Group 3
JICA-JST Project

The project for visualization of impact of chronic/latent chemical hazard and geo-ecological remediation in Zambia

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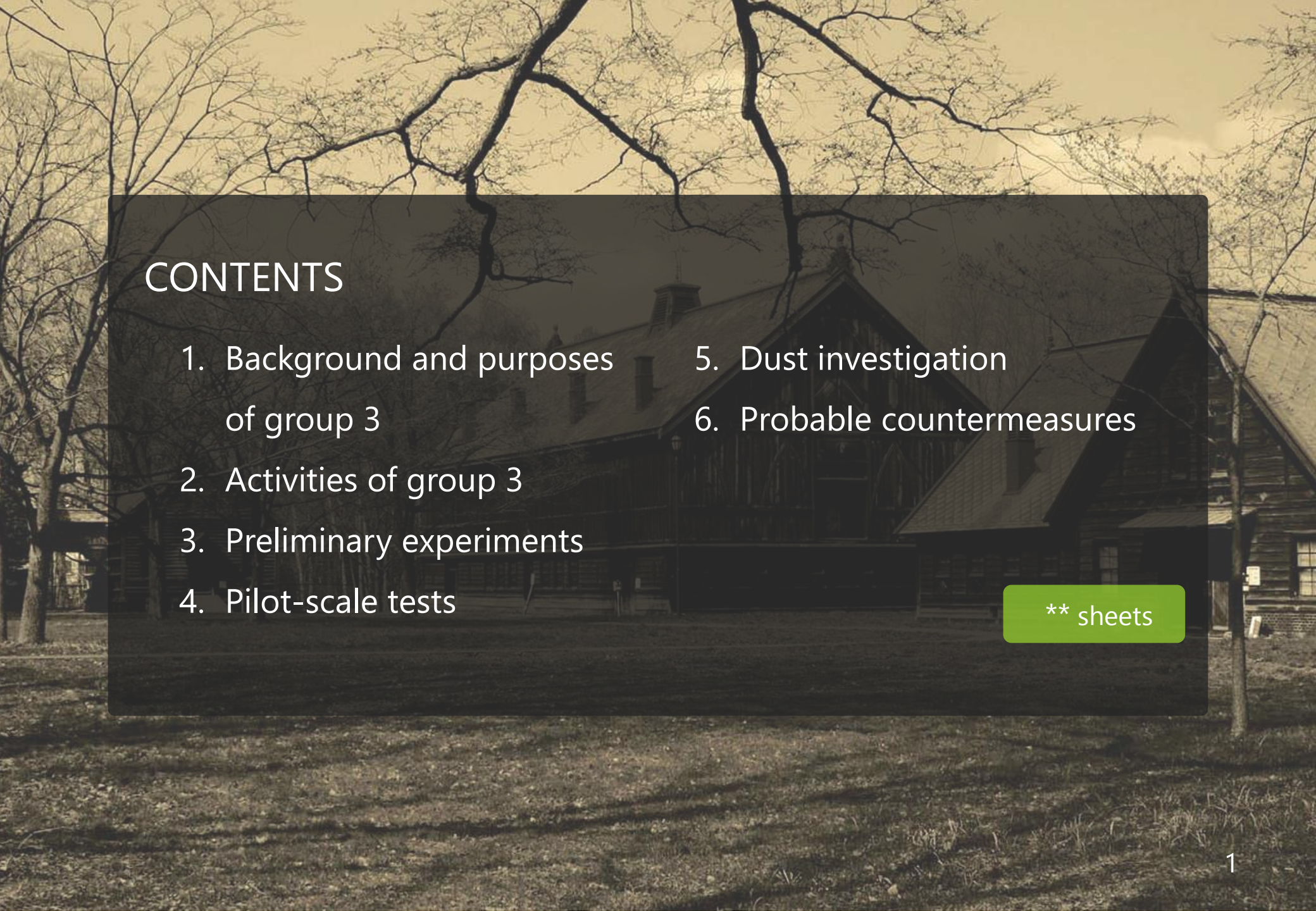

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** sheets

Background and purposes of group 3

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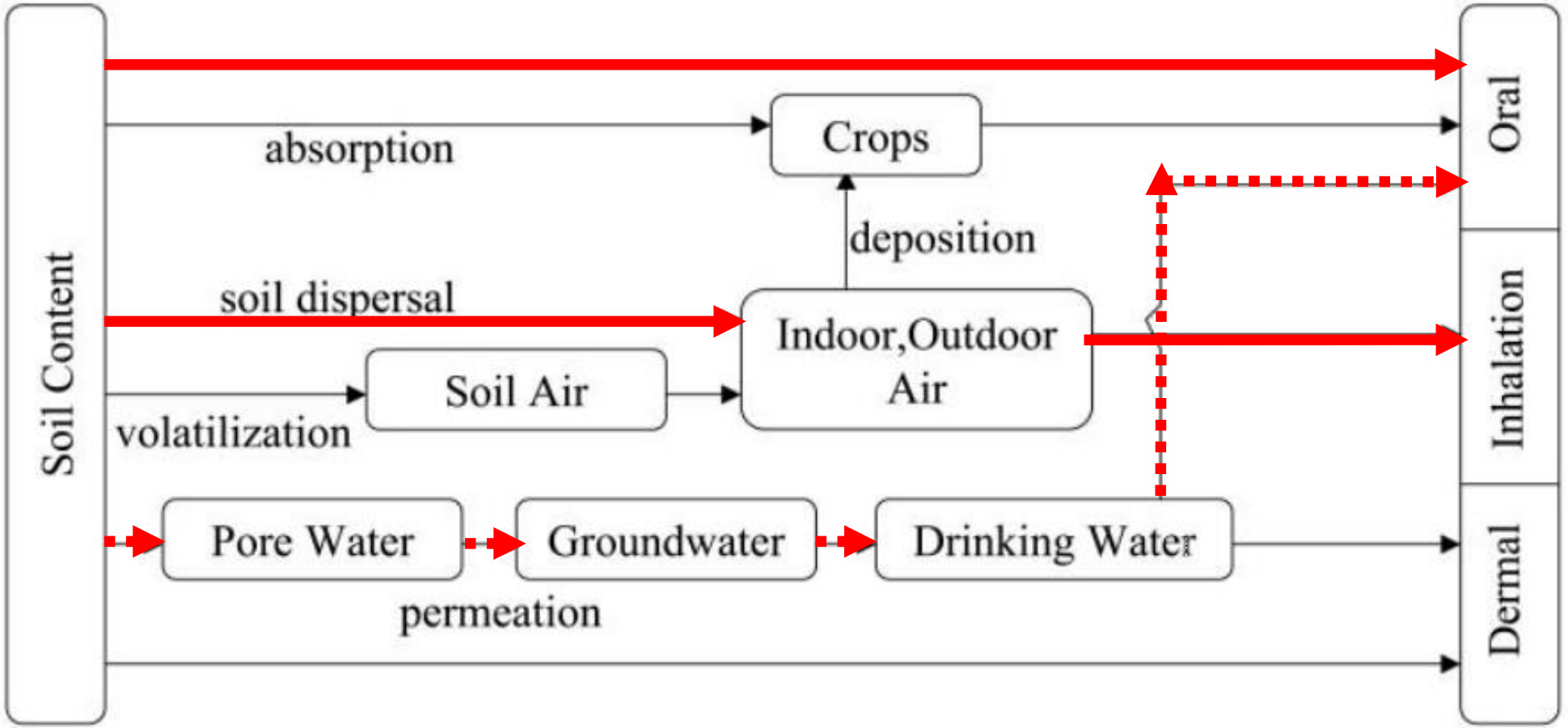
- **Group 1: Investigation of surface conditions by remote sensing methods and evaluation of effectiveness of vegetation**
- **Group 2: Epidemiological survey of Pb intake**
- **Group 3: Investigation of Pb diffusivity in the environments and proposal of candidate remediation methods**

- **Full-scale remediation in Kabwe by WB and satreps etc.**

Main activities of Group 3

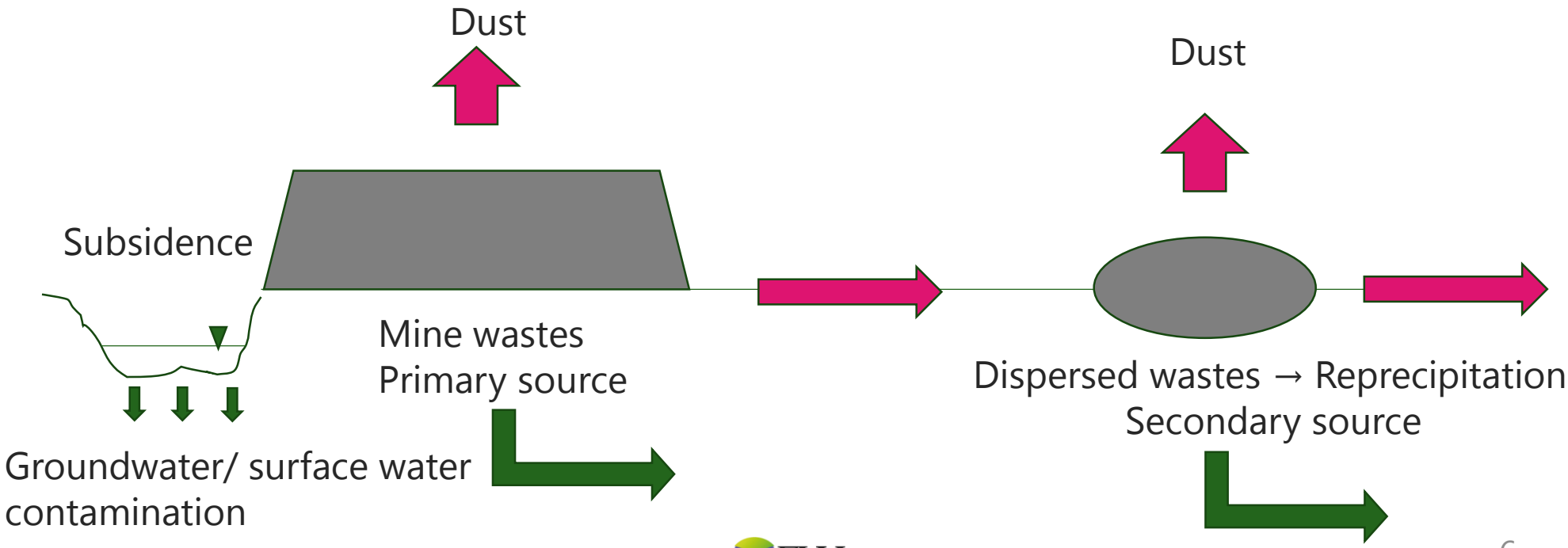
- **Preliminary experiments for pilot-scale experiments**
  - Characterization of mine wastes disposed and/or recycled
  - Application of promising remediation methods (Physical, chemical, biological, and/or electrokinetic methods) in the laboratory
- **Pilot-Scale is situ experiments in UNZA**
  - Plan and construction of impoundments
  - Monitoring the diffusivity of Pb contained in the impoundments
  - Evaluation of the diffusivity of Pb
  - Proposal of remediation methods
- **Investigation of hydrogeological condition and dust distribution in kabwe**
  - Investigation of hydrogeological condition in Kabwe
  - Characterization of Pb in dusts
  - Spatial distribution of dust
- **Proposal of candidate remediation method in Kabwe**

Major Exposure pathways of Pb



Concept of exposure of Pb

- Critical pathways of Pb during a rainy season consist of surface runoff and infiltration into underground.
- Critical pathways of Pb during a dry season is dispersion with dust.



Promising countermeasures against cutting the pathways

To reduce the concentration of dust

- Covering with uncontaminated soils
- Covering with sheet or other materials

To reduce the solubility of Pb

- Mixing with chemicals (e.g., adsorbents) for reducing the solubility

To clean up surface soils

- Washing contaminated soils
- Removing contaminated surface soil

To prevent contaminated groundwater from diffusing out

- Constructing low-permeable layer
- Constructing permeable reactive barrier
- Monitored natural attenuation

Preliminary experiments

Characterization of mine wastes/ recycable minerals

- Distribution of wastes
- Leachability and content of Pb

Investigation of hydrogeology in Kabwe

- Geology and hydrogeology in Kabwe
- Geochemistry in Kabwe

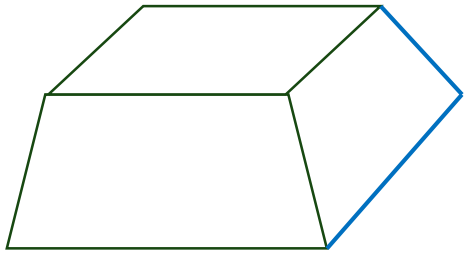
Investigation of hydrogeology in pilot-scale in situ experiments in UNZA

- Geology and hydrogeology in UNZA site
- Geochemistry in UNZA site

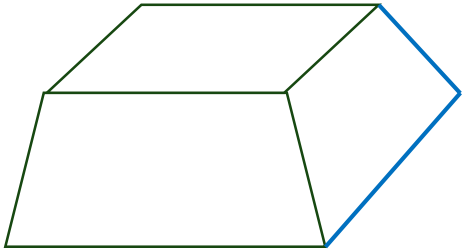
Application of candidate remediation methods using collected soil samples in Kaber in the laboratory

Drilling Site/Soil Excavation Site

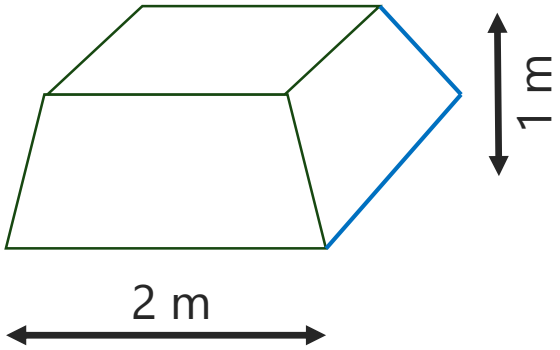
Pilot-scale in situ experiments



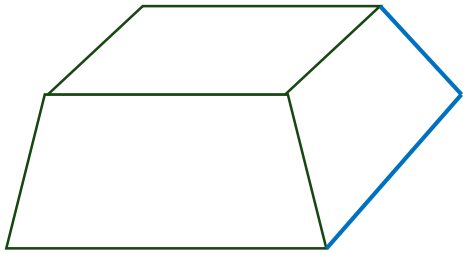
Case 1 No countermeasures
Only mine wastes



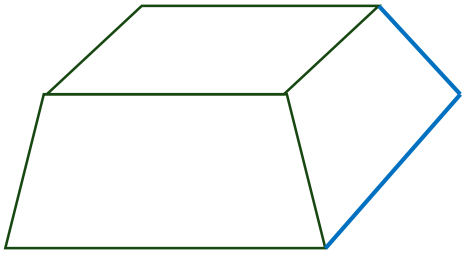
Case 2 Covering soil 1



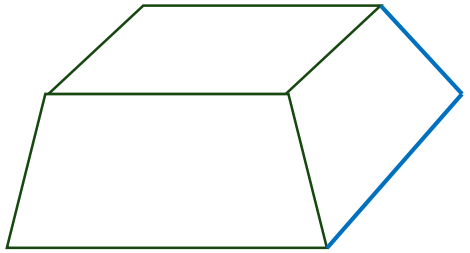
Case 3 Covering soil 2



Case 4 Immobilization 1

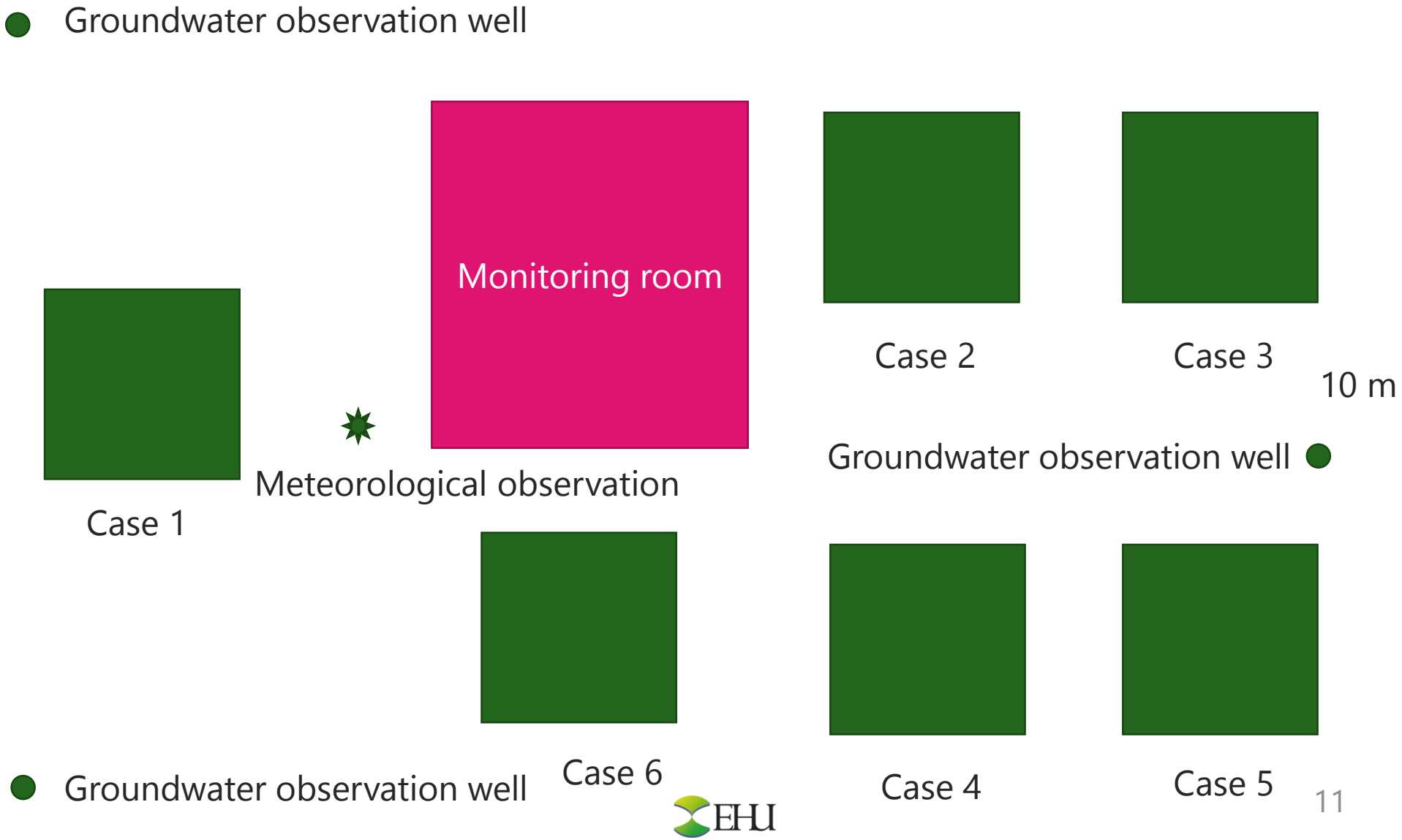


Case 5 Immobilization 2



Case 6 Other method

Plan view of the experimental site



Meteorological observation in UNZA

1. Direction of wind
2. Velocity of wind
3. Atmospheric pressure
4. Solar radiation
5. Rainfall
6. Temperature
7. Humidity

Storage place of Soil in UNZA

Particle size entering lungs

> 7 µm mouth, naris

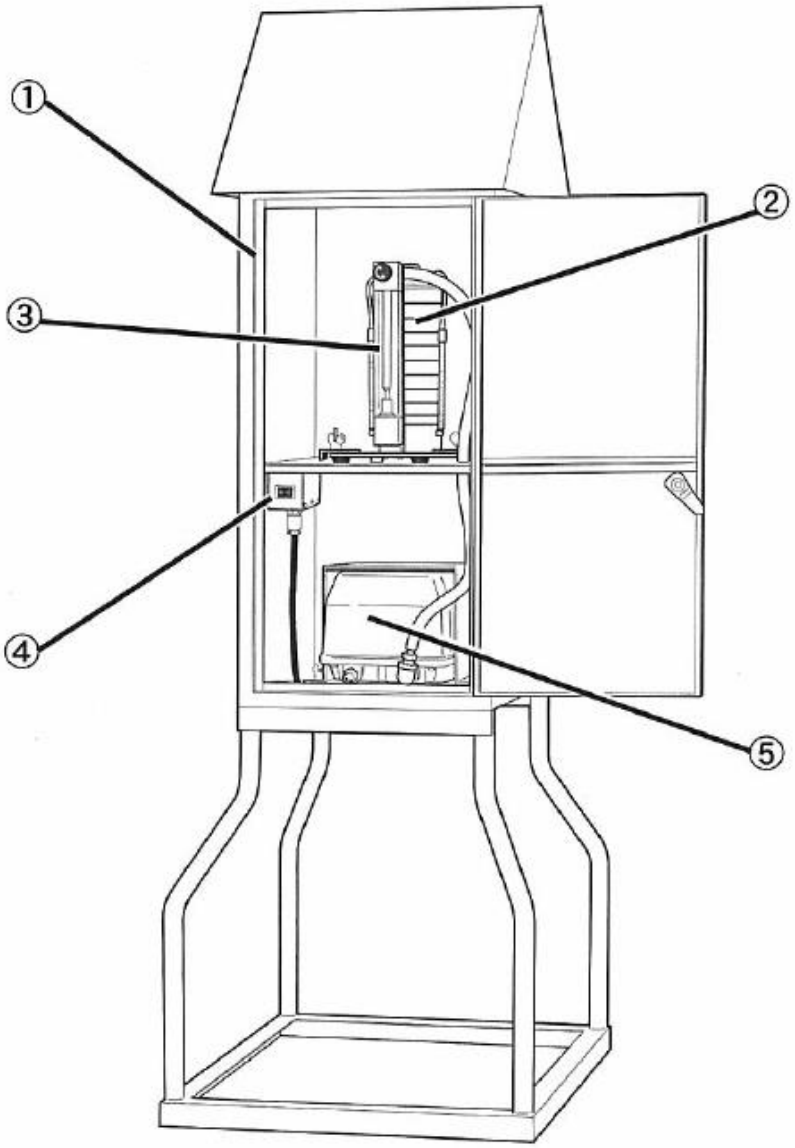
3.3-5 µm trachea

2.0-3.3 µm bronchus

1.1-2.0 µm

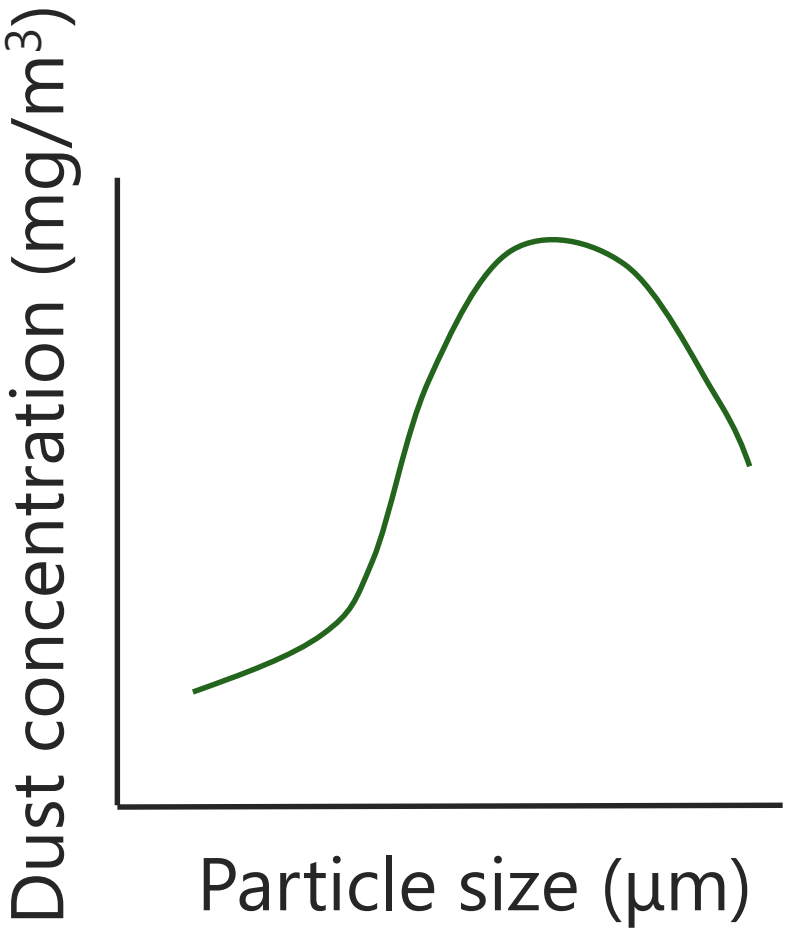
<1.1 µm alveolus

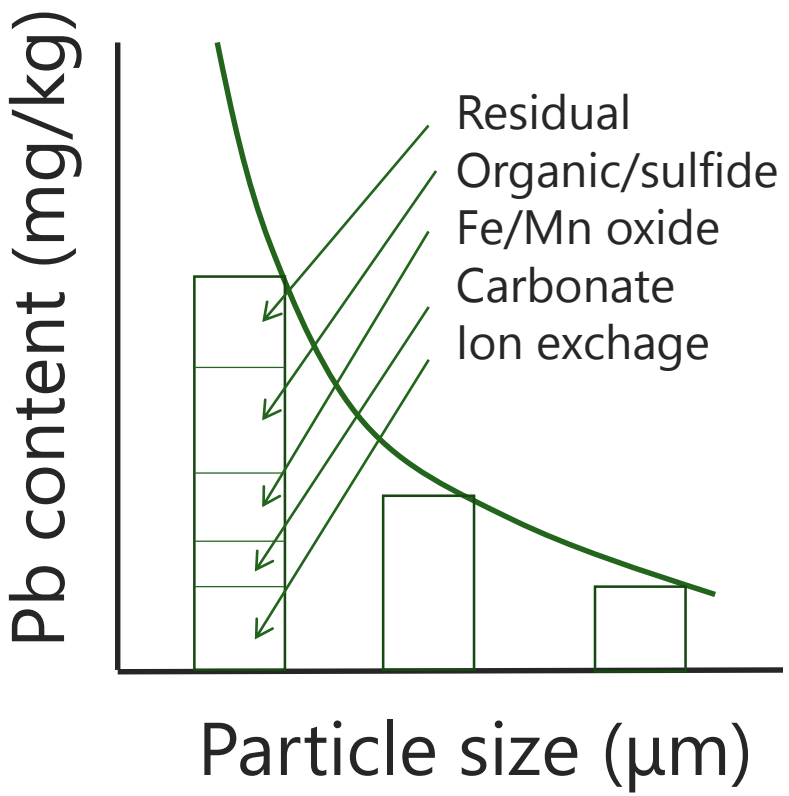
Structure of mobile dust sampler



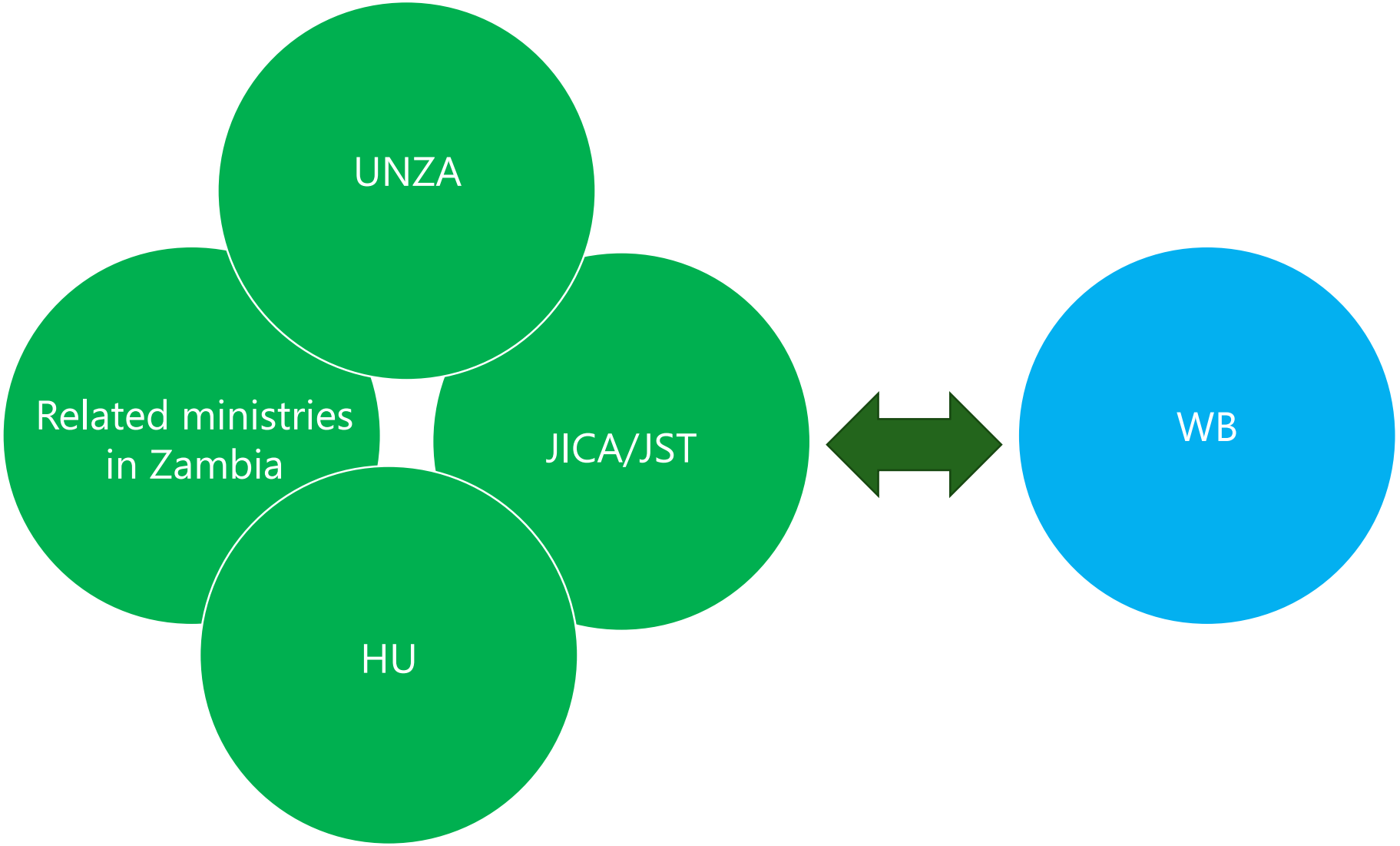
1. Shelter
2. Sampler with 7 filters
3. Flow meter
4. Switch
5. Vacuum pump

Distribution of Pb content in dust





Organizing the research



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