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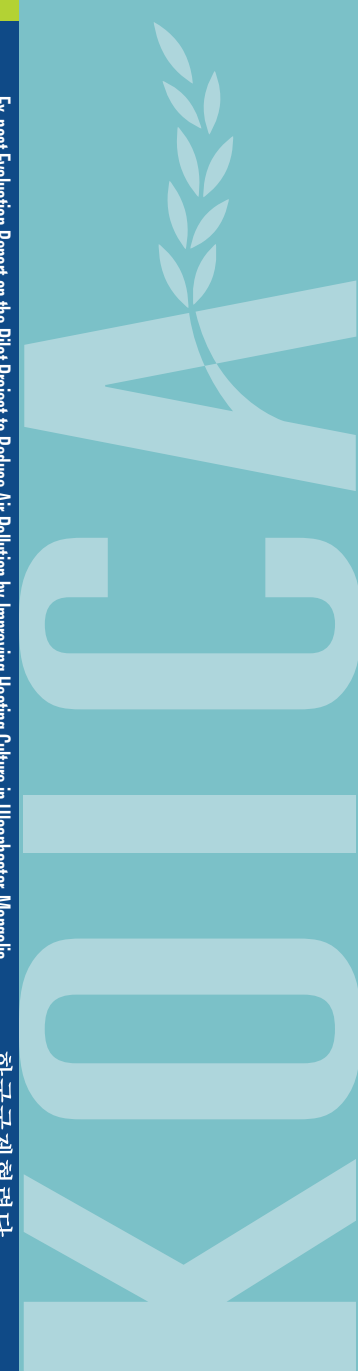
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Ex-post Evaluation Report on the Pilot Project to Reduce Air Pollution by Improving Heating Culture in Ulaanbaatar, Mongolia

2013. 12

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The Korea International Cooperation Agency (KOICA) performs various types of evaluation in order to secure accountability and achieve better development results by learning.

KOICA conducts evaluations within different phases of projects and programs, such as ex-ante evaluations, interim evaluations, end-of-project evaluations, and ex-post evaluations. Moreover, sector evaluations, country program evaluations, thematic evaluations, and modality evaluations are also performed.

In order to ensure the independence of evaluation contents and results, a large amount of evaluation work is carried out by external evaluators. Also, the Evaluation Office directly reports evaluation results to the President of KOICA.

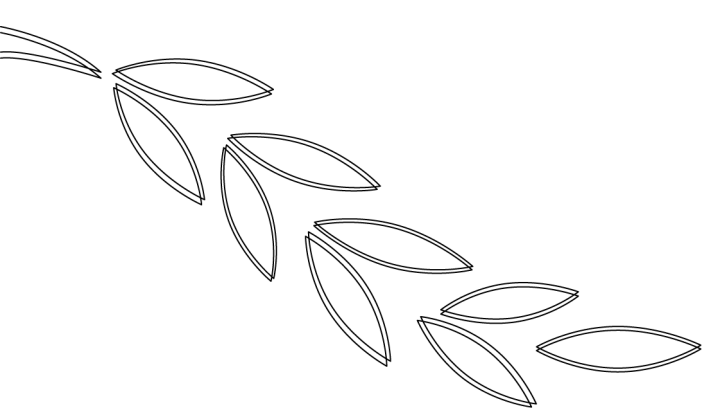
KOICA has a feedback system under which planning and project operation departments take evaluation findings into account in programming and implementation. Evaluation reports are widely disseminated to staffs and management within KOICA, as well as to stakeholders both in Korea and partner countries. All evaluation reports published by KOICA are posted on the KOICA website. (www.koica.go.kr)

This evaluation study was entrusted to Global Development Cooperation Consulting (GDC) by KOICA for the purpose of independent evaluation research. The views expressed in this report do not necessarily reflect KOICA's position.

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Summary

Evaluation grade table

1. Title of the Evaluated Project :

Ex-post Evaluation Report on the Pilot Project to Reduce Air Pollution by Improving Heating Culture in Ulaanbaatar, Mongolia

2. Grade

- Relevance : ③ (very relevant)
 - Rationale : Project was relevant to the partner country's development needs and strategies, and the aid policy and strategies of Korea

- Effectiveness/Impact : ② (positive and effective)
 - Rationale : The project, as a pilot project, provided useful information and scientific data for achieving the given objectives, raised environmental awareness among stakeholders, and recommended alternatives of heating. However, discontinued production of the Korean briquette ended the possibility of creating further effects and impacts.

