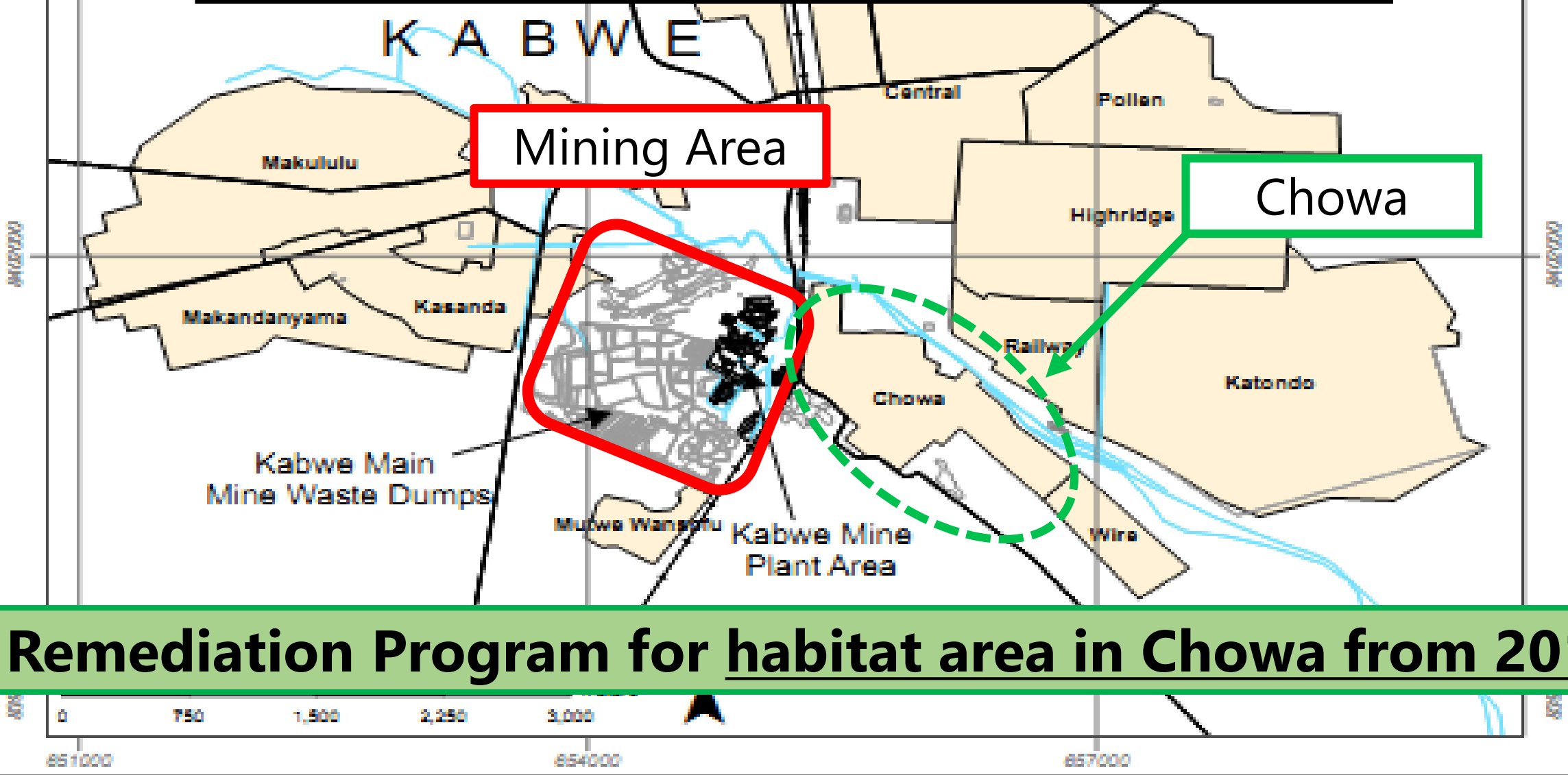
Pure Earth started [Remediation Program](#)

Cooperation

World Bank and **Pure Earth (NPO)**

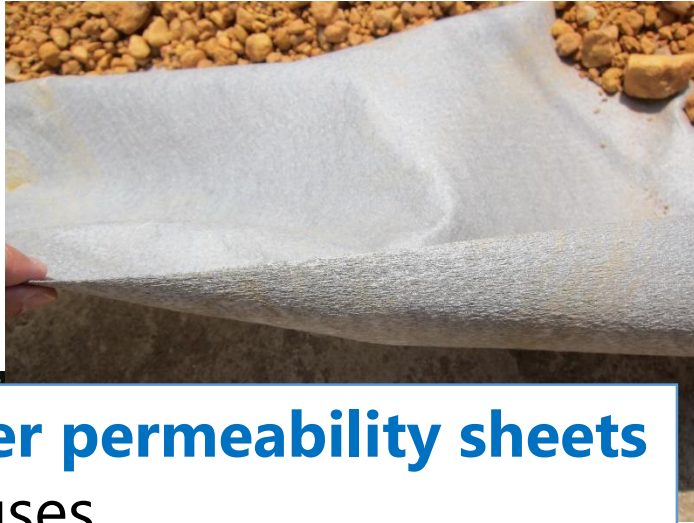


Map around Mining Area



● Remediation Program for habitat area in Chowa from 2014

Remediation Program by

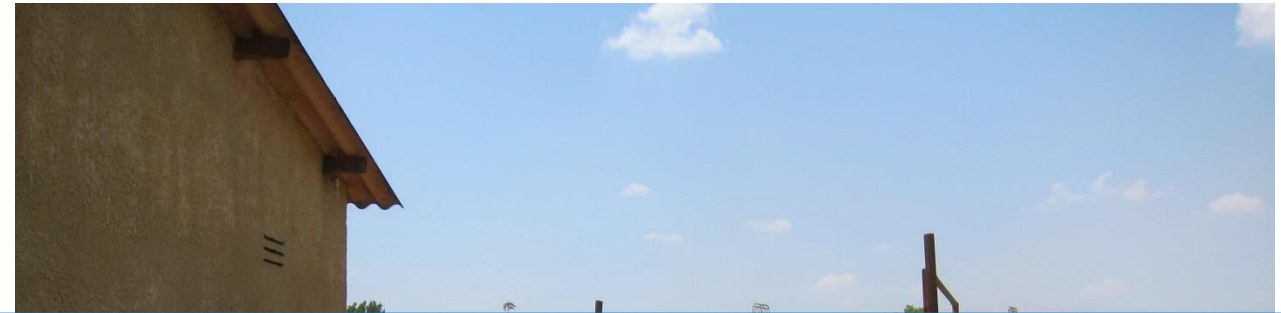


Laying **Water permeability sheets** around houses



Covered with **Clean Soil** on the seats

Remediation Program by



- Our Project collaborates with Pure Earth
→ Measure BLLs to check the effects of Remediation Program
- Pure Earth shares LeadCare II with us

Now we can measure BLLs in the filed!

Covered with clean soil on the seats

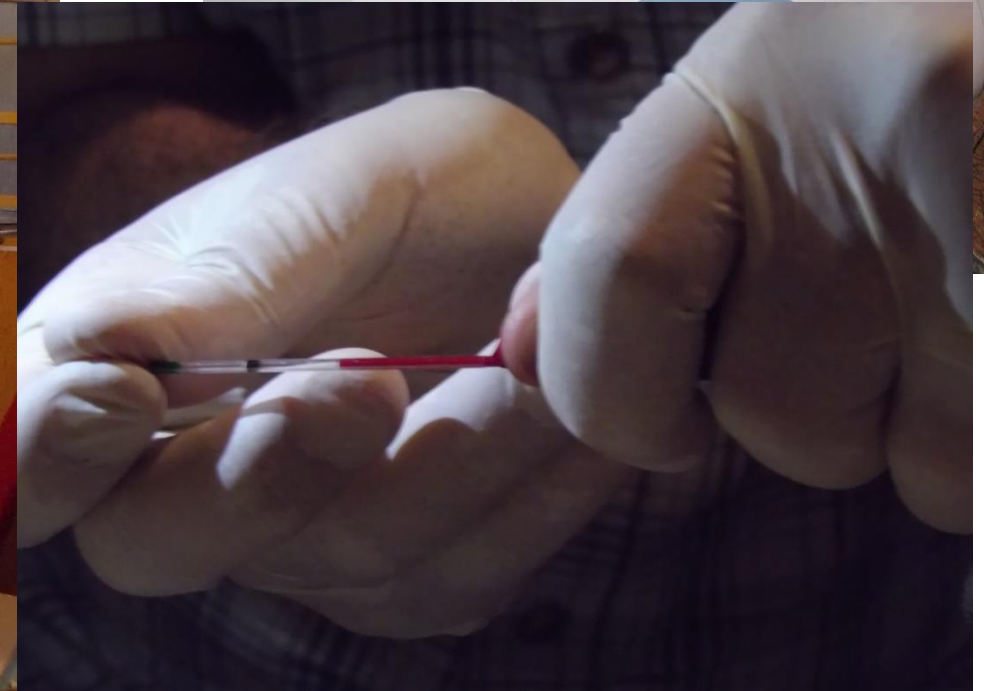
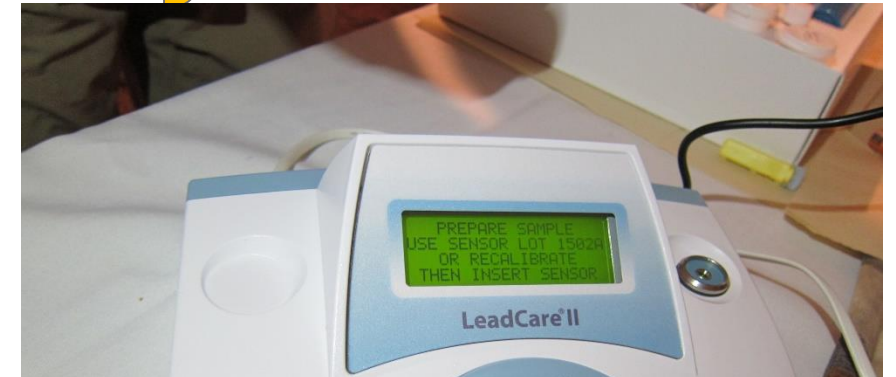


Picture with Prof. Jack Caravanos from Pure Earth

Lecture of using LeadCare II by Prof. Jack

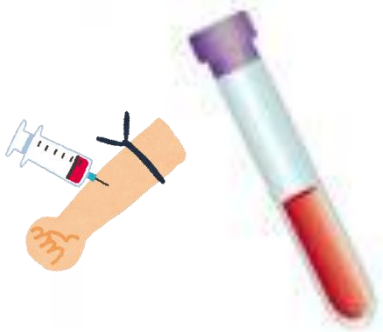


Trying with our own blood



Prick and just **50 μ l whole blood**

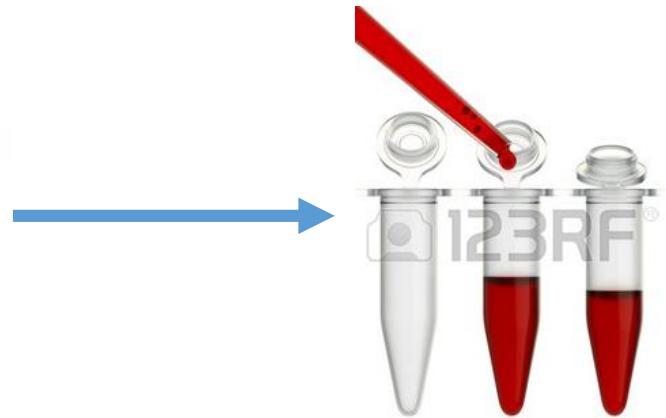
Sampling method



Collection of 5 mL
Blood with Heparin



1 mL Blood



Transfer 2 mL * 2 tubes
For **Pb conc & Isotope analysis**

LeadCare® II

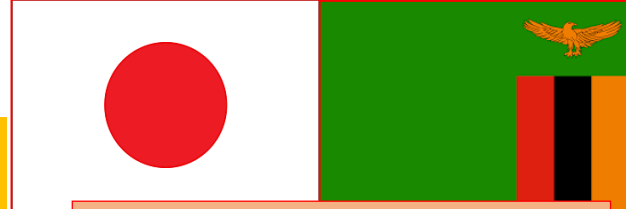


Blood Pb measurement with LeadCare2

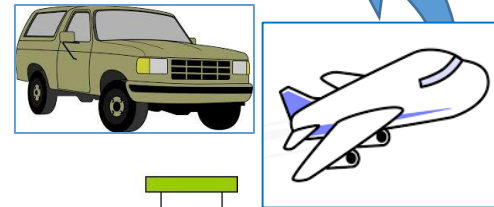


Centrifuge (4000 rpm, 10 min)

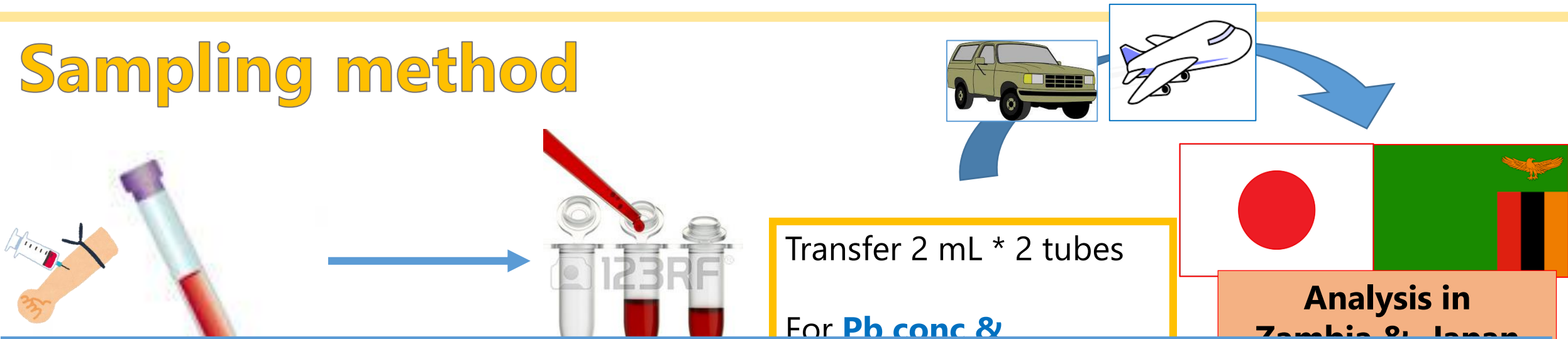
Plasma Transfer
0.5 mL * 1 tube
For **Blood Biochemistry**



Analysis in Zambia & Japan



Sampling method



- LeadCare II can measure BLLs quickly, it's for clinics
→ Necessary accurately to measure BLLs by ICPMS

- ✓ **Correspond to the field quickly using LeadCare II**
- ✓ **Feedback the accurate results using ICPMS**

1 mL Blood

Blood Pb measurement
with **LeadCare2**

Centrifuge
(4000 rpm, 10 min)

Plasma transfer
0.5 mL * 1 tube

For **Blood Biochemistry**

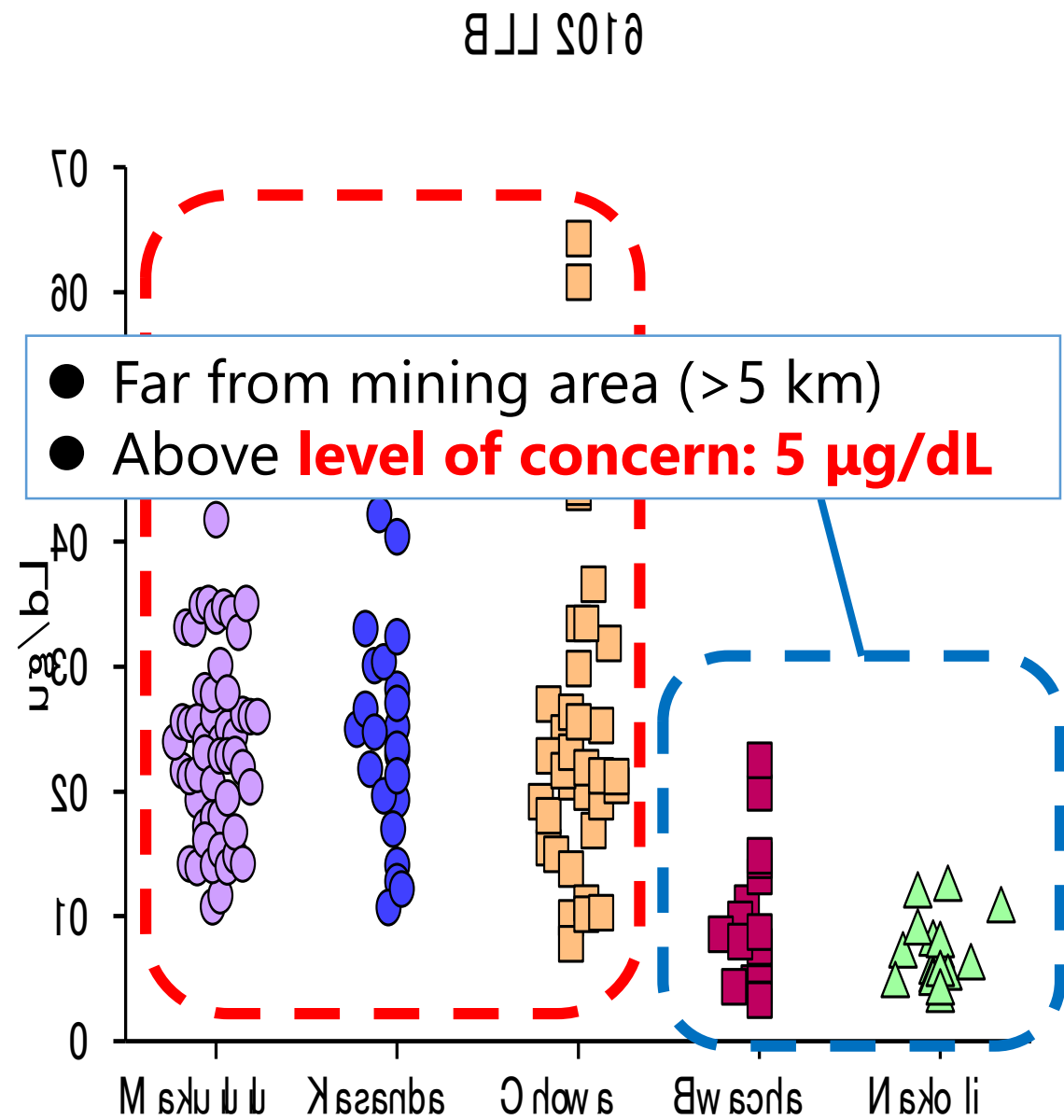
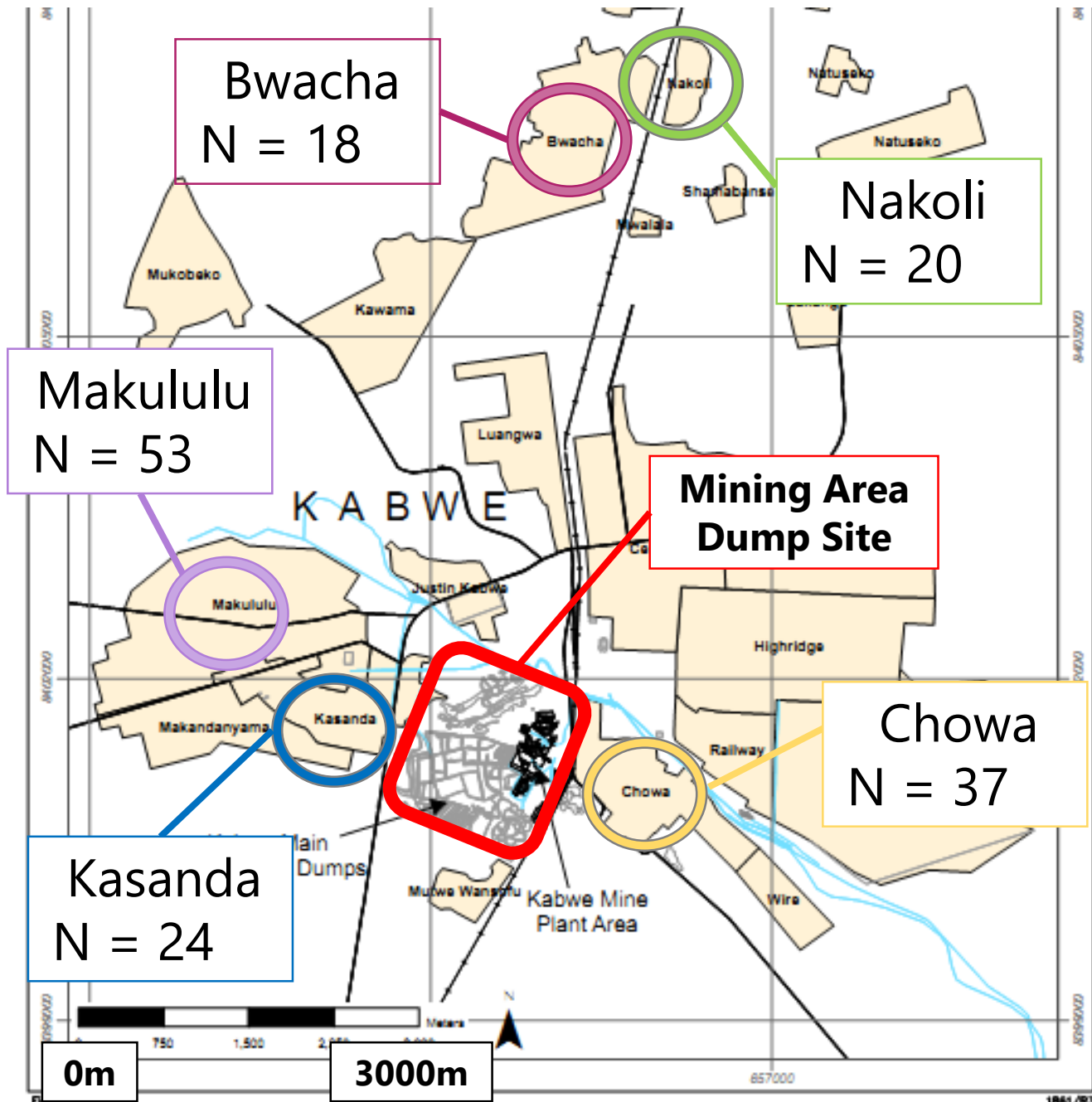
Last Sampling in October and November

LeadCare II



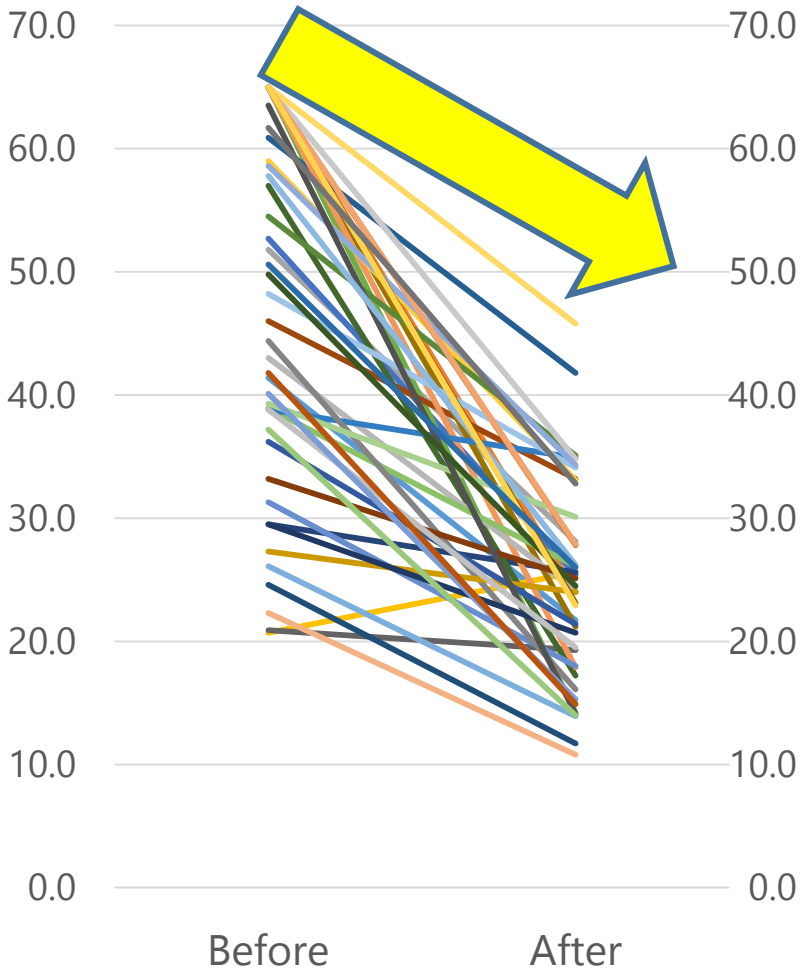
- Collecting **blood samples of children**
 - Recruited in 2014 by Pure Earth
 - Including children who live in Remediation Area

**Measuring BLLs using Lead Care II
in Kabwe Health Centers**

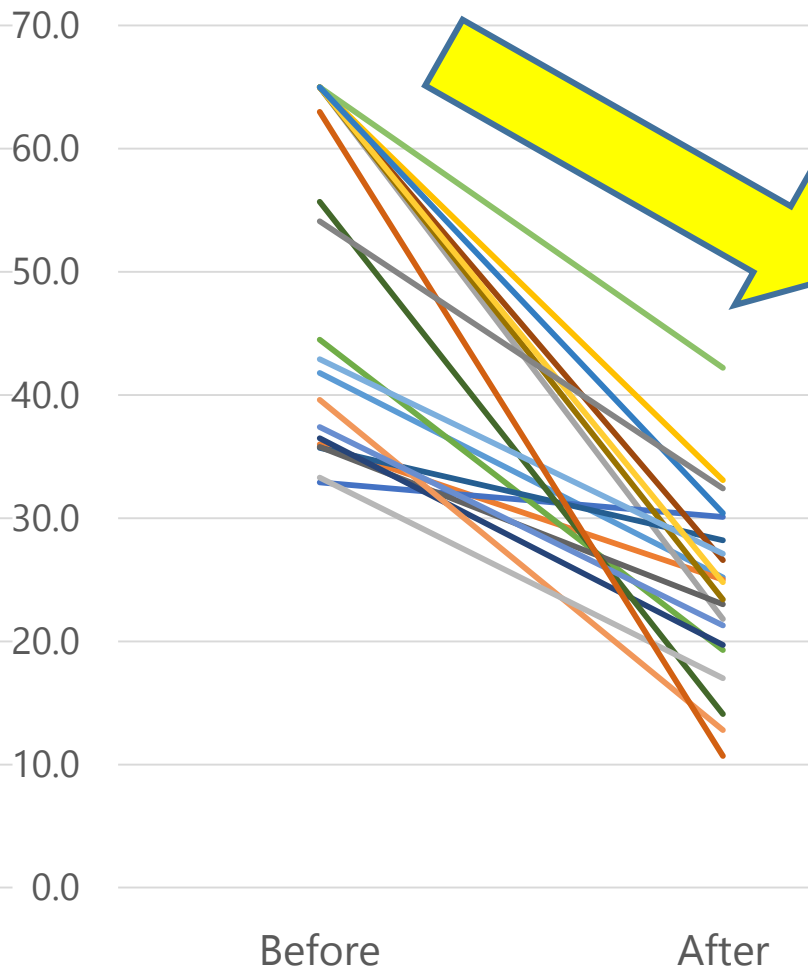


Comparing BLLs before (2014) and after (2016)

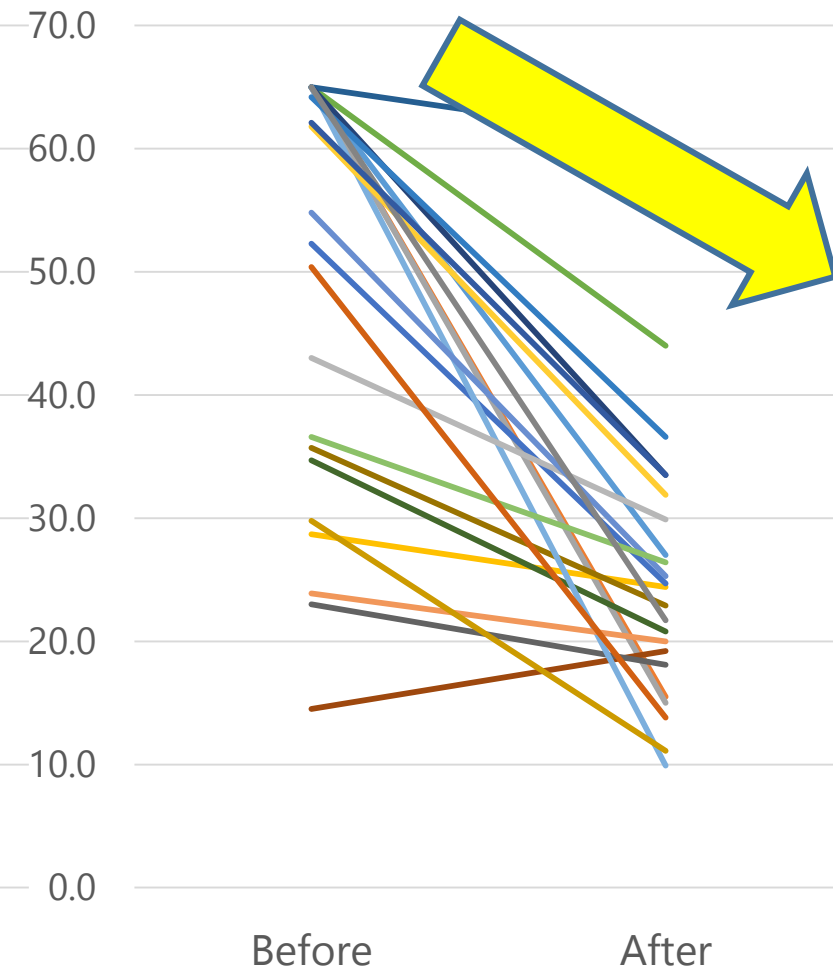
Makululu



Kasanda



Chowa

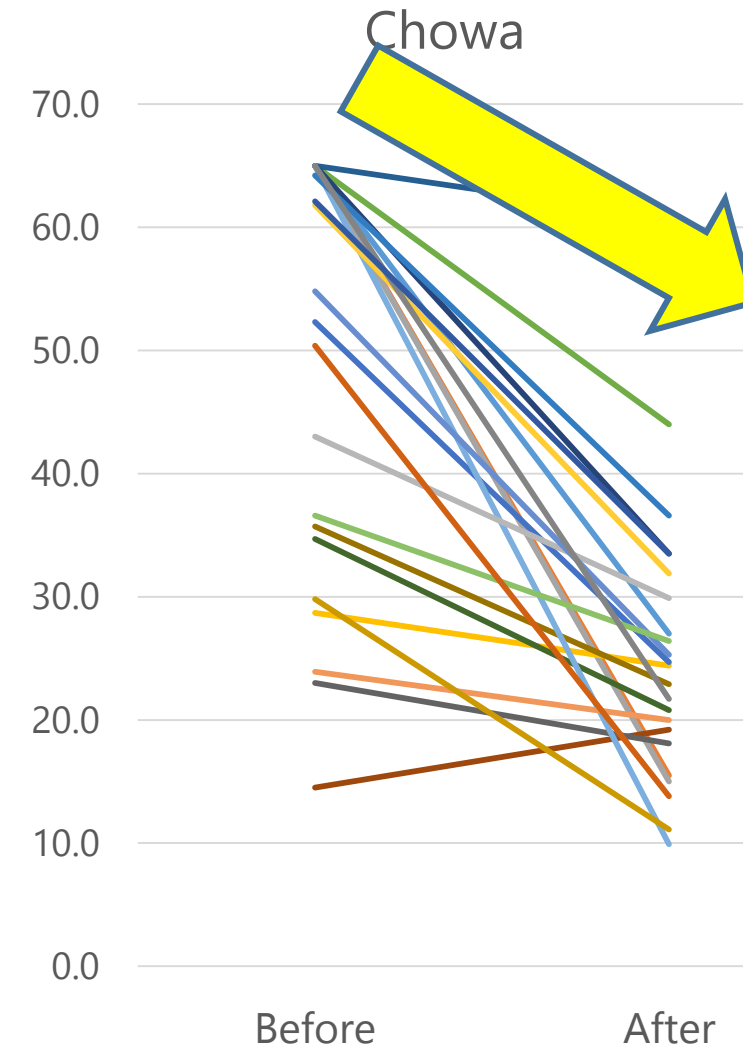


Comparing BLLs before (2014) and after (2016)

- All areas show decline of BLLs

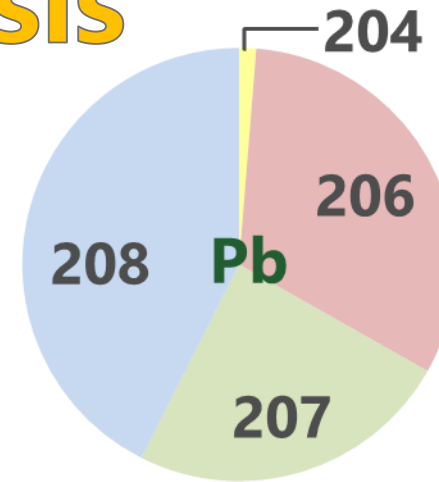
Not by Remediation, because of Age effect?

- ✓ Decline of BLLs by growing
- ✓ Only some houses in Chowa were remediated
- Using different method
 - ✓ Prick in 2014: high possibility of contamination
 - ✓ Using syringe in 2016: low possibility
- BLLs are **still high**: level of concern: 5 $\mu\text{g}/\text{dL}$



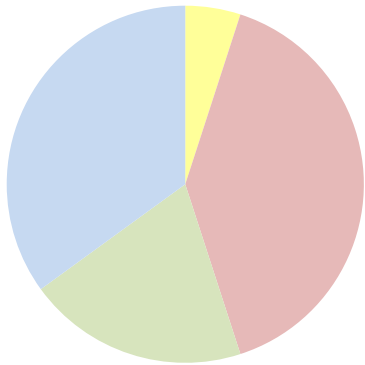
Pb Isotope Ratio Analysis

- Pb Isotopes: 204, 206, 207, 208

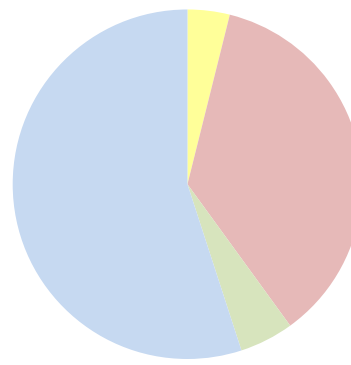


- The distribution of Isotopes is different

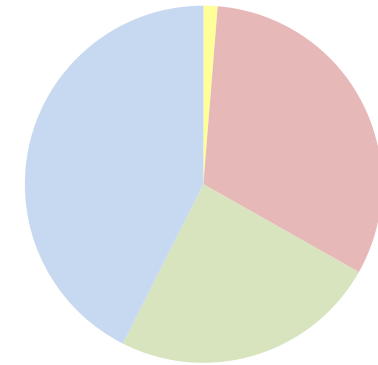
Shots



Rifle Bullets



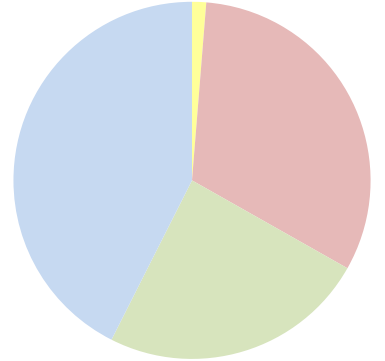
Sinker



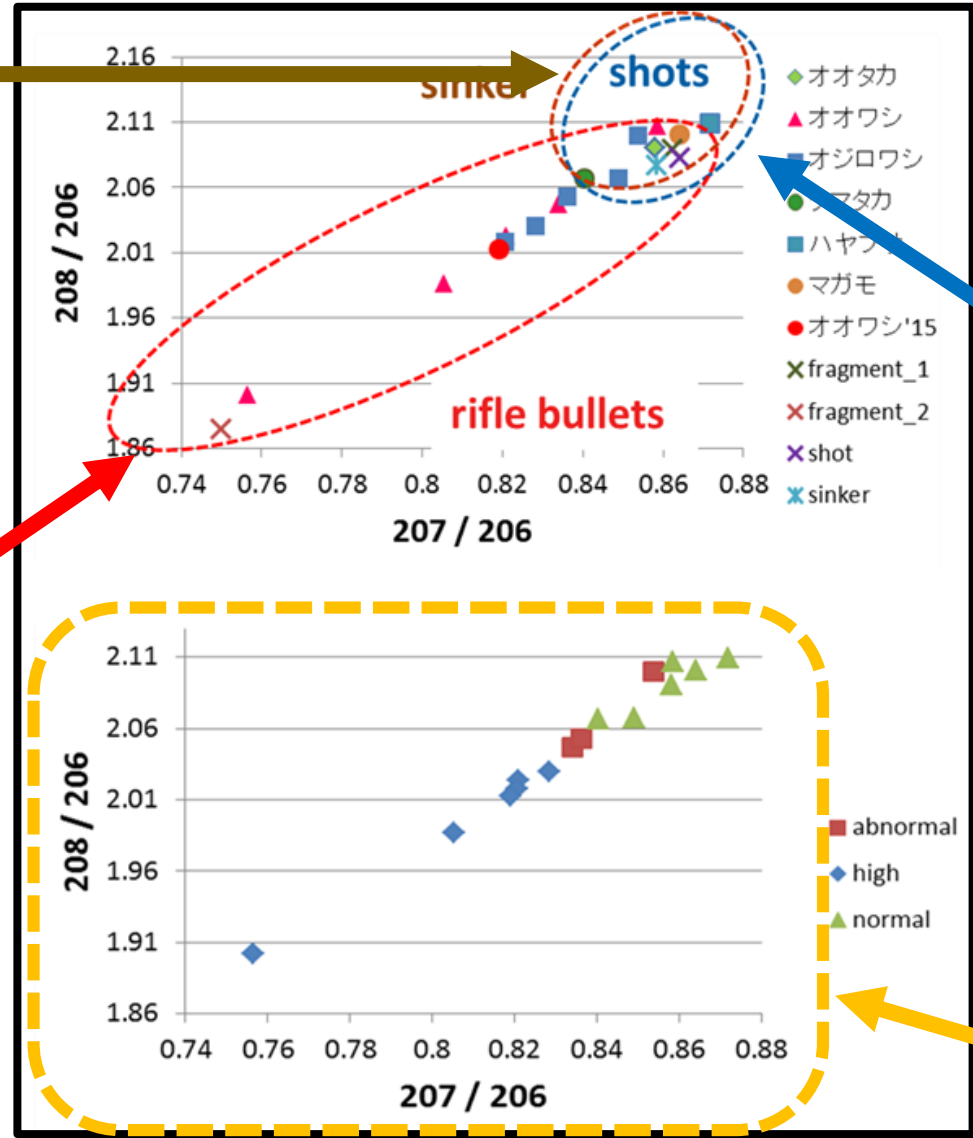
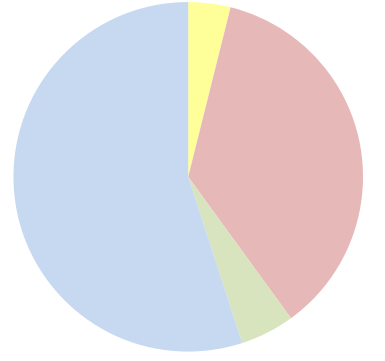
The distribution of metal materials depends on production areas: USA, Japan, Africa

Pb Isotope Ratio Analysis: Lead Pollution Raptors

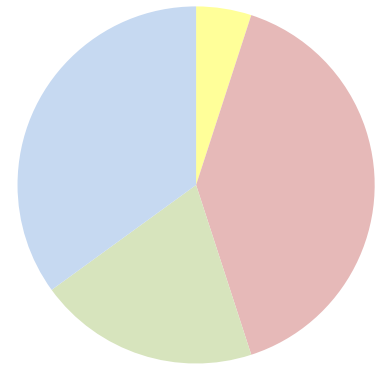
Sinker



Rifle Bullets



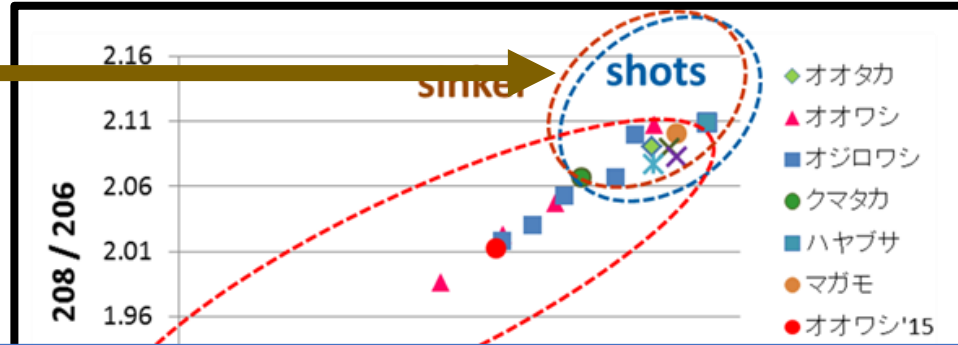
Shots



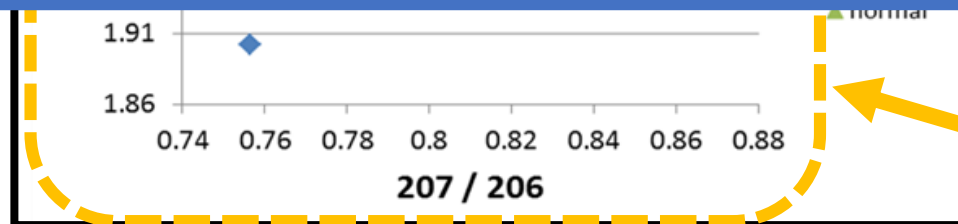
Biological samples

Pb Isotope Ratio Analysis: Lead Pollution Raptors

Sinker



- Comparing Isotope ratio of biological and environmental samples
→ Determining **the source of lead exposure**
- In KAMPAI Project
→ Group 1: **Environmental Samples**
→ Group 2: **Human Samples**

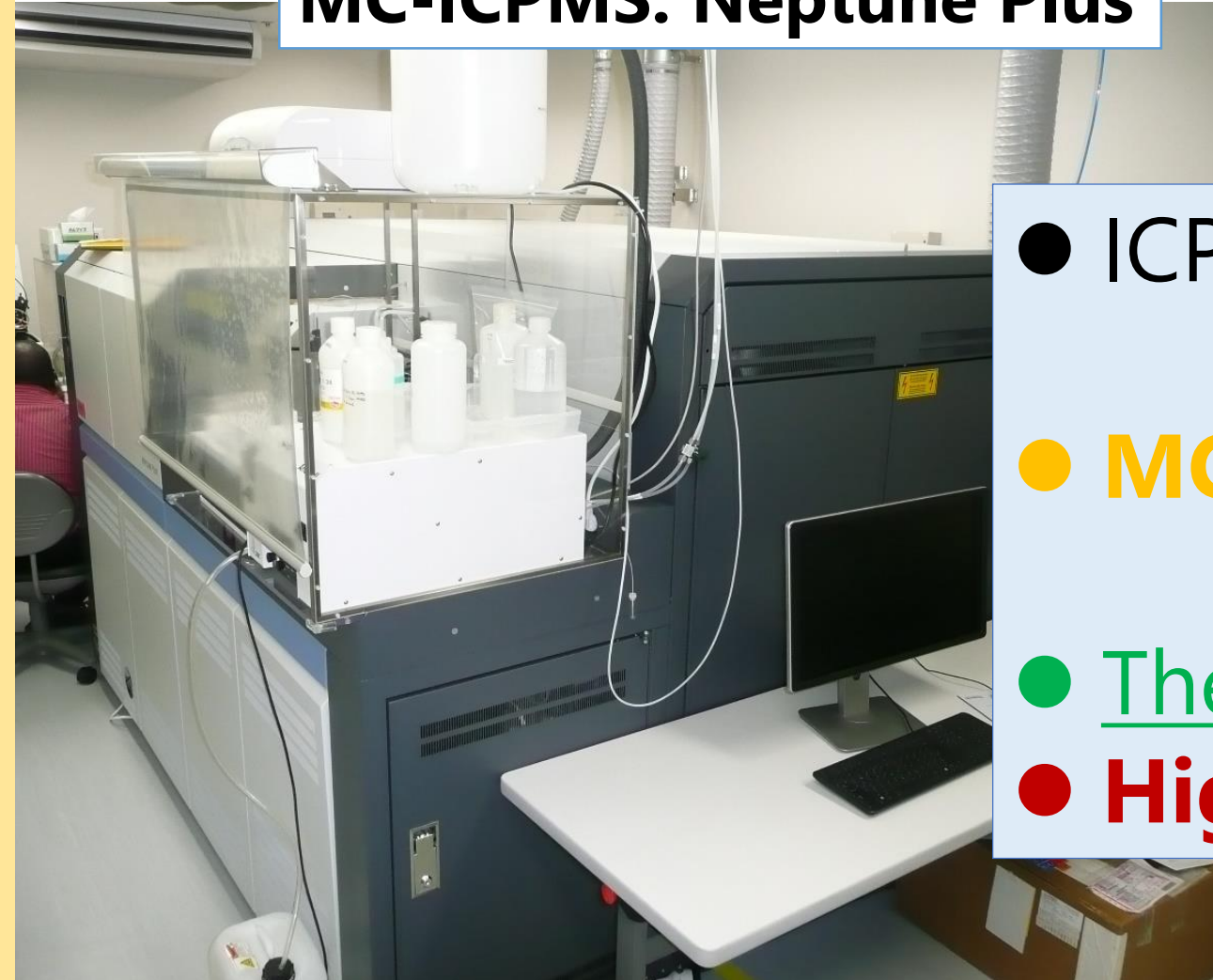


Biological samples

Multi Collector ICPMS (MC-ICPMS) in Hokkaido University

MC-ICPMS: Neptune Plus

- ICPMS for BLLs
- **MC-ICPMS** for Isotope analysis
- The latest version of MC-ISPMS
- **High accuracy**



Multi Collector ICPMS (MC-ICPMS) in Hokkaido University

MC-ICPMS: Neptune Plus

- ICPMS for BLLs
- **MC-ICPMS** for Isotope analysis
- The latest version of MC-ISPMS
- **High accuracy**
→ It is necessary to use clean room
- Using for determining the source of exposure (soils, air, vegetables, etc.)

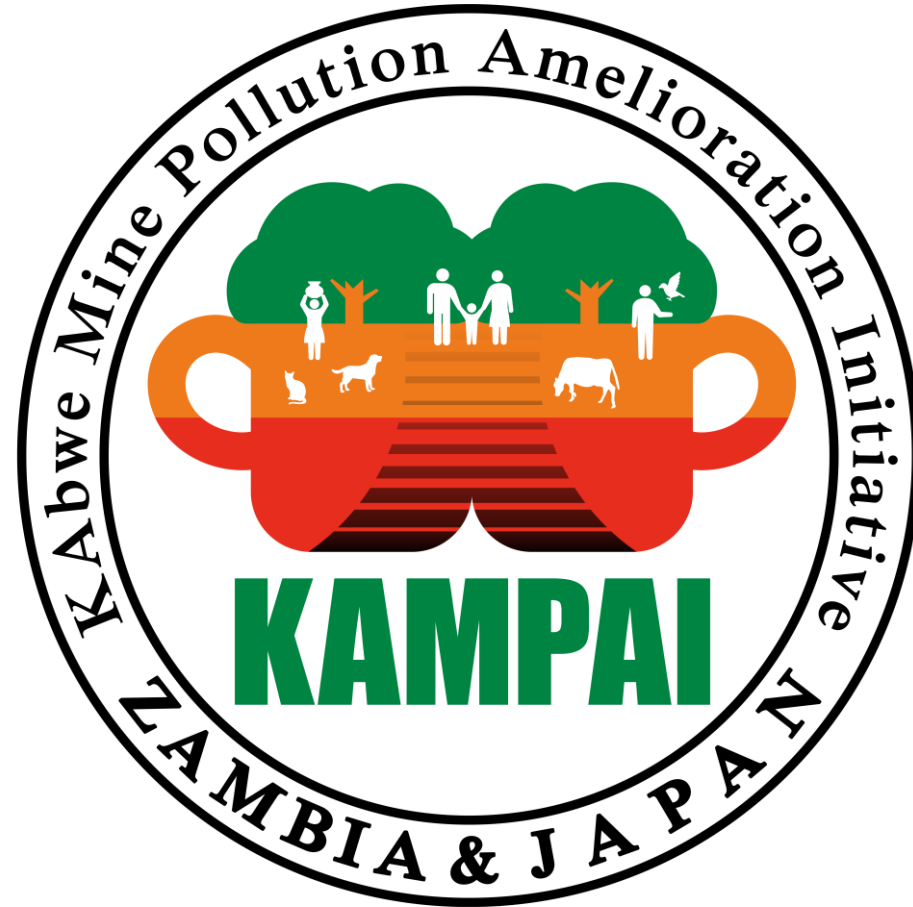


**Air shower and
Clean room**

Future Plan

- Big survey in Next August
 - **Health Risk Assessment**
 - Exposure Assessment
 - Neurodevelopment Analysis
 - IQ Analysis
 - Quality Of Life (QOL) Analysis
 - **Economic Assessment**
- **Same households will be recruited for all analysis**
 - **Analyzing the effects of lead exposure from various angles**

Thank you for your attention



KAMPAI Project Logo (Provisional)