

Country Name	Capacity Development Project for Air Pollution Control in Ulaanbaatar City
Mongolia	

I. Project Outline

Background	<p>As Mongolia is endowed with rich coal resources, the country is heavily reliant on coal for an energy source. At the time of ex-ante evaluation (2009), three thermal power plants, approximately 200 HOBs (Heat Only Boilers), approximately 1,000 smaller CFWHs (Coal Fired Water Heaters), and many of the home heating equipment in the Ger areas in Ulaanbaatar City were all coal burning facilities, and particulate matters emitted from these heating facilities and power plants were accumulated in high concentration. Air pollution was particularly severe in winter seasons when much coal is burned for heating, which seriously affected public health. Under such situation, the Ulaanbaatar City government established the Air Quality Division under the Nature Environmental Protection Department of the Capital City in 2007 for environmental assessment, awareness-raising, lawmaking and policymaking etc. This was upgraded in February 2009 to the “Air Quality Department of the Capital City (AQDCC)”, which was under the direct control of the city mayor. However, the staff of AQDCC had inadequate knowledge and experience in this field. Moreover, the administrative jurisdiction over air pollution monitoring and control of pollution sources etc. was held by various organizations, which required cooperation among them. However, effective cooperation was not carried out.</p>												
Objectives of the Project	<p>Through developing capabilities of the Air Pollution Reducing Department (APRD)¹ and the other relevant agencies to evaluate emission inventory and impacts on air quality, continuously implementing stack gas measurements, strengthening emission regulatory capacity of APRD, enhancing emission reduction measures to major emission sources and disseminating the project outcomes in Ulaanbaatar City, the project aimed to strengthen the city’s capacity for air pollution control, thereby strengthening measures for emission reduction of air pollutants.</p> <ol style="list-style-type: none"> Overall Goal: Measures for emission reduction of air pollutants will be strengthened in Ulaanbaatar City. Project Purpose: Capacity for air pollution control in Ulaanbaatar City is strengthened, paying special attention to the human resource development of the Municipality of Ulaanbaatar and other relevant agencies among other aspects of the capacity development. 												
Activities of the Project	<ol style="list-style-type: none"> Project Site: Ulaanbaatar City Main Activities: (1) Design and establish the emission source inventory system and develop the simulation model by APRD, National Air Quality Office (NAQO), National Agency for Meteorology and Environment Monitoring (NAMEM) and Central Laboratory of Environment and Metrology (CLEM); (2) Prepare guidelines for and implement stack gas measurements by APRD, NAQO, CLEM and National University of Mongolia (NUM); (3) Design and develop the boiler registration system by APRD, NAQO, CLEM, Engineering Facilities Department of the Ulaanbaatar City (EFDUC), Heating Stoves Regulatory Authority (HSRA), Urban Development Policy Department of the Mayor’s Office of Capital City (UDPDMOCC) and the thermal power plants No.2, 3 and 4; and (4) Conduct seminars and lectures on the boiler registration system and air pollution control etc. and diagnose major emission sources and propose air pollution control measures by APRD, NAQO, CLEM, EFDUC, HSRA, UDPDMOCC and the thermal power plants No.2, 3 and 4 etc. Inputs (to carry out above activities) <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Japanese Side</td> <td style="width: 50%;">Mongolian Side</td> </tr> <tr> <td>1) Experts: 14 persons</td> <td>1. Staff Allocated: 41 persons</td> </tr> <tr> <td>2) Trainees Received: 25 persons</td> <td>2. Storage and office space</td> </tr> <tr> <td>3) Equipment: Stack Gas Analyzer, Automated Dust Sampling Device, Portable Stack Gas Analyzer etc.</td> <td>3. Local operation cost</td> </tr> <tr> <td>4) Local operation cost</td> <td></td> </tr> </table> 			Japanese Side	Mongolian Side	1) Experts: 14 persons	1. Staff Allocated: 41 persons	2) Trainees Received: 25 persons	2. Storage and office space	3) Equipment: Stack Gas Analyzer, Automated Dust Sampling Device, Portable Stack Gas Analyzer etc.	3. Local operation cost	4) Local operation cost	
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Project Period	March 2010 – March 2013	Project Cost	(ex-ante) 400 million yen, (actual) 442 million yen										
Implementing Agency	The Air Pollution Reducing Department (APRD), Counterpart Working Group (C/P-WG) ²												
Cooperation Agency in Japan	Suuri-Keikaku Co., Ltd.												

¹ The Air Quality Department of the Capital City (AQDCC) became the Air Pollution Reducing Department (APRD) in 2016 due to the organizational change.

² The Counterpart Working Group (C/P-WG) consists of 19 organizations which conduct project activities with APRD officials (Ministry of Energy (ME), Ministry of Environment and Tourism (MET), National Air Quality Office (NAQO), National Inspection Agency (NIA), Central Laboratory of Environment and Metrology (CLEM), Petroleum Authority of Mongolia (PAM), the Thermal Power Plants No.2, 3 and 4, National University of Mongolia (NUM), Mongolian University of Science and Technology, Urban Development Policy Department of the Mayor’s Office of Capital City (UDPDMOCC), Road Department of the Capital City (RDCC), Public Transportation Department of the Capital City (PTDCC), Inspection Agency of the Capital City (IACC), Engineering Facilities Department of the Ulaanbaatar City (EFDUC), Traffic Police Department (TPD), Heating Stoves Regulatory Authority (HSRA) and Environment Pollution and Waste Management Department (EPWMD)).

II. Result of the Evaluation

<Constraints on Evaluation>

- The indicator for Overall Goals is “Most of major stationary emission sources such as 150 to 200 HOBs and 3 power plants in Ulaanbaatar City will be under control to comply with emission standards”. There are 170 HOB facilities in total in the city (as of 2016), and APRD implements stack gas measurements at HOBs during winter. However, the number of HOB facilities for which APRD has implemented stack gas measurements by the time of ex-post evaluation is 85 facilities (in other words, the number of HOB facilities for which data is available is 85), and thus surveys were conducted for these 85 facilities in this ex-post evaluation.

<Special Perspectives Considered in the Ex-Post Evaluation>

- In this ex-post evaluation, the indicator for Overall Goal is not evaluated to be “achieved”, if emission standards are complied in these 85 facilities only. It is evaluated taking into account whether all HOBs and power plants in the city are under control to comply with emission standards.

1 Relevance

<Consistency with the Development Policy of Mongolia at the Time of Ex-Ante Evaluation and Project Completion>

The project was consistent with Mongolian development policy on ‘reducing air pollution’ as set forth in the “the Government Action Plan (2008-2012)”, “the Mayor’s Action Plan in Ulaanbaatar City (2008-2012)” and “the New Development Medium-Term Target Program (2010-2016)” etc.

<Consistency with the Development Needs of Mongolia at the Time of Ex-Ante Evaluation and Project Completion >

The total population of Ulaanbaatar City exceeded one million in the official announcement in April 2007, and in addition, there were unregistered migrants coming into the city. The air pollution problem accompanying population growth became evident at the time of ex-ante evaluation. At the time of project completion, Phase 2 of this project was determined to be implemented, as it was necessary to strengthen technical capacities of Mongolian counterparts (C/Ps) to consider and implement measures independently and develop a mechanism or system for promoting specific measures in order to promote effective air pollution control. The needs for reduction of air pollution were continuously confirmed in the preparatory survey for the Phase 2 project.

<Consistency with Japan’s ODA Policy at the Time of Ex-Ante Evaluation>

The project was consistent with Japan’s ODA policy, as it is stated in the Country Assistance Program (2004) that Japan would support environmental conservation for sustainable economic growth which is compatible with environmental protection, and in particular, assistance for environmental measures of Ulaanbaatar City including air pollution control measures is stated.

<Evaluation Result>

In light of the above, the relevance of the project is high.

2 Effectiveness/Impact

<Status of Achievement for the Project Purpose at the time of Project Completion>

The Project Purpose had been mostly achieved by the time of project completion. The First Annual Report encompassing the emission source inventory and the results of air quality evaluation and stack gas measurements in 2010 was released in June 2012, and the Second Annual Report for 2011 was released in December 2012 (Indicator 1). JICA experts put together a total of 11 recommendations concerning air pollution countermeasures, and all of them were included in annual reports. Moreover, APRD explained and recommended air pollution countermeasures to the vice mayor and stakeholders based on annual reports, among which three of them were approved by the city council and included in the project plan ((1) Removing HOBs in HOB-crowded eastern part and installing in their place large, high-efficiency HOBs; (2) Installing cyclones for HOBs that lack emission control measures; (3) Removing ger stoves and wall stoves in the northern Ger area in Chingeltei District and installing HOBs in proportion to the population)(Indicator 2). In addition, the APRD and JICA experts made reports at the Donor and Mongolian Joint Meetings organized by the National Committee on Air Pollution Reduction (on a total of three occasions in December 2011, June 2012, and October 2012), and C/Ps made presentations based on the project outcomes in October 2012 (Indicator 3). With respect to policy, regulatory, and institutional frameworks for air pollution control, the Mayor Order on the Boiler Registration Management System was issued in August 2011, and a memorandum on the use of measuring equipment for air pollution control and energy conservation diagnosis was exchanged in November 2012 between APRD and the Mongolian University of Science and Technology. As for the responsibilities, roles, and share of the work for each organization, promoting formal inter-organizational cooperation through such means as memorandums was being considered (Indicator 4).

<Continuation Status of Project Effects at the time of Ex-post Evaluation>

Project effects have been mostly sustained since project completion. With respect to Indicator 1, audit certification studies on HOBs have been conducted annually between October and April of the following year based on the Hot Water Boiler Audit Certification rule, and the registration data in the boiler registration system developed under this project has been updated; HOBs with a rated capacity over 100kW in the six central districts in Ulaanbaatar City are designated to register, and all target facilities are registered at the time of ex-post evaluation. The emission source inventory database created under this project has also been updated annually, and modeling of air quality dispersion simulation and production of concentration distribution/diffusion diagrams have been carried out each year using revised results of the inventory emission rate calculation. There are three thermal power plants and 170 HOB facilities with a rated capacity over 100kW (a total of 321 boiler units) in the city as of 2016, and by the time of ex-post evaluation, stack gas measurement has been conducted for 100 percent, or 26, of the boiler units at thermal power plants and 50 percent, or 85, of the facilities³ with HOBs. Staff at thermal power plants regularly conduct stack gas measurements themselves because the city’s external agencies such as APRD are prohibited from entering power plants for conducting stack gas measurement as thermal power plants are considered critical national facilities under the jurisdiction of the Ministry of Energy (ME). As for HOBs, even though the implementation of stack gas measurement prioritizes the central area in the city where the effects on air pollution are significant, the measurement has been conducted only at half of all facilities due to reasons such as the shortage of personnel for measurement. An annual report consisting of emission source inventory data, emission rate calculation results, and stack gas measurement results etc. is assembled each year and published on the APRD homepage (emission source inventory

³ Each HOB facility usually has two to four boilers in Ulaanbaatar City. Presently there are 170 HOB facilities and 321 boilers in the city, and stack gas measurement is normally conducted on one boiler to represent each facility, and stack gas measurement has so far taken place at half of the 170 facilities in the city (85 facilities).

and stack gas measurement results [the HOB certified study report] are each published individually, and the results of air quality evaluation and analysis are reflected in NAMEM's annual report). As for Indicator 2, progress has generally been observed in all areas covered by the 11 recommendations that were made at project completion. For example, heating service from heat stations began in Bayanzürkh District in 2015, shutting down several nearby boiler facilities. Moreover, cyclones and wet scrubbers have been installed in 67 percent of the city's HOBs with a rated capacity over 100kW, and regional heating service was developed, and ger stoves and wall stoves have been eliminated. Soil covering and tree planting have taken place on buried ash landfills for thermal power plants No. 2 and No. 3, reducing the dispersion of ash). In addition, recommendations have continuously been submitted to the vice mayor after project completion about air pollution control measures based on annual reports (during and after 2016, 15 recommendations have been made in Phase 2 of this project, and three recommendations were independently made by APRD). With respect to Indicator 3, APRD's work on air pollution control measures and outcomes have been continuously reported, once or twice each year since the completion of the project, at meetings on air pollution control measures co-organized by the Ministry of Environment and Tourism (MET), the National Committee on Air Pollution Reduction, APRD, NAMEM, CLEM, Inspection Agency of the Capital City (IACC), and private corporations etc. Concerning Indicator 4, efforts to develop regulatory and institutional frameworks have been made since project completion, as seen in such examples as the joint order issued by the Minister of Environment and Tourism and the mayor of Ulaanbaatar City on the approval and renewal of the "Implementation Rules in Air Pollution Improvement Areas,"⁴ and the creation of a letter of agreement between APRD and NAMEM concerning the division of their roles on operation of the Comprehensive Air Quality Monitoring Network.⁵ A memorandum that was being considered at the time of project completion regarding the responsibility, role, and share of the work for each relevant organization was concluded in January 2013 by the Minister of Environment and Tourism and the mayor of Ulaanbaatar City, and the responsibilities, roles, and division of work among the concerned organizations that were involved in setting the policy of and implementing measures for air pollution reduction for the 2013-2016 period have been clarified. A memorandum on the policy and implementation of air pollution reduction countermeasures for the 2017-2020 period also has been created.

<Status of Achievement for Overall Goal at the time of Ex-post Evaluation>

The Overall Goal has been partially achieved by the time of ex-post evaluation. As stated above, at the time of ex-post evaluation, staff at thermal power plants conduct stack gas measurements themselves and control emission of air pollutants. As shown in the table below, while one to two units out of five units in total exceed the emission standard of the Mongolian National Standard (MNS) at the thermal power plant No. 2, the emission standard is almost complied at the thermal power plants No. 3 and 4⁶. On the other hand, regarding 85 HOB facilities which stack gas measurement has been conducted by the time of ex-post evaluation, almost half of them exceed the emission standard. Reasons for this are that many boilers operated in the city are foreign-made such as Chinese, and their technical specifications are not compatible with fuels used in Mongolia (Nalaiha charcoal and Baganuur charcoal etc.), that technical capacities of boiler operators are low and they cannot properly conduct operation management, and that the MNS emission standard is too strict⁷, etc. In order to improve the situation, Ulaanbaatar City conducts audit and certification of HOBs for emission reduction, and based on its results, APRD provides technical guidance and advice on installation of emission gas treatment device for boiler operators and imposes administrative measures such as improvement orders and penalty charges. Moreover, awareness raising activities for citizens and boiler operators have been strengthened by introducing policies related to regulations on air pollution control and conducting explanatory meetings. In addition, under cooperation from concerned government ministries such as MET, ME and the Ministry of Road and Traffic Development, "National Air/Environment Pollution Reduction Program (2017-2025)" and "Ulaanbaatar City Air Pollution Reduction Special Plan (2017-)"⁸, which are to enforce reduction of air pollutants, were approved in March 2017, and both short-term and long-term measures for air and environmental pollution reduction have been strengthened. The purpose of these program and plan is to mitigate population concentration into the capital through appropriate city and rural development and infrastructure improvement and establish measures and systems for air and environmental pollution reduction. As part of such efforts, environmentally friendly, efficient and clean technologies and innovations have been introduced, the use of raw coal has been prohibited gradually, development of regional infrastructures utilizing renewable energies and gas etc. has been promoted, a regulation system based on car plate numbers and electric cars have been introduced in Ulaanbaatar City, car fuels have been improved and the Ger areas redevelopment plan⁹ has been implemented, which indicates that air pollution reduction measures in the city has been strengthened.

<Other Impacts at the time of Ex-post Evaluation>

No negative impact on natural and social environment has occurred under the project.

<Evaluation Result>

In light of the above, through the project, the Project Purpose had been mostly achieved by project completion, project effects have mostly sustained, and the Overall Goal has been partially achieved by the time of ex-post evaluation. Therefore, the effectiveness/impact of the project is high.

⁴ This rule, which was designed to divide the Ger District in Ulaanbaatar City where air pollution was severe into three areas, prohibit the use of raw coal in these areas, and provide improved stoves and improved fuel, expanded the target geography to four areas in January 2017 and specified for each area prohibited items as well as measures to be implemented (elimination of night-time electricity charge through the introduction of electric heaters, promotion of the distribution of improved fuel, introduction of energy-saving heating products, etc.).

⁵ The Comprehensive Air Quality Monitoring Network is a network system to transfer and collect air quality measurements data via air quality automated measuring stations; at the time of ex-post evaluation, six stations controlled by the APRD and another six stations controlled by the NAMEM are implementing automated continuous measurement of air environment, and this network serves as a system to share these measurement data.

⁶ The capacities of three thermal power plants differ as: No. 2 (22.5MW), No. 3 (136MW) and No.4(693MW)

⁷ As a result that the World Bank conducted a survey on the emission standard, MNS for HOBs has been revised, and the revised MNS has been applied since April 2016.

⁸ "Ulaanbaatar City Air Pollution Reduction Special Plan (commenced from 2017)" is a detailed plan related to the implementation of air pollution reduction measures among related organizations in the city. The progress and action results of the plan are reported to the city council every three months, and measures are added or updated as necessary. The reporting has been conducted twice by the time of ex-post evaluation.

⁹ The Ger areas redevelopment plan is a plan to transform Ger areas, which are major sources of air pollution, into residences. It is planned to divide Ger areas into the suburb area, the city center and the middle area, and in the suburb area, regional infrastructures are to be developed such as constructing residences and providing heating with renewable energies, in the city center, high-rise residential buildings are to be constructed, and in the middle area, medium-rise residential buildings are to be constructed. 24 places in Ger areas are subject to the redevelopment plan at the time of ex-post evaluation.

Achievement of Project Purpose and Overall Goal

Aim	Indicators	Results																																								
<p>(Project Purpose) Capacity for air pollution control in Ulaanbaatar City is strengthened, paying special attention to the human resource development of the Municipality of Ulaanbaatar and other relevant agencies among other aspects of the capacity development.</p>	<p>1. AQDCC publishes annual report on air pollution such as emission inventory summary, air quality evaluation results and emission measurement results etc. 2 times during the project period under the cooperation with the relevant agencies.</p>	<p>Status of the Achievement: achieved (partially continued) (Project Completion) The First Annual Report was released in June 2012, and the Second Annual Report was released in December 2012. (Ex-post Evaluation) The registration data in the boiler registration system developed under this project have been updated every year. The emission source inventory database created under this project has also been updated annually, and modeling of air quality dispersion simulation and production of concentration distribution/diffusion diagrams have been carried out each year. There are three thermal power plants and 170 HOB facilities with a rated capacity over 100kW (a total of 321 boiler units) in the city as of 2016, and the number of units for which stack gas measurement has been conducted by the time of ex-post evaluation is as below. The measurement has been conducted for 100 percent of the boiler units at thermal power plants and 50 percent of the HOB facilities.</p> <table border="1" data-bbox="775 595 1522 696"> <thead> <tr> <th></th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>Thermal Power Plant (unit)</td> <td>11</td> <td>15</td> <td>26</td> <td>26</td> <td>26</td> <td>26</td> </tr> <tr> <td>HOB (facility)</td> <td>4</td> <td>16</td> <td>19</td> <td>24</td> <td>22</td> <td>85</td> </tr> </tbody> </table> <p>Based on the above, APRD has published an annual report on its homepage each year, in which emission source inventory data, emission rate calculation results, and stack gas measurement results etc. is assembled.</p>		2013	2014	2015	2016	2017	Total	Thermal Power Plant (unit)	11	15	26	26	26	26	HOB (facility)	4	16	19	24	22	85																			
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<p>2. AQDCC makes at least 5 recommendations on air pollution control to vice-mayor of MUB based on the annual reports under the cooperation with the relevant agencies.</p>	<p>Status of the Achievement: achieved (continued) (Project Completion) JICA experts put together a total of 11 recommendations concerning air pollution countermeasures, and all of them were included in annual reports. Moreover, APRD explained and recommended air pollution countermeasures to the vice mayor and stakeholders based on annual reports, three of which were approved by the city council and included in the project plan. (Ex-post Evaluation) Progress has generally been observed in all areas covered by the 11 recommendations above since project completion. In addition, recommendations have continuously been submitted to the vice mayor after project completion about air pollution control measures based on annual reports.</p>																																									
<p>3. AQDCC makes reports on the results obtained by the project to roundtable meetings and its equivalents held during the project period under the cooperation with the relevant agencies.</p>	<p>Status of the Achievement: achieved (continued) (Project Completion) APRD and JICA experts made reports at the Donor and Mongolian Joint Meetings in total of three occasions, and C/Ps made presentations based on the project outcomes in October 2012. (Ex-post Evaluation) APRD's work on air pollution control measures and outcomes have been continuously reported, once or twice each year since the completion of the project, at meetings on air pollution control measures.</p>																																									
<p>4. Policy, regulatory and institutional frameworks for air pollution control are improved through measures such as issuing of Mayor's instructions and signing official documents between the AQDCC and concerned national/municipal government organizations.</p>	<p>Status of the Achievement: partially achieved (continued) (Project Completion) The Mayor Order on the Boiler Registration Management System was issued in August 2011, and a memorandum on the use of measuring equipment for air pollution control and energy conservation diagnosis was exchanged in November 2012 between APRD and the Mongolian University of Science and Technology. The responsibilities, roles, and share of the work for each organization were being considered. (Ex-post Evaluation) Efforts to develop regulatory and institutional frameworks have been made since project completion, as seen in such examples as the joint order issued by the Minister of Environment and Tourism and the mayor of Ulaanbaatar City on the approval and renewal of the "Implementation Rules in Air Pollution Improvement Areas," and the creation of a letter of agreement between APRD and NAMEM concerning the division of their roles on operation of the Comprehensive Air Quality Monitoring Network.</p>																																									
<p>(Overall Goal) Measures for emission reduction of air pollutants will be strengthened in Ulaanbaatar City.</p>	<p>Most of major stationary emission sources like 150 to around 200 HOBs and 3 power plants in Ulaanbaatar City will be under control to comply with emission standards.</p>	<p>(Ex-post Evaluation) partially achieved Results of stack gas measurement conducted by the time of ex-post evaluation are as below.</p> <table border="1" data-bbox="775 1962 1522 2154"> <thead> <tr> <th rowspan="2">Measuring Object</th> <th rowspan="2">Total</th> <th colspan="5">Number of boiler units that exceed MNS</th> </tr> <tr> <th>Dust</th> <th>SO₂</th> <th>NO_x</th> <th>CO</th> <th>PM₁₀</th> </tr> </thead> <tbody> <tr> <td>HOB</td> <td>85</td> <td>49</td> <td>41</td> <td>N/A</td> <td>56</td> <td>N/A</td> </tr> <tr> <td>Thermal Power Plant No.2</td> <td>5</td> <td>N/A</td> <td>N/A</td> <td>1</td> <td>2</td> <td>N/A</td> </tr> <tr> <td>Thermal Power Plant No.3</td> <td>13</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>N/A</td> </tr> <tr> <td>Thermal Power Plant No.4</td> <td>8</td> <td>0</td> <td>8</td> <td>0</td> <td>0</td> <td>N/A</td> </tr> </tbody> </table>	Measuring Object	Total	Number of boiler units that exceed MNS					Dust	SO ₂	NO _x	CO	PM ₁₀	HOB	85	49	41	N/A	56	N/A	Thermal Power Plant No.2	5	N/A	N/A	1	2	N/A	Thermal Power Plant No.3	13	0	0	0	0	N/A	Thermal Power Plant No.4	8	0	8	0	0	N/A
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Note: (1) As for HOBs, the table shows the data for 85 boiler units in 85 HOB facilities. (2) Time frame of acquisition of the above data: measurement data during 2013 to 2017 for HOBs and measurement data during 2015 to 2017 for thermal power plants.

Source : Project Completion Report, questionnaire survey for thermal power plants and APRD, APRD homepage, and APRD’s stack gas measurement database

3 Efficiency

The project cost exceeded the plan, while the project period was within the plan (ratio against plan: 111%, 100%, respectively). Therefore, the efficiency of the project is fair.

4 Sustainability

<Policy Aspect>

Reducing air pollution is still positioned as an important issue in “the Government Action Plan (2016-2020)”, “National Air/Environment Pollution Reduction Program (2017-2025)”, “the Mayor’s Action Plan in Ulaanbaatar City (2016-2020)” and “Ulaanbaatar City Air Pollution Reduction Special Plan (2017-)” etc., which are effective at the time of ex-post evaluation.

<Institutional Aspect>

At the time of ex-post evaluation, APRD, as a specialized organization for air quality management and monitoring, is in charge of updating the boiler registration system in Ulaanbaatar City and the emission source inventory database, conducting and evaluating air quality dispersion simulation, implementing stack gas measurements, organizing seminars and workshops for boiler operators etc. NAMEM under the MET is in charge of analysing and providing environmental information (meteorological information and air quality information etc.) to governmental organizations and the public (it does not manage or measure emission sources), and CLEM is in charge of observing and measuring meteorological phenomenon and environment (air, water and soil) for conservation of natural environment etc. At the time of ex-post evaluation, there are one division chief and seven staffs in the Air Quality Management division¹⁰, and one division chief and five staffs in the Policy Coordination division in APRD. According to APRD, the number of staff required to sufficiently conduct stack gas measurements of fixed emission sources is three, however, only two staff are currently assigned, and stack gas measurements have not been conducted in all HOBs in the city. At the time of ex-post evaluation, there are one division chief and eight staff in the Environmental Analysis division of NAMEM, and there are two staff each in the air quality automated measuring stations of CLEM. According to NAMEM and CLEM, the number of staff is sufficient to conduct environmental monitoring, analysis and evaluation.

<Technical Aspect>

At the time of ex-post evaluation, few C/Ps of APRD remain in the same department that they worked during project implementation due to studying abroad, personnel transfers and disemployment etc. However, handover of assignments to successors are properly conducted. C/Ps of NAMEM and CLEM still work for these organizations. The technical level of staff in APRD, NAMEM and CLEM can be said sufficient to sustain project effects, as tasks in each organization stated above are properly conducted. At APRD, after project completion, trainings on technical procedures of stack gas measurements, processing of measured data, and maintenance of measuring equipment and the air quality automated measuring stations etc. have been conducted for 11 staff in total in Phase 2 of this project; however, internal trainings except for those provided by JICA projects are not conducted. Technical guidelines and manuals produced under the project are utilized for checking works at measuring sites, maintenance of measuring equipment and training successors (used as reference materials) etc., and technical transfers are conducted utilizing these guidelines and manuals at sites. Stack gas measuring equipment (Stack Gas Analyzer and Automated Dust Sampling Device etc.) provided under the project are well utilized for burning tests of improved fuels and stack gas measurements, regular inspections for these equipment are conducted before and after stack gas measurements and cleaning and repairs are conducted as needed. It has also been confirmed that there are enough spare parts for these equipment at the time of ex-post evaluation.

<Financial Aspect>

APRD has budget allocation from the national budget and the city’s budget and operating revenues from fee-based stack gas measurements. It could not be sufficiently checked whether necessary amount of financial sources are secured for sustaining project effects, as detailed data on revenues and expenditures and allocation of maintenance budget in APRD at the time of ex-post evaluation could not be obtained due to lack of sufficient management of financial information within APRD. Nonetheless, as shown in the table on the right, APRD has a certain budget every year¹¹. However, these budget amounts are not sufficient to employ necessary numbers of staff to conduct stack gas measurements in all HOBs in the city. While the budget amount allocated to NAMEM and CLEM is not available, budget allocation for air quality monitoring and maintenance of the air quality automated measuring stations is not sufficient in these organizations, and thus consumables and spare parts of measuring equipment¹² cannot be regularly replaced and sufficient spare parts cannot be secured, which has resulted in frequent breakdown of measuring equipment due to deterioration of equipment. Thus, coordination is being taken to receive financial assistance from donors

Breakdown of APRD’s Budget

(Unit: 1,000MNT)

	2015	2016	2017
Implementation of Air Pollution Control Measures	203,124	50,000	2,900,000
Air Quality Monitoring, Maintenance, Stack Gas Measurements of Boilers, Certifying Activities etc.	118,349	100,000	300,000
Others	245,905	403,694	605,000
Total	567,378	553,694	3,805,000

Source: APRD

¹⁰ The Air Quality Management division is in charge of managing the emission source inventory database, conducting and evaluating air quality dispersion simulation, and implementing stack gas measurements etc., and the Policy Coordination division is in charge of managing the boiler registration system, conducting seminars for boiler operators and dealing with air pollution problems in the Ger areas and pollution problems caused by transportation agencies etc.

¹¹ The reason for the budget for “Implementation of Air Pollution Control Measures” having largely increased in 2017 is because the budget for measures such as supplying improved fuels to Ger areas, introducing electric heaters, and installing emission gas treatment devices to HOBs in winter time of 2017 to 2018 has increased, as a result of a policy having been effective to put further efforts for implementation of air pollution control measures due to a change of the governmental administration and the mayor of Ulaanbaatar City in 2016.

¹² Not the equipment procured under the project but the equipment procured and owned independently by these organizations.

including international organizations at the time of ex-post evaluation.

<Evaluation Result>

In light of the above, slight problems have been observed in terms of the institutional and financial aspects of the implementing agency. Therefore, the sustainability of the effectiveness through the project is fair.

5 Summary of the Evaluation

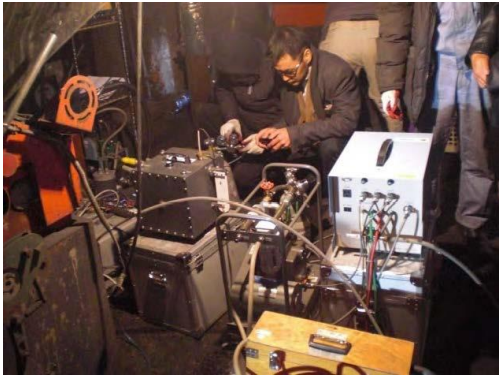
Through the project, the targets of indicators for Project Purpose had been mostly achieved by project completion. Project effects have mostly sustained, and the Overall Goal has been partially achieved by the time of ex-post evaluation. As for sustainability, some problems have been observed in terms of the institutional and financial aspects, and in particular, sufficient number of staff to conduct stack gas measurements are not secured and financial information is not clearly managed in APRD. However, it has been confirmed that there is no problem in policy and technical aspects. As for efficiency, the project cost exceeded the plan.

Considering all of the above points, this project is evaluated to be high.

III. Recommendations & Lessons Learned

Recommendations for Implementing Agency:

As stated above, it could not be sufficiently checked whether necessary amounts of financial sources are secured for sustaining project effects, due to lack of proper management of financial information within APRD. It is important for APRD to clarify expenditures from annual budget by major purposes and properly manage financial information, which also could enhance sustainability of project effects.



Stack Gas Measurement at HOB



Training on Inventory/Simulation