- Efficiency : ② (partially efficient)
 - Rationale : Despite the additional input and adjustments made by KOICA, the project delivered only 4237 stoves compared to the planned provision of 5,000 stoves.

- Sustainability : (evaluation deferred)
 - Rationale : Evaluation deferred due to absence of project components in operation or any entity that continues the mission.

3. Overall Grade : Partially Successful



Summary

1. Background

- (Rapid Urbanization) Ulaanbataar, the capital of Mongolia, is facing various issues such as a drinking water, sanitation, heating, waste problem because of rapid urbanization.
- (Population growth) The city is experiencing unprecedented population growth due to continuous influx of migrants. Self-employed farmers and nomads who moved in from nomadic areas need places to live and work. Majority of them install "Ger" that is Mongol's traditional tent in a very small piece of unoccupied land on the outskirts of the city. As a result, many tent villages have been formed around the city.
- (Air pollution) Environmental problems are associated with the issue of the tent village. The villagers use low-grade heating fuel (poor quality coal, waste tires, rubbish etc.). The fuel makes serious air pollution at Ulaanbataar.
- Therefore, "Yeontan"¹⁾ stove dissemination project was began for reducing air pollution in Ulanbaataar as a KOICA project with the budget of \$700,000. It was a pilot project that was implemented during 2 years from 2008 to 2009. The summary of the project is in the table below.

1) Korean style briquette

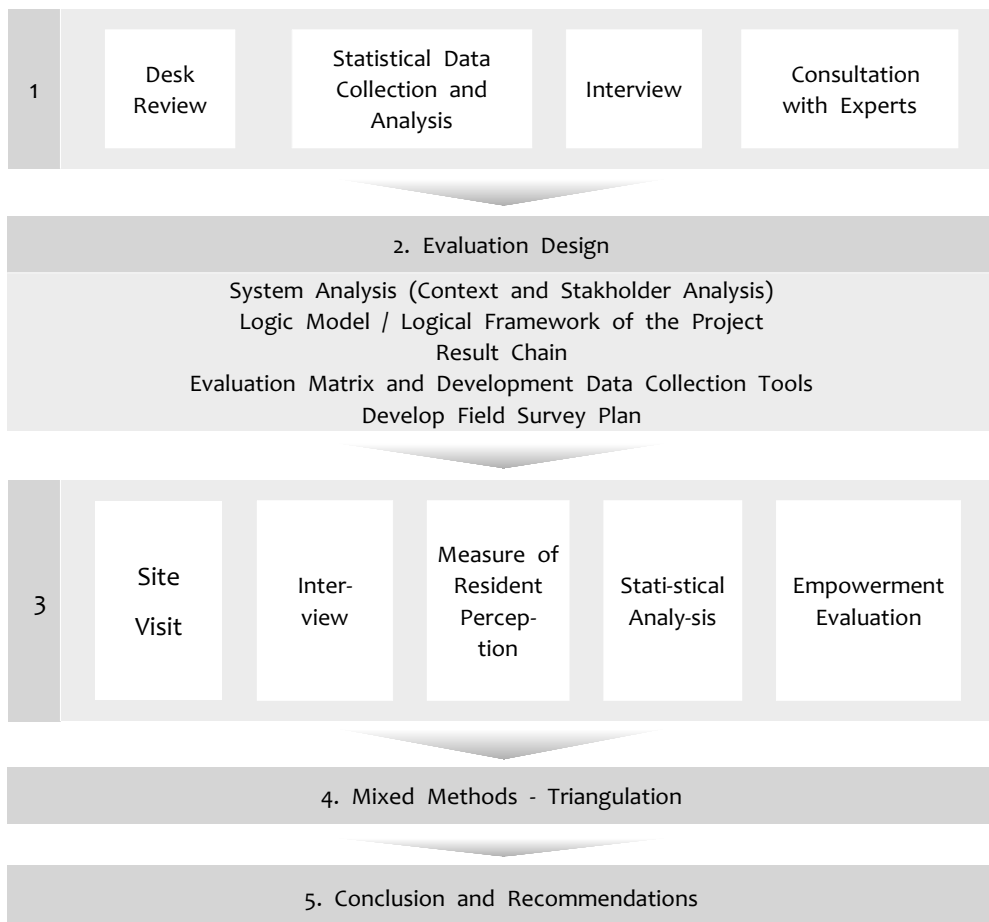
Project Title	Heating culture improvement pilot project for reduction of air pollution in Mongolia	
Duration	2008-2009	
Project Objective	Through the heating culture improvement in a tent village, air pollution can be reduced. The project contribute to the Environmental improvement of recipient country.	
Project Details	<ul style="list-style-type: none"> • Support 5000 Yeontan stoves. • Support 500,000 Yeontans (100 Yeontans each household) • Dispatch of experts : Yeontan education and air pollution monitoring experts • Invited training : Manager course(2persons, 1week), Practitioners course (2persons, 1 week) 	
Budget	\$700,000	
Target Area	District of Khan-uul, Ulaanbataar city, Mongolia	
Beneficiaries	Up to 100,000 people in Ulaanbataar	
Impelmenting Agencies	Korea	Korea International Cooperation Agency (KOICA)
	Mongolia	Ulaanbataar Municipality

2. Evaluation purpose

- The evaluation is an ex-post evaluation to assess whether the project has contributed to reduction of air pollution and improved living condition of the residents of Ger village among other objectives of the project. It has conducted its analysis based on the criterions of evaluation suggested by OECD/DAC; Relevance, Efficiency, Effectiveness, Influence and Sustainability.
- The focus of the evaluation was on the drawing implications that can be utilized in similar projects in the future, by making recommendations for improvements on the KOICA's programs policies, project planning, and implementing as well as evaluation process.

3. Evaluation procedure

- Procedure for systematic and scientific evaluation breaks down to evaluation design, data collection, and analysis.
- After the domestic research, the evaluation framework is developed for the effective research and evaluation. The data collection tools were also developed for systematic data collection.
- The mixed research methods enhance the validity and objectivity of conclusions, thereby suggestions and strategies are expected to be useful for the similar project in future.



4. Evaluation

1) Summary of Relevance Evaluation

- Through the evaluation of the project formation and project process, this project was examined. The relevance of project was evaluated in terms of specific evaluation items of 3 categories and 6 sub-categories.
- Each evaluation items had examined 3~4 indicators. The result are as follows;

Evaluation items	Evaluation questions	Score
Consistency of partner country's development policy	Is it consistence with partner coutry's policy?	3
Consistency of KOICA's support strategy	Is it consistence with KOICA's policy?	3
The relevance of selected project	Is it appropriate of the research about the project demand?	2
	Is the project has an effectiveness?	3
	Is the project has a feasibility?	3
	Is the project has an influence?	3
Feasibility of setting goals	Is set properly as Short-term and long-term performance of the project?	2
Feasibility of design	Is set properly the design and problem-solving approach?	1
The participation of partner countries	Participation of partner country in the purchase process and selections.	2
Overall Relevance- Very Relevant		14/18

- (Evaluation of project formation) The project is properly formulated because it accords with the policies of partner country as well as it is urgent to solve environmental problem.
- KOICA has planned and implemented the project in an effort to contribute to improve air pollution in the future.
- The project is an exemplary practice in the fact that a pilot project was conducted as a first step to ensure effectiveness of the second-step project of a larger scale and in turn to increase accountability.
- Partner country has an urgent demand, development policy and practical difficulties and this project attempted to solve this problems, therefore it is proper in terms of the relevance of selected projects.
- (Evaluation of project planning) The selection and progress of the project were appropriate, but planning process and the contents are slightly insufficient.
- First of all, the goal, "improve the culture", has set beyond the actual scope of the project.
- Measures for future use of data and reports from the project had not been considered, which should be noticed.
- Synthetically, this project would be evaluated as very relevant. Specifically, for the project formation, it was very relevant, for the project planning, it was a partially relevant one.
- Total points are 14(78%) out of 18 (100%). "very appropriate".

2) Summary of Efficiency Evaluation

Evaluation items	Evaluation questions	Score
Implementation	Was it finished on time without any change?	2
Input	Were all resources put efficiently?	2
Structural factors	Does structural causes disturbing efficiency exist?	2
Participation of recipient country	Did the recipient country participate in project design and performance initiatives?	2
Overall efficiency - Partially effective		2

- For the implementation, it is evaluated as partially effective, which is based on the fact that the number of Yeontan and stoves provided through the project was under the planned 5000.
- For the Structural factors, it is evaluated as partially effective as well, which is based on the facts that there were various structural factors affecting the project such as that Mongolia does have its own unique political situation, and that there are various alternative stoves apart from Yeontan stove in the project site.
- For the recipient's participation, it is evaluated as partially effective as well, which is based on the facts that the participation of each local authorities depended on their own situation of stove provision.

3) Summary of Effectiveness and Impact Evaluation

- Generally by means of pilot project, the output and short-term outcomes were evaluated as being 'effective'.

- However, it left much to be desired that there were no outputs and specific inputs regarding the follow-up steps for air-pollution and the promotional program of heating culture improvement.

Evaluation Items	Questionnaires	Grade
Supply of Yeontan stove	Current status (number of using, Yeontan consumption, cost of fuel)	2
Scientific data for reducing air-pollution	Research for heating fuel development	3
Yeontan development for Mongol	Harmful gas per calorie	2
Promotional program for improving heating culture	Execution outcomes	N/A
Baseline data for project plan	Expecting risk-factors, external factors and pre-conditions for achieving expected effect	
Recommendation for project design	Project basic design including Goal, Target, Strategy and Execution plan	
Overall - Effective		3

- In the view of mid/long-term, the impact on this project was expected to achieve as following:

Level	Evaluation Items
Outcomes in mid/long term	<ul style="list-style-type: none"> • Policy/system for improving the heating culture • Promotional outcomes in order to improve the heating culture • Improvement of the heating method • Technology transfer of industries • Capacity building of Mongol government and utilizing information • Connection of following project

- However, it was limited having reduction effect of air-pollution by using Yeontan. Because Yeontan and its stove were given just to 3% (supply 4237 pieces of Yeontan solve to 150,000 householders) of householder in Ger.
- Also considering it is pilot project, it was difficult to expect in giving the impact as a change of heating culture and mid/long-term achievement.
- However, it could be said that the project has the effectiveness in that project stockholders and policy decision-maker had chance to consider alternative fuel and be helped in decision making with relevant data.

4) Summary of Sustainability

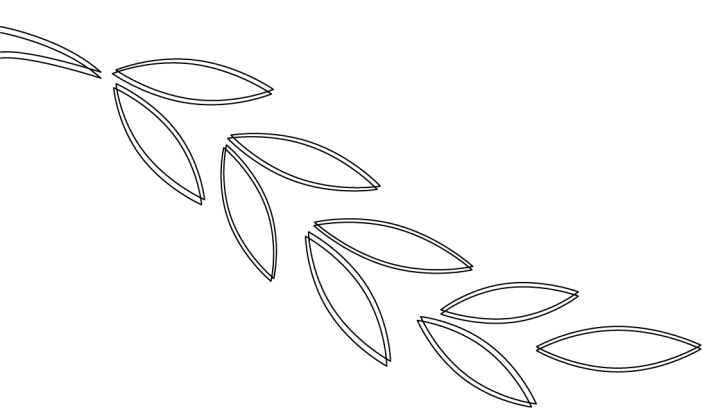
- The evaluation for sustainability (which is one of DAC 5 criteria) was held off because it is thought to have been already conducted at the verification stage of project validity. Also, the project itself has the pilot role for following future project.

5. Recommendations

- It is necessary to make a study being able to conduct 'result-based design and management' during the process of 'in-depth plan'.
- (Cooperation with other agencies) In terms of this project, it is required having an efforts to prosecute a cooperative project, sustainable discussion with international organizations and other donor agencies.
- (Risk-control and Improvement plan for sustainability) During the process of pre-inspection, the risk factors which could influence on 'sustainability' were not reviewed. Actually, considering the importance of "Sunjin energy" as

one and only Yeontans supplier, the factors such as financial stability of the company must have been seriously reviewed for future project.

- (Limited evaluation budget and time period) It is necessary to conduct the site-inspection which is divided into 2 parts, pre-site-explore and main-inspection, in order to secure the evaluation quality.
- (Increase of pilot projects) It is desired that more small-scale pilot projects studying projects' feasibility to be carried out in the future in order to secure effectiveness and performance of given projects.



I . Evaluation Overview and Methodology

1. Evaluation Overview
2. Evaluation methodology
3. Limitations of Evaluation



I Evaluation Overview and Methodology



1. Evaluation Overview

1) Background

- (Rapid Urbanization) Ulaanbataar, the capital of Mongolia, is facing various issues such as a drinking water, sanitation, heating, waste problem because of rapid urbanization.
- (Population growth) The city is experiencing unprecedented population growth due to continuous influx of migrants. Self-employed farmers and nomads who moved in from nomadic areas need places to live and work. Majority of them install "Ger" that is Mongol's traditional tent in a very small piece of unoccupied land on the outskirts of the city. As a result, many tent villages have been formed around the city.
- (Air pollution) Environmental problems are associated with the issue of the tent village. The villagers use low-grade heating fuel (poor quality coