JICA's Long-Term Partnership for Clean Air in Mongolia

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Japan International Cooperation Agency (JICA)

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- An incorporated administrative agency in charge of Japan's ODA
- Vision: Leading the World with Trust
- President: Prof. Akihiko TANAKA
- Full-time Staff: 2,011 (as of January 2025)
- 15 domestic offices and 97 overseas offices
- JICA is cooperating with 145 developing countries and regions.

JICA Project in Mongolia

- Title: Capacity development project for air pollution control in Ulaanbaatar city
- Project Type: Technical Cooperation
- Project Term:
  - Phase 1: April 2010 to March 2013
  - Phase 2: December 2013 to June 2017
  - Phase 3: November 2018 to July 2024
- Counterpart: DAAEP (former AQDCC), MECC, NAMEM, CLEM and other organizations
- Overarching Theme: Develop Mongolia's capacity for air quality management to address serious air pollution in UB city

DAAEP: Dept. of Against Air and Environmental Pollution of the Capital City
MET: Ministry of Environment and Climate Change
NAMEM: National Agency for Meteorology and Environment Monitoring
CLEM: Central Laboratory of Environment and Metrology

Outline of JICA's Support

Phase 1
(April 2010 to March 2013)

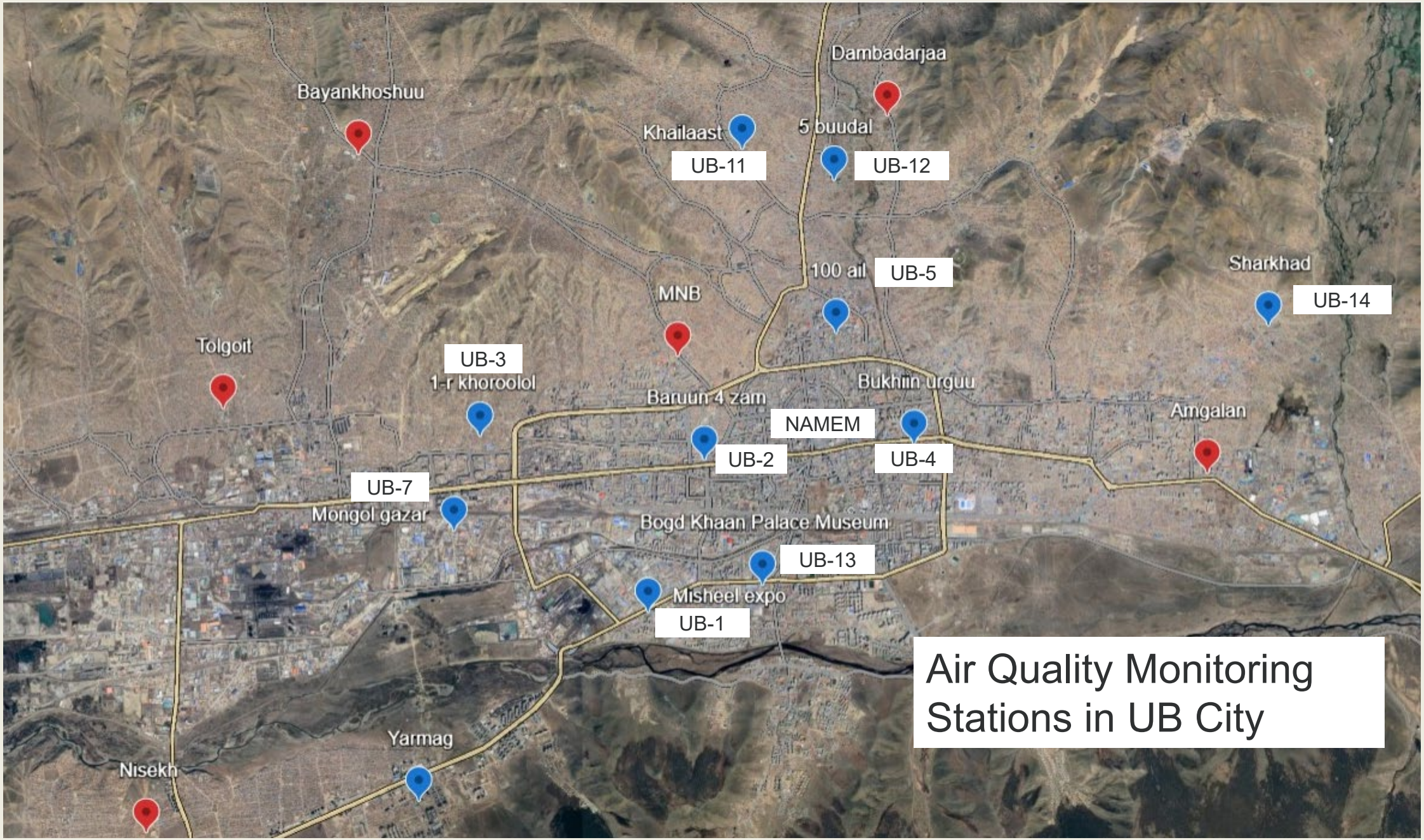
- Technical transfer for stack gas measurement
- Development of emission factors and inventory for stationary sources
- Boiler registration management system
- Measures for coal-fired power plants and energy conservation
- Atmospheric simulation model development

Phase 2
(December 2013 to June 2017)

- Stationary and mobile source monitoring
- On- board emission measurement for vehicles
- Emission factors for mobile sources and inventory improvement
- Air quality monitoring network support
- Full implementation of the boiler registration management system
- PM component and source contribution analysis
- Cost effectiveness evaluation methodologies for air pollution control measures

Phase 3
(November 2018 to July 2024)

- Sustaining technical capabilities transferred in Phases 1 and 2
- Development of air pollution control measures
- Pilot Implementation of air pollution control measures aiming at full scale implementation by the Mongolian side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Bayankhoshuu
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UB-11
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NAMEM
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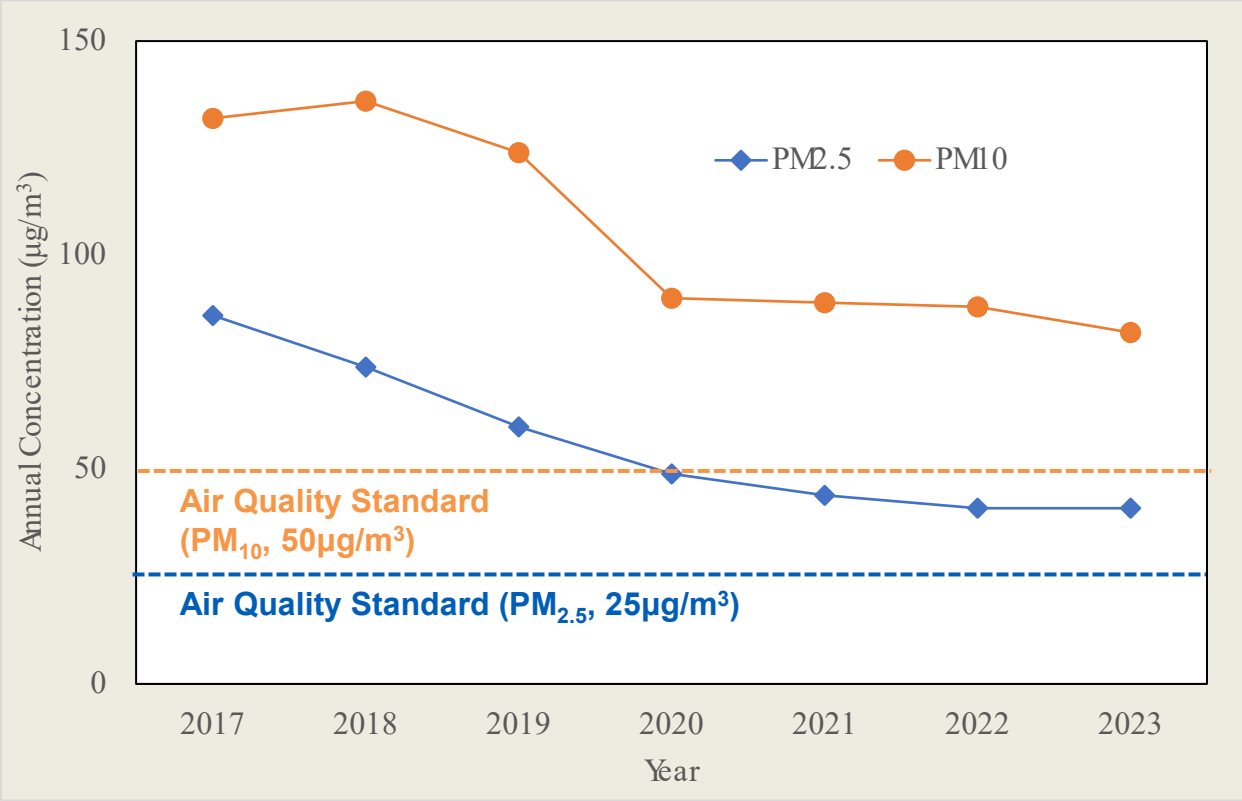
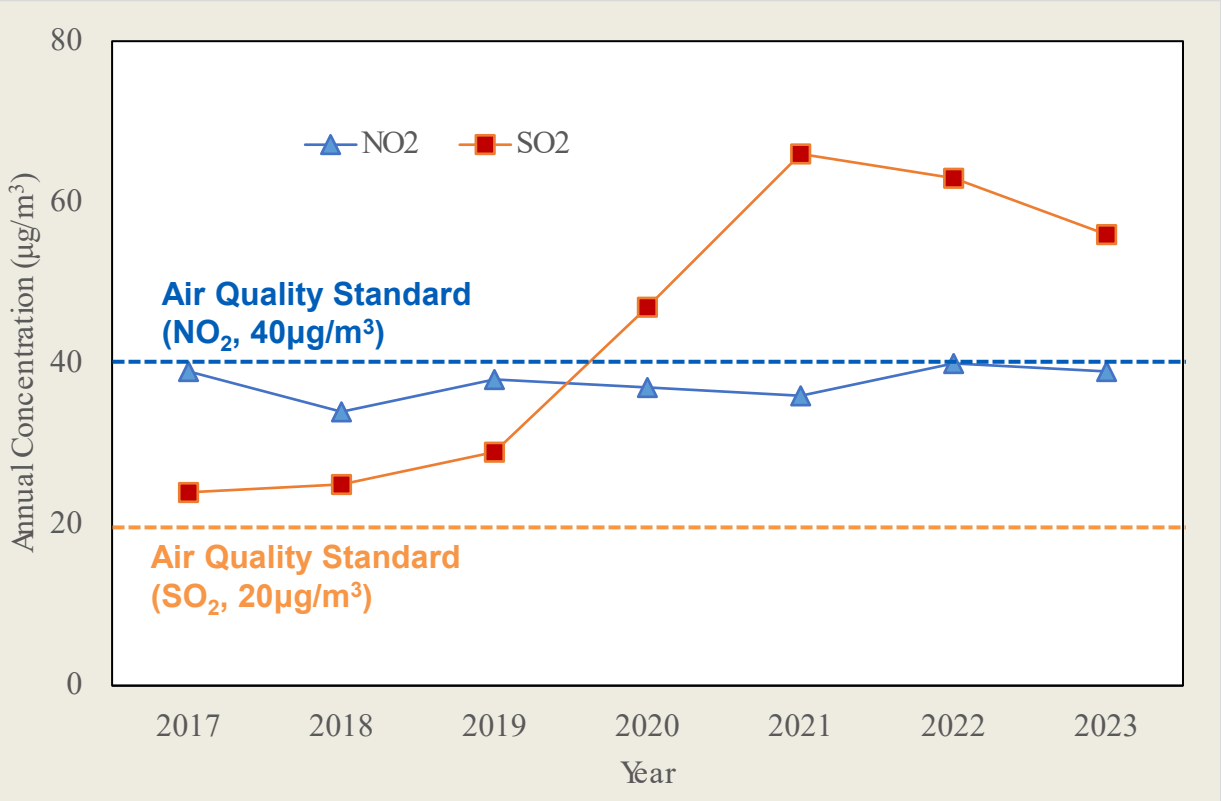
UB-2
UB-4
UB-7
Mongol gazar
Bogd Khaan Palace Museum
UB-13
Misheel expo
UB-1
Yarmag
Nisekh
Air Quality Monitoring Stations in UB City

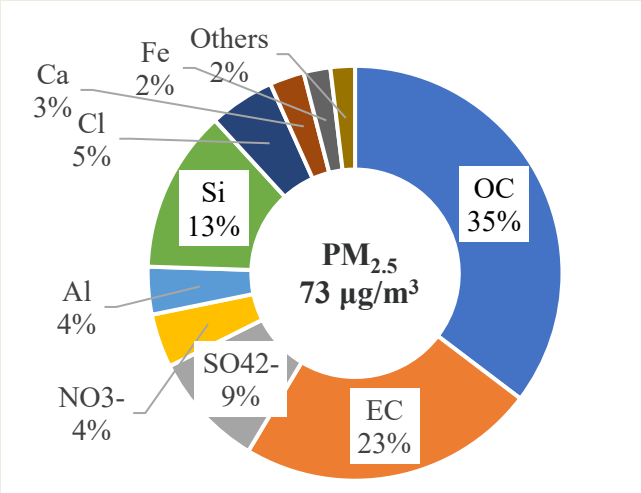
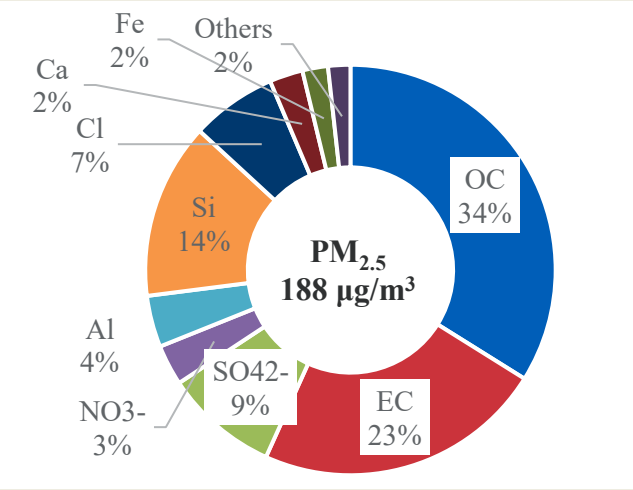
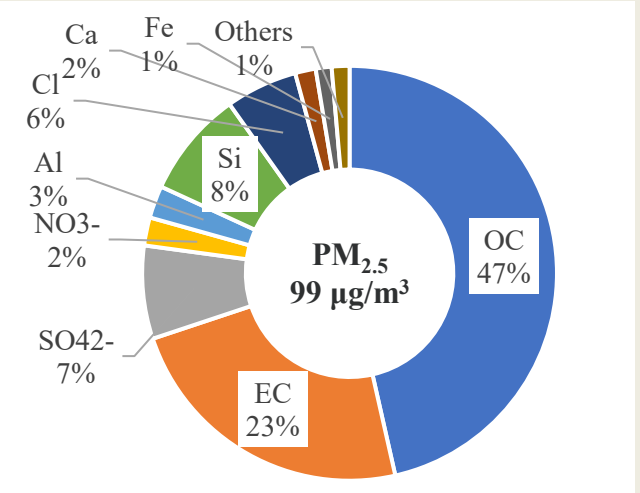
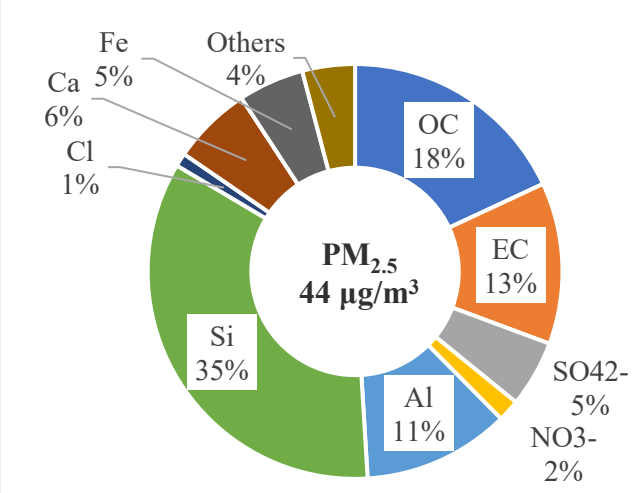
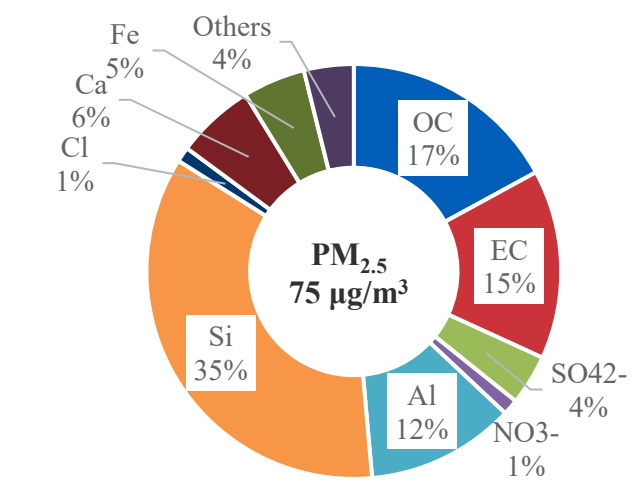
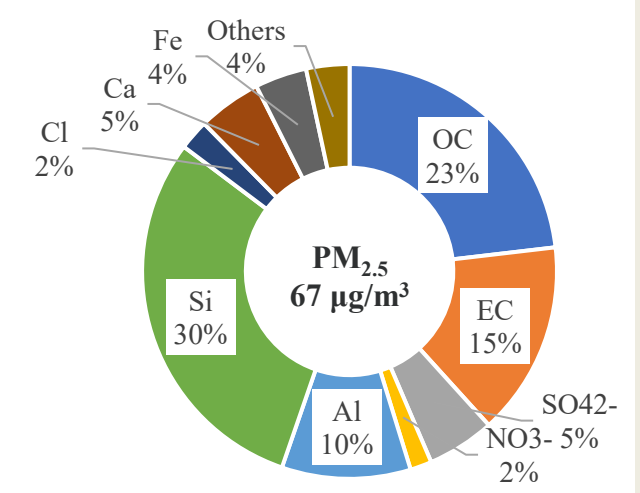
Trend of Air Pollutant Concentrations in UB City





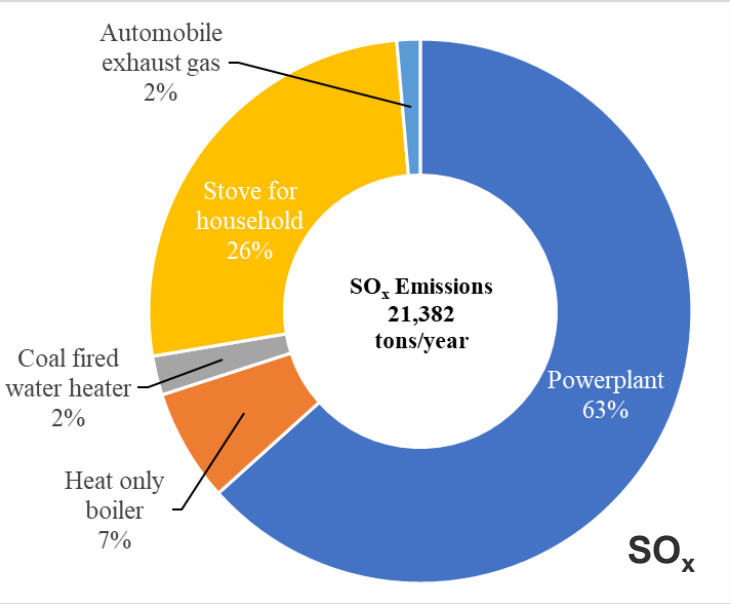
(Source) NAMEM Report

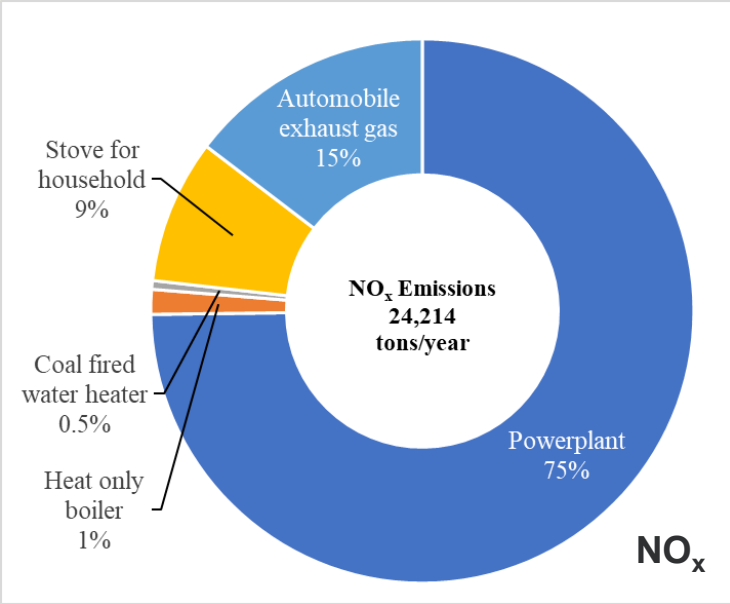
$PM_{2.5}$ Components (Dec. 2021 to Dec. 2022)

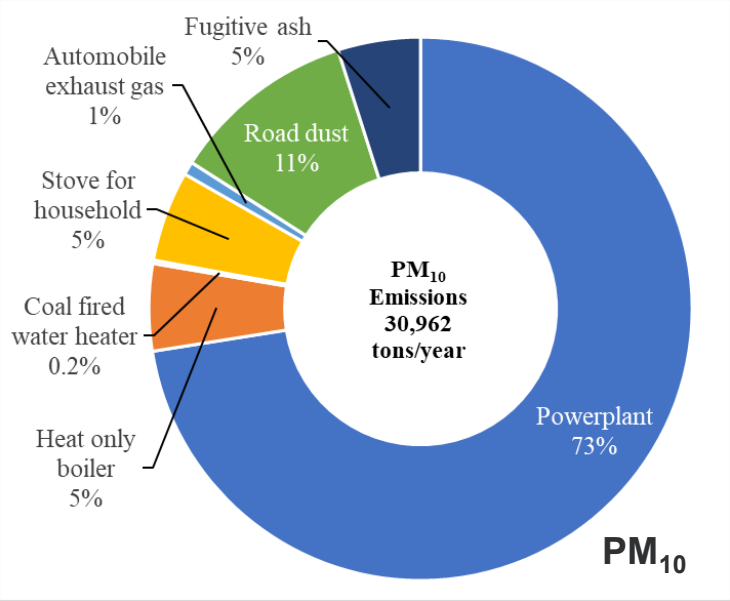
	NAMEM	UB-2	UB-3
Winter (Nov. to March)			
Non-winter (April to October)			

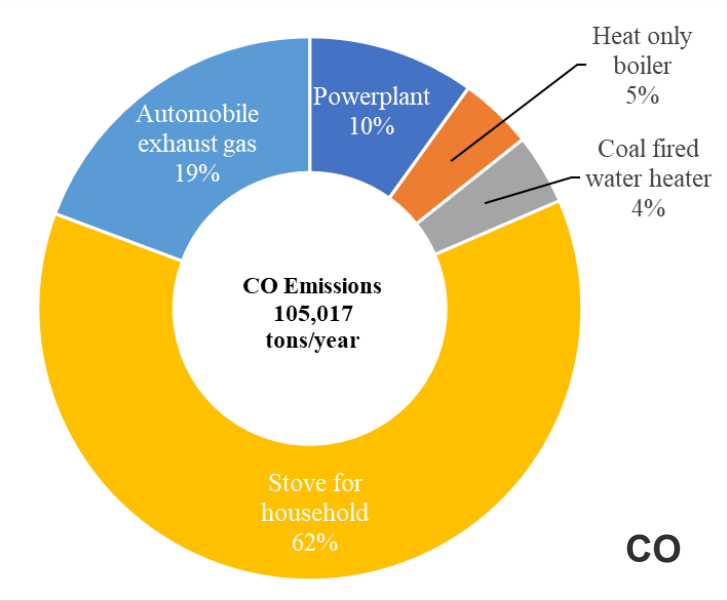
OC: Organic Carbon EC: Elemental Carbon

Emission Inventory (2020)



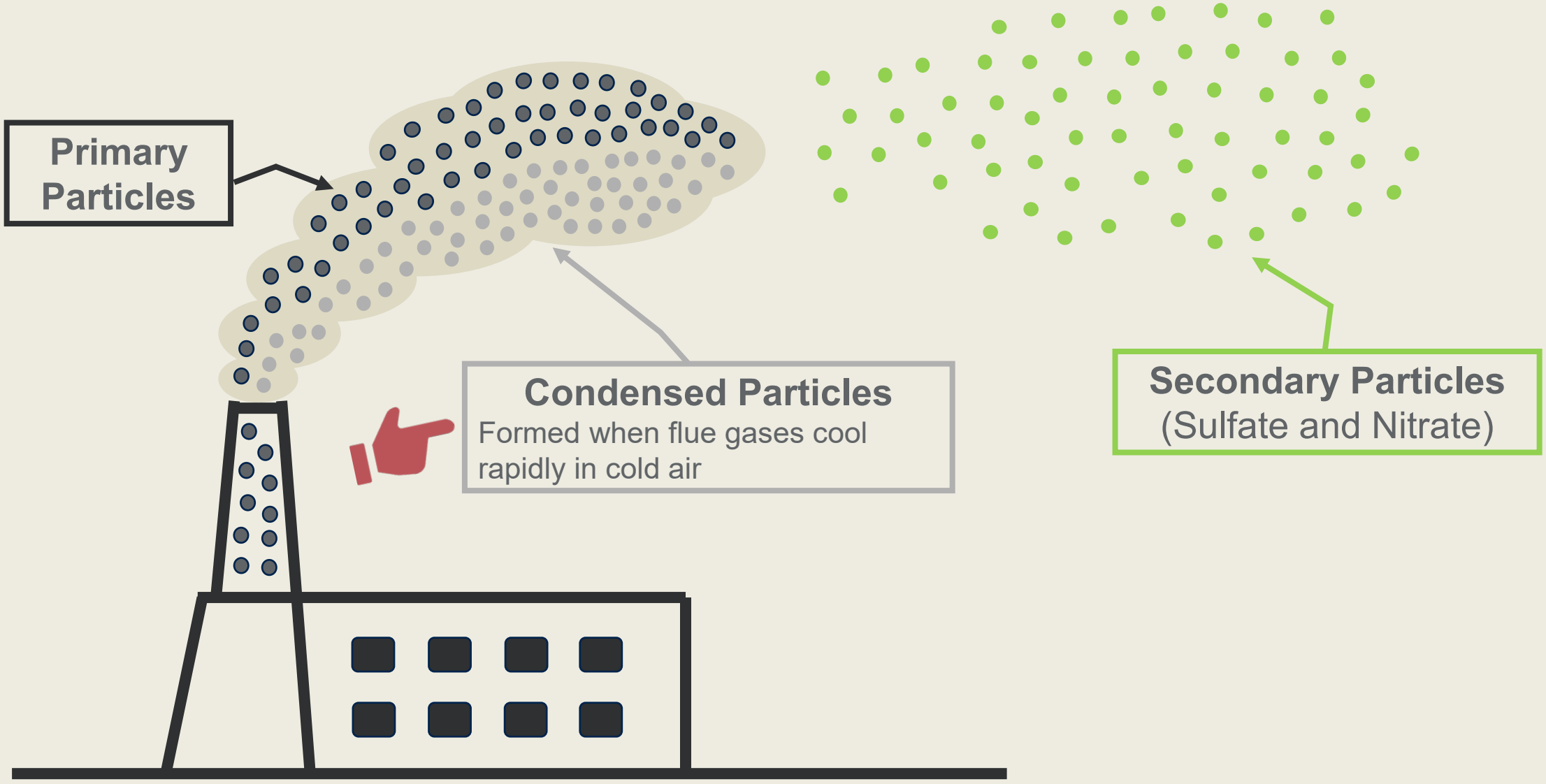






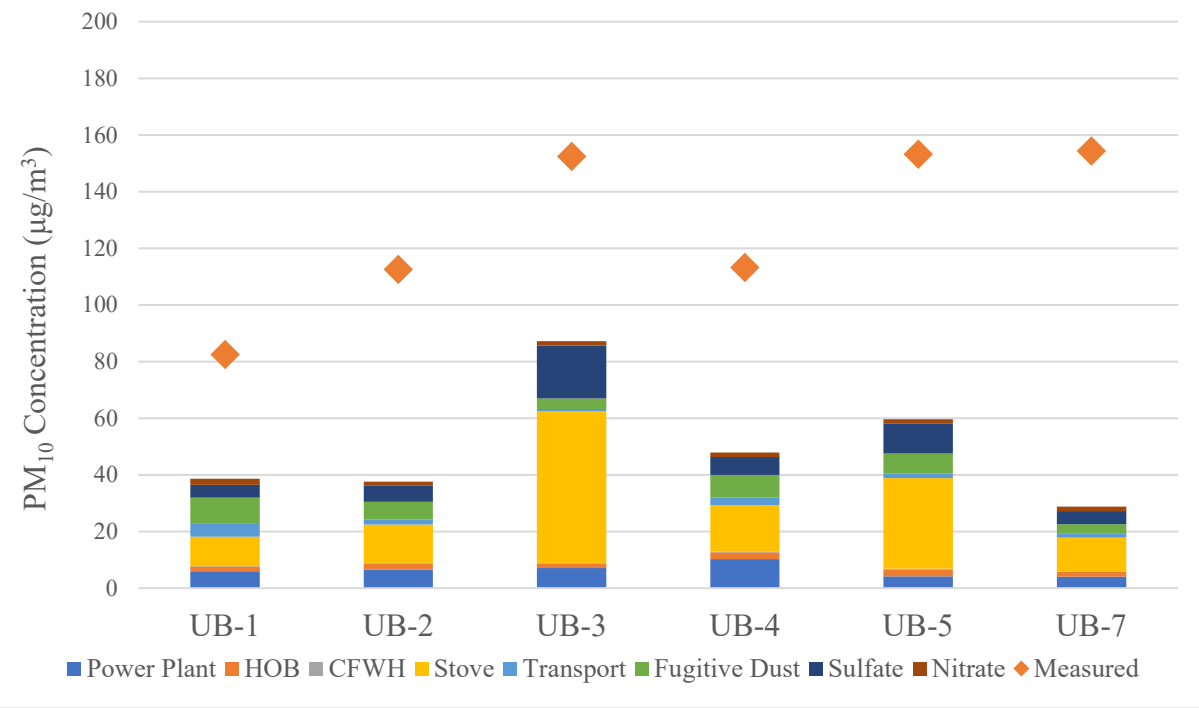
- Power plants: Major sources of SOx, NOx, and PM_{10}
- Household stoves: Account for over 60% of CO emissions

Particle Types

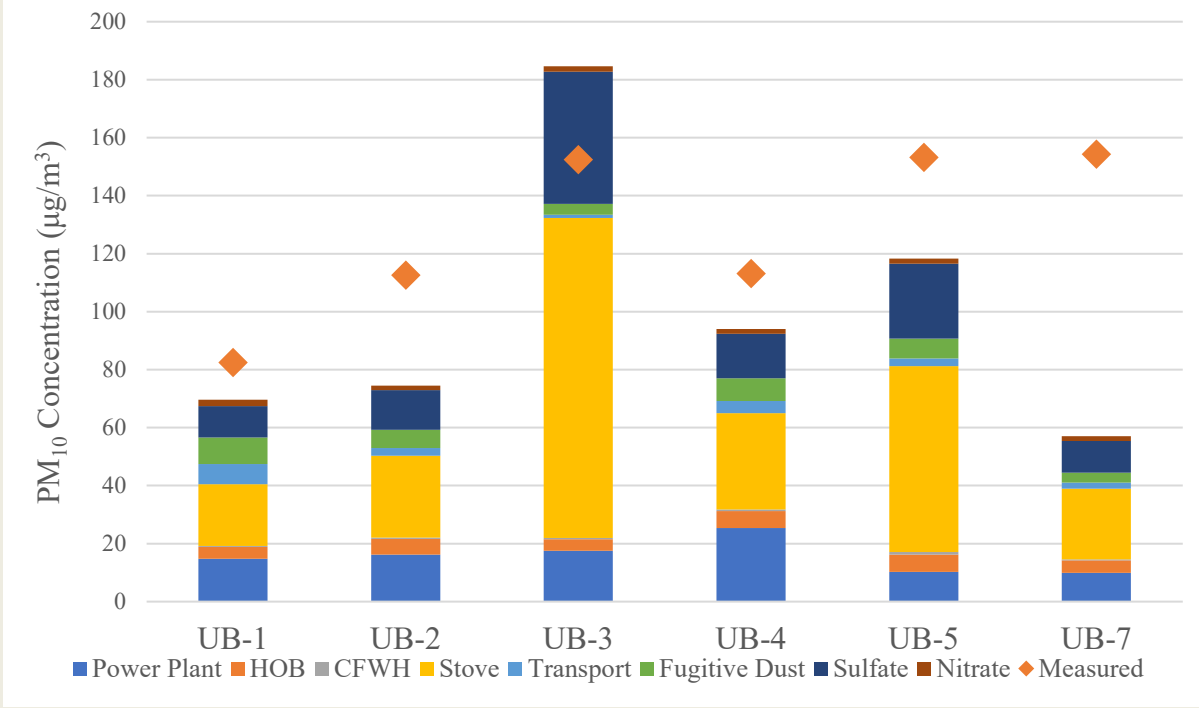


Simulation Results (PM_{10})

CALPUFF model simulations including condensed particles align more closely with measured values.



Results without condensed particles



Results with condensed particles

Recommendations for Emission Reduction at Coal-fired Power Plants

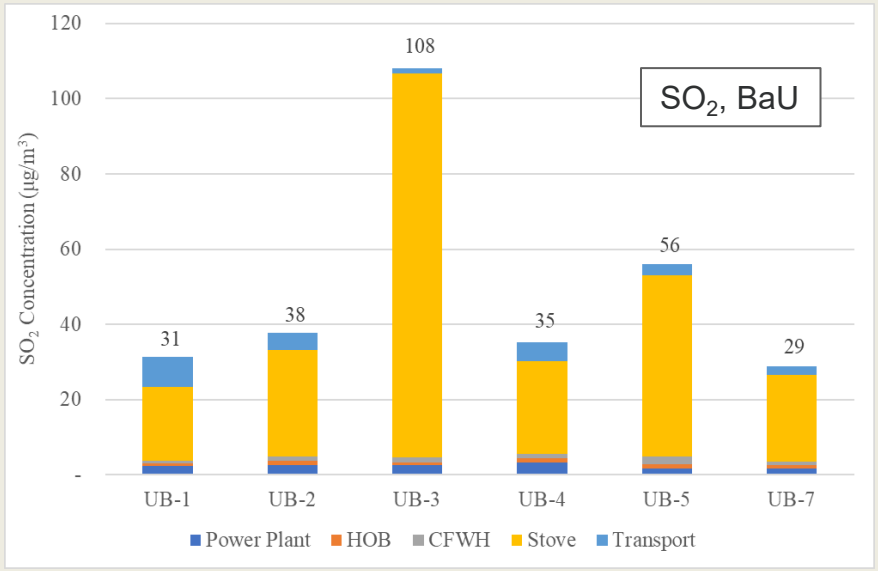
- Routine upkeep of equipment to prevent air pollution
- Optimizing coal usage by selecting low-sulfur, low-nitrogen coal and regulating input levels
- Optimization of electrostatic precipitator settings
- Regulating the volume of air supplied to the system
- Installation of desulfurization and denitrification equipment

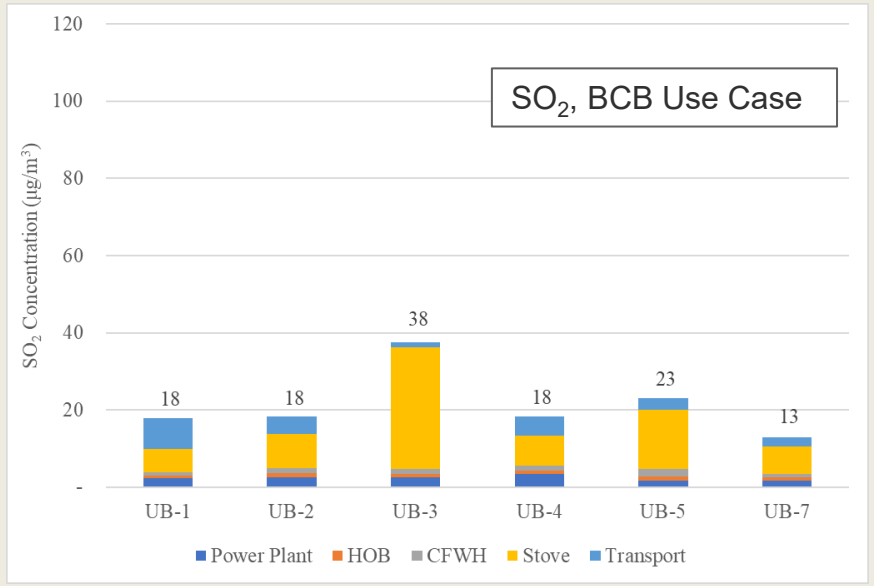
Cleaner Household Fuel Development

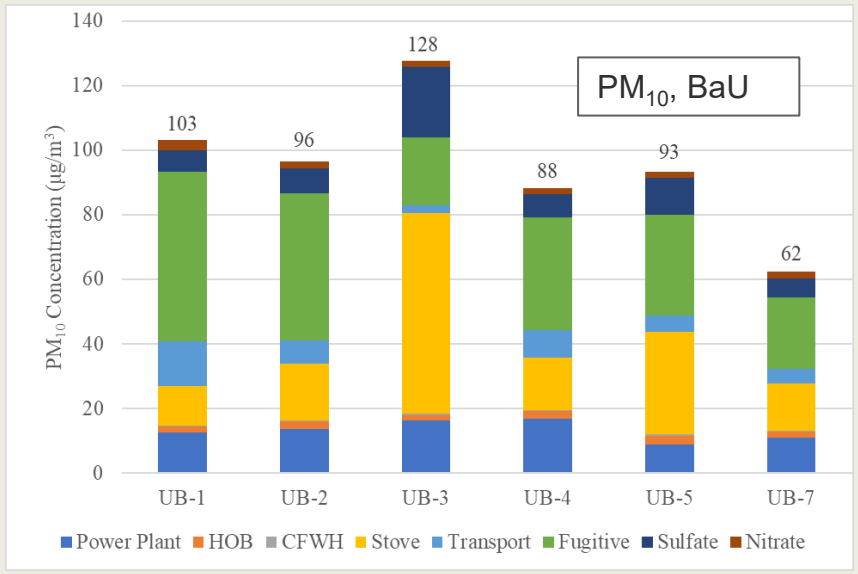
- The JICA project developed Biomass-blended Coal Briquette (BCB) as cleaner household fuel.
- Emission tests show lower pollutants compared to the fuel for sale.
- Emission reductions in dust, SO_2, NOx, and CO

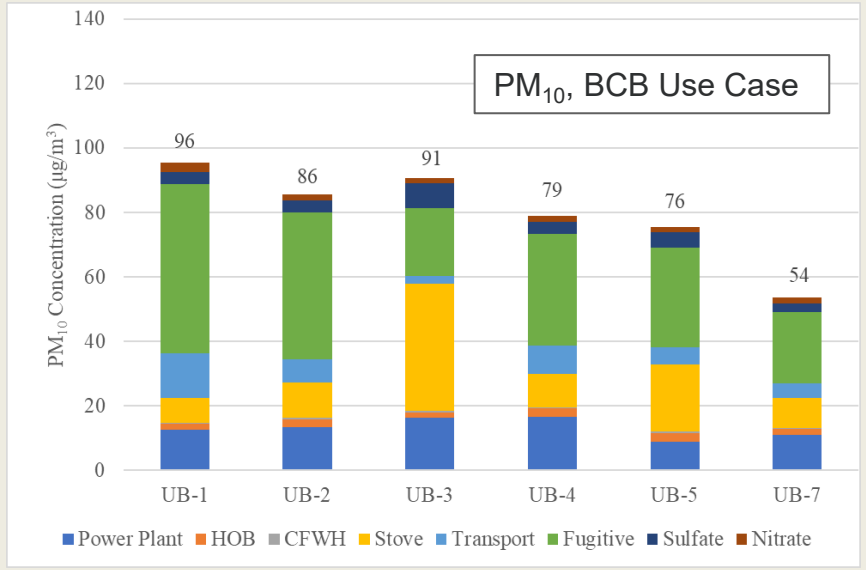
		TTT (2023)	Biomass blended Coal Briquette (BCB)		(Reference) Mongolian National Emission Standards for Household Stoves
Fuel Composition		Middling: 95% Binder and Desulfurizer ($CaMg(CO_3)_2$): 5%	Middling: 81% Biomass (Sawdust): 10% Binder: 6% Desulfurizer ($CaCO_3$): 3%		
Type of Stove		Advanced	Advanced	Traditional	
Number of Tests		2	3	3	
Emissions (mg/Nm³)	Dust	138	77	110	130
	SO_2	762	538	347	1,200
	NO_x	178	152	159	700
	CO	11,139	2,664	16,563	9,800

Effects of Cleaner Household Fuel









- BCB contributes to reduced SO_2 and PM10 concentrations
- Challenges:
  - Cost
  - Biomass procurement system
- Long-term goal: Transition to liquid, gas, or electric fuels

Pilot Projects for Cleaner Urban Transport (1)

- Traffic signal optimization at 10 intersections
- Introduction of low-sulfur fuel (Sulfur content <10ppm) and low-emission automobiles (EuroV)

Pilot Projects for Cleaner Urban Transport (2)

Estimated reductions in SOx, NOx, PM, and CO emissions

		Unit	SO_x	NO_x	PM	CO
Automobile emission without control measure (2027 as BAU)		ton/year	531	8,797	635	39,388
Emission with control Measures	Signal control	ton/year	493 (-7.2%)	8,261 (-6.1%)	599 (-5.6%)	34,825 (-12%)
	Low sulfur fuel and low emission automobile (All automobiles)	ton/year	12 (-98%)	1,037 (-88%)	12 (-98%)	1,727 (-96%)
	Low sulfur fuel and low emission automobile (Only buses)	ton/year	409 (-23%)	6,399 (-27%)	357 (-44%)	38,181 (-3.1%)

Summary

- JICA supported air quality management in Mongolia for over 14 years.
- Capacity building for DAAEP, MECC, NAMEM, and CLEM
- Scientific evidence generated for emission control in:
  - Powerplants;
  - Heat Only Boiler (HOB);
  - Household fuel; and
  - Automobiles.