



Mercury monitoring in Mongolia

14th Annual APMMN Partners Meeting

08 December 2025, Taipei, Taiwan

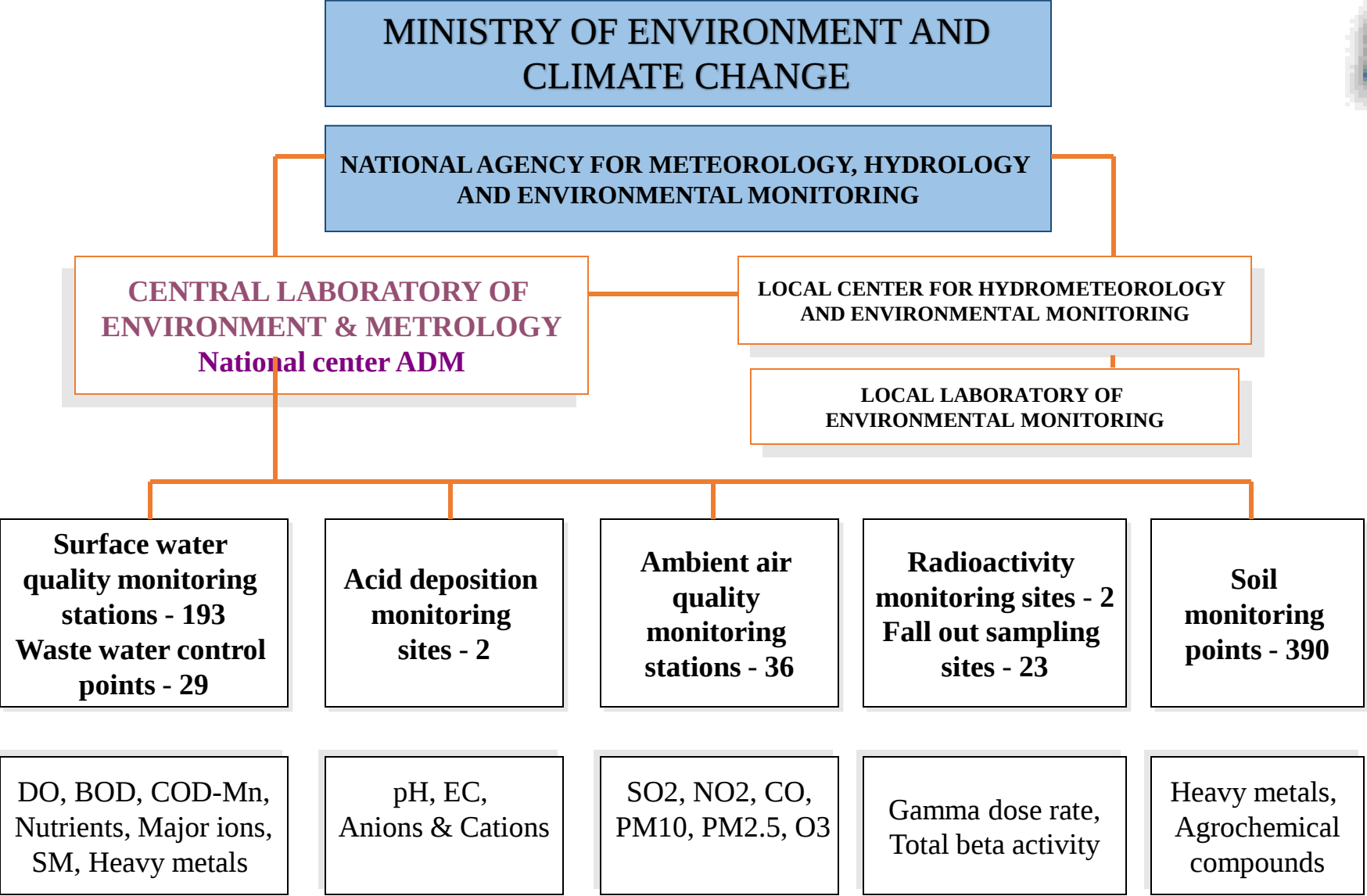
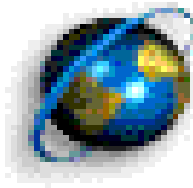
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Outline

- Environmental Quality Monitoring Network in Mongolia
- Introduction of CLEM
- Capacity building
- Laboratory equipment
- Methods and Procedures for the analysis
- Hg monitoring
- Current Status of Atmospheric Mercury Monitoring in Mongolia

ENVIRONMENTAL QUALITY MONITORING NETWORK



Central Laboratory of Environment and Metrology



The CLEM is a national institution responsible for providing governmental services such as monitoring environmental quality across Mongolia, inspecting, verifying, and certifying meteorological measuring instruments, installing new measurement equipment at central and local levels, conducting maintenance and inspections, and manufacturing certain analytical devices. The organization operates through 3 main divisions. The Environmental Analysis Division, the Metrology Division, and the Administration and Operations Division.

The Environmental Analysis Division comprises laboratories for air, water, soil, and radiation analysis. The Metrology Division consists of laboratories specializing in air pressure measurement, solar radiation studies, humidity and temperature measurement, water flow velocity measurement, and length measurement.

Introduction of laboratory

The Central Laboratory of Environment and Metrology (CLEM) under the National Agency for Meteorology and Environmental Monitoring, is responsible for observing and monitoring the spatial and temporal changes in air, water, and soil quality; controlling pollution sources and waste; providing relevant organizations with this information; guiding the methodological management of the environmental quality monitoring network; and testing and introducing environmental analysis methods and techniques.

- The CLEM was established in 1976. In terms of environmental quality monitoring network, there are:
 - 21 local laboratory of environmental monitoring;
 - 37 ambient air quality monitoring stations in national scale, 12 of which are located in Ulaanbaatar;
 - 193 surface water quality sites that are located in more than 94 rivers and 18 lakes;
 - 29 wastewater control points,
 - 10 waste water pollution control points of 5 Waste Water Treatment Facilities /WWTF/,
 - 23 fall-out sampling sites for radiation measurement,
 - 35 radiation control sites,
 - 390 soil monitoring points and
 - 2 acid deposition monitoring sites.

Introduction of laboratory

The CLEM was accredited by the Mongolian Agency for Standardization and Metrology in 2004 for its metrology activities and in 2009 for its environmental monitoring activities.



Within the scope of Quality Control / Quality Assurance activities

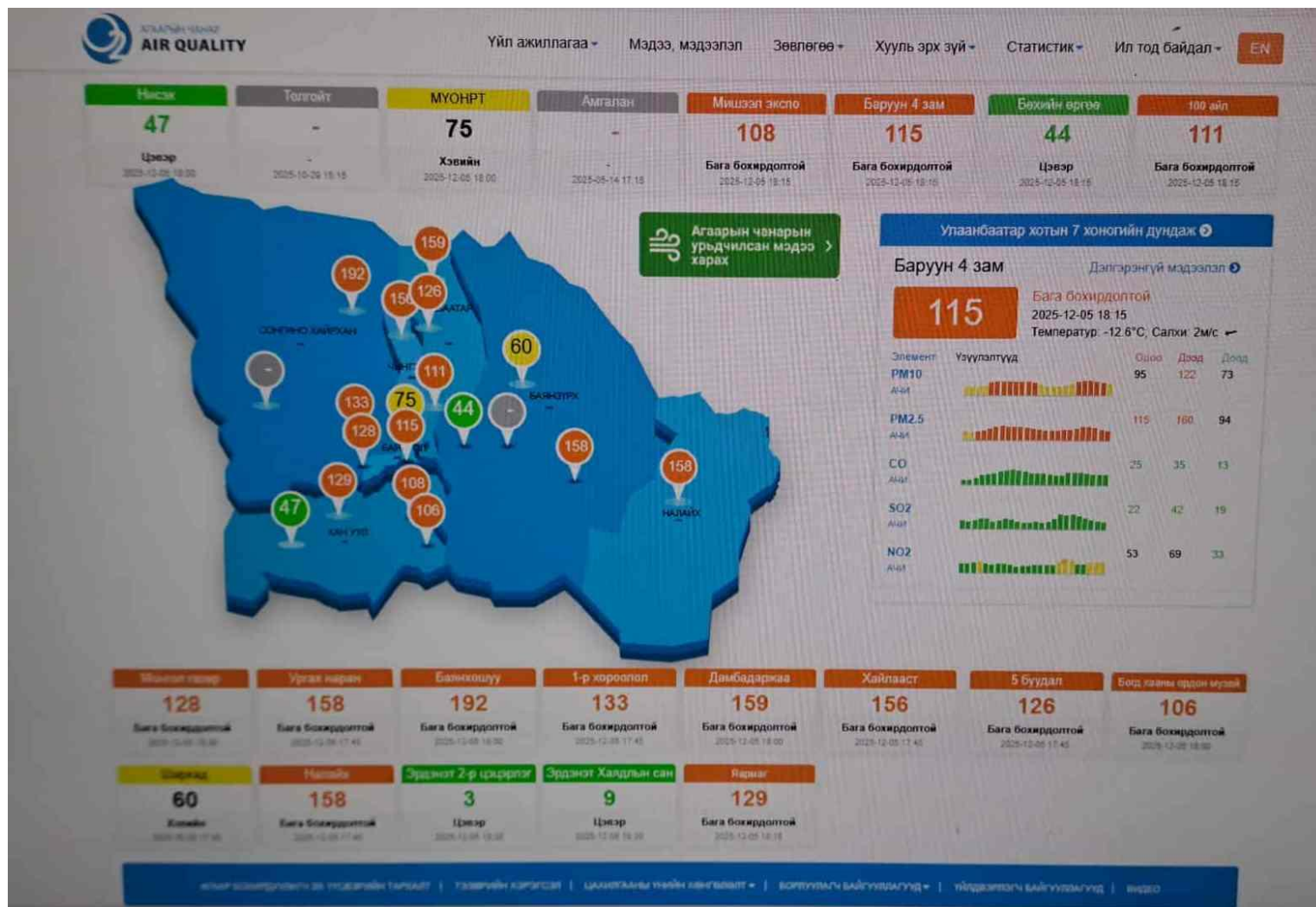
Internal Control

- Conduct and evaluate control samples among local and laboratory staff
- Perform annual internal audits of laboratory operations
- Assess whether the measuring instruments used at meteorological stations have undergone scheduled inspections

External Control

- Submit standard reference instruments used for meteorological measurements for international verification
- Analyze international quality control samples provided by the East Asian Acid Deposition Monitoring Center
- Analyze international quality control samples provided by the World Meteorological Organization

Air Quality Monitoring

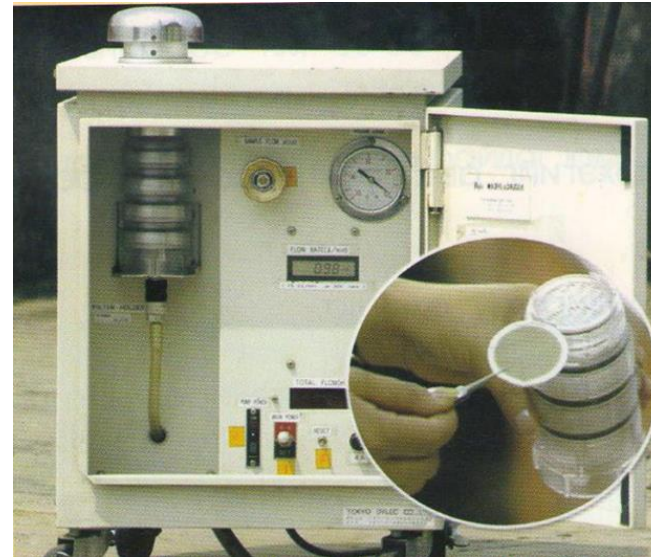


Air quality monitoring in UB-12 **automatic** station /CLEM/, 4 automatic station /Air Quality Agency of UB/ SO₂, NO₂, CO, PM₁₀, PM_{2.5}, O₃

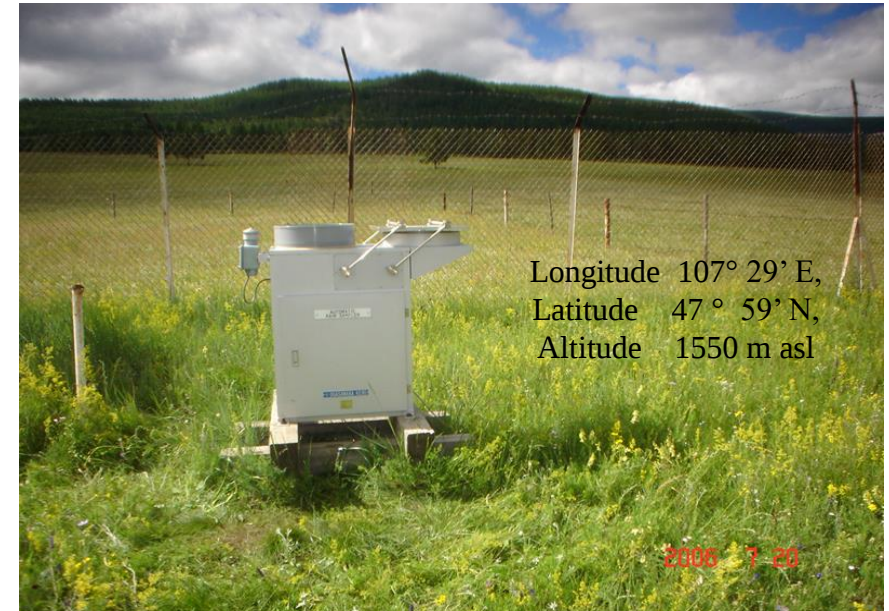
37 ambient air quality monitoring stations in national scale, 12 of which are located in Ulaanbaatar;

Wet and dry deposition monitoring site

Urban site- Ulaanbaatar



Remote site - Terelj



Monitoring program

Monitoring site	Items	Monitoring interval	Monitoring parameters
Terelj Ulaanbaatar	Wet deposition	Daily (May to October)	pH, EC, SO_4^{2-} , $\text{NO}_3^- \text{Cl}^-$, NH_4^+ , Na^+ , K^+ , Ca^{2+} , Mg^{2+}
Terelj Ulaanbaatar	Dry deposition	Biweekly Weekly (May to October)	Gases: SO_2 , HNO_3 , HCl , NH_3 Aerosol: SO_4^{2-} , NO_3^- , Cl^- , NH_4^+ , Na^+ , K^+ , Ca^{2+} , Mg^{2+}

Capacity building



The laboratory does not have its own purpose-built building.

Capacity building

Sample management and storage



- Recently we have not been take sample for mercury analysis.
 - We don't accreditation certificate on mercury analysis due to lack of standard reference material.
 - In emergency case, we collect sample and store them in a refrigerator
-
- Toxic exhaust gas dissolved to charcoal and solutions
 - We use general lab fume hood
 - We store wastewater in canister and send them to waste treatment company.
 - We store solid waste and send them to waste treatment company.

Mobile Station for Air Quality Monitoring

With the grant aid from the Republic of Korea, a mobile laboratory capable of measuring six air quality indicators and basic weather parameters was handed over to the Central Laboratory of Environment and Metrology (CLEM) under the National Agency for Meteorology and Environmental Monitoring (NAMEM).



21 LOCAL LABORATORY OF ENVIRONMENTAL MONITORING

This year, air quality stations have been established in the provincial centers of 21 aimags

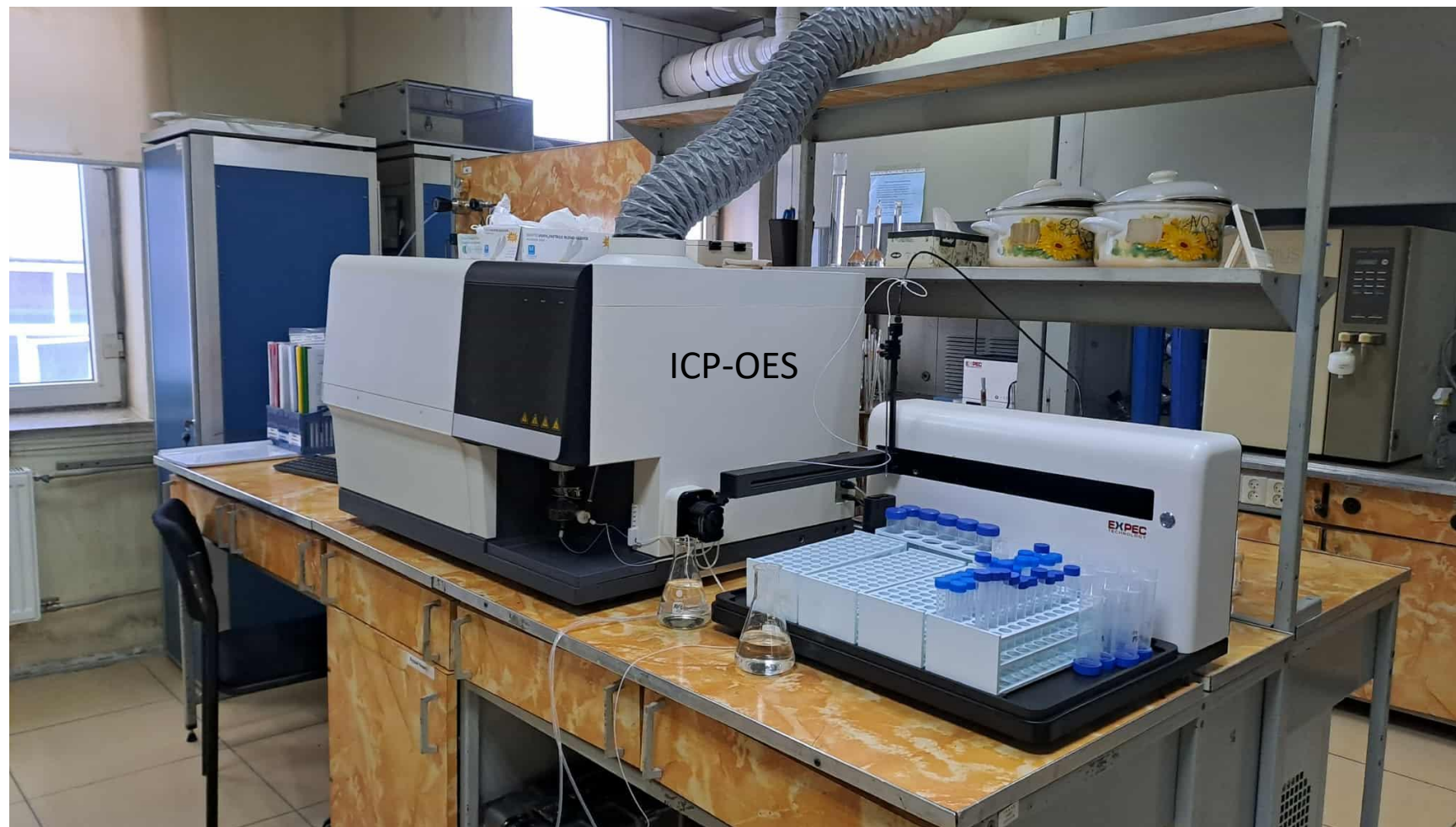


"Automatic Air Quality Monitoring Station"



Group Training

New ICP-OES /December 2025/



Capacity building

Within the framework of the “MON-21 Project to Strengthen the Capacity of the Central Environmental Analysis Laboratory,” which is being implemented with concessional loans from the Эксим Bank of Korea through the Ministry of Environment and Climate Change, a new laboratory building is being constructed / nevertheless, the construction has not commenced yet /. This will enable the determination of no fewer than 100 indicators of pollution in air, water, and soil.

3) Building Construction Plan



Analyses for Hg

- Direct mercury analyzer DMA-80
 - Water, soil, biological samples
- RA-915+ Zeeman mercury analyzer
 - Air, Water, soil, biological samples
- Air sampling system with gold cartridge
 - Air
- No reagents



Methods and Procedures for the analysis

- We have a national standards
 - MNS6183:2010 Determination of total mercury concentration in air by mercury vapor analyzer
 - MNS6184:2010 Determination of total mercury concentration in water by mercury vapor analyzer
 - MNS6185:2010 Determination of total mercury concentration in soil by mercury vapor analyzer
 - MNS5989:2009 Atomic absorption spectrometry. Cold vapor method for determination of mercury content in water
 - MNS5990:2009 Atomic absorption spectrometry. Cold vapor method for determination of mercury content in soil

There is a national program for environmental monitoring. However, mercury monitoring is not included in this program, which was last approved in 2016.

Mercury Deposition Sampler



In 2020, Taiwan's Environmental Protection Administration handed over precipitation sampling equipment for mercury content analysis to the NAMEM.



Mercury Deposition Sampler

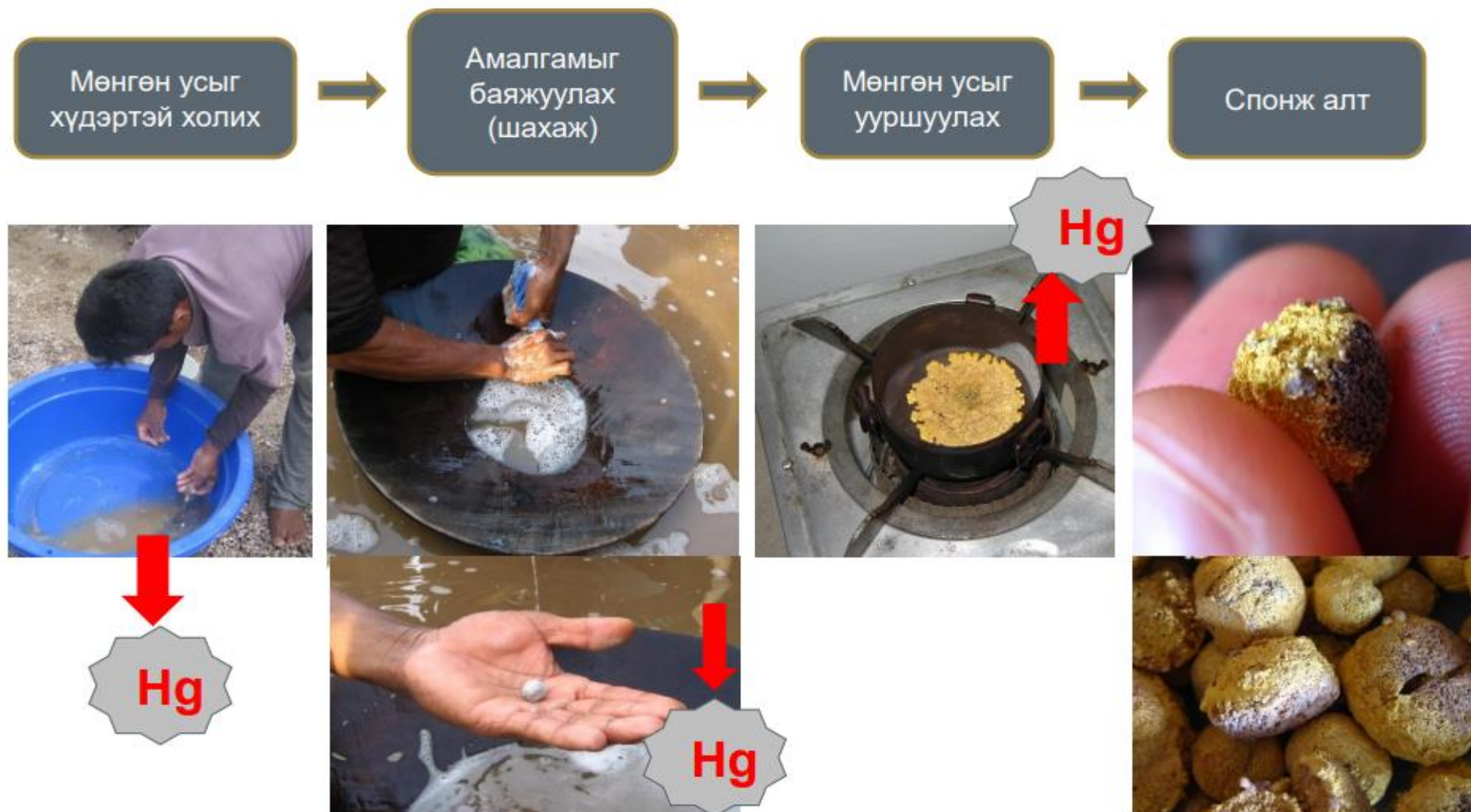
Mercury Deposition Sampler /CLEM/



Passive Sampler /NAMEM/



Use of Mercury in Artisanal and Small-Scale Mining



Although organic and inorganic mercury compounds have been included in the 'List of Chemicals Restricted for Use in Mongolia' and the use of mercury in mineral extraction and processing has been prohibited, small-scale miners continue to illegally use mercury in gold mining activities."

Source: planet Gold Mongolia



БАЙГАЛЬ ОРЧНЫ ШИНЖИЛГЭЭНИЙ ЛАБОРАТОРИУДЫН ИНЖЕНЕР, ТЕХНИКИЙН АЖИЛТНУУДЫГ МӨНГӨН УСНЫ СОРЬЦ АВАХ, ТООЛЛОГО ХИЙХ ЧИГЛЭЛЭЭР ЧАДАВХЖУУЛАХ СУРГАЛТ

2023 оны 06 дугаар сарын 20-21

Цаг уур, орчны шинжилгээний газрын хурлын танхим
Улаанбаатар хот

"Capacity-building training for engineers and technical staff of environmental analysis laboratories on mercury sampling and inventory."



"Capacity-building training for engineers and technical staff of environmental analysis laboratories on mercury sampling and inventory."



Current Status of Atmospheric Mercury Monitoring in Mongolia

In 2013, Mongolia joined the Minamata Convention and committed to reducing mercury use and improving monitoring systems.

- Atmospheric mercury monitoring in Mongolia is still at an early stage. The main sources are considered to be coal consumption in urban areas (especially Ulaanbaatar), thermal power plants, and some small-scale mining activities (such as artisanal gold mining). This causes soil, water, and air pollution, posing serious risks to human health. Although efforts are being made to monitor pollution caused by gold mining and other mining activities, the system for unified laboratories, regular measurements, and transparent public reporting remains weak. Research findings are not openly disseminated to the public and remain confined to project reports.
- Laboratories for measuring mercury content exist, however, analytical instruments such as ICP-MS, CVAFS, and DMA are not yet widely used. Although some laboratories have begun to adopt them, operational standards, calibration, and validation of detection limits remain inconsistent. At the regional level, capacity is insufficient and weak compared to international standards.
- The current capacity is based on general chemical analysis experience of water and soil, but there is a lack of specialized analytical methods for mercury, standardized protocols, and QA/QC procedures.

***Thank you for your
attention***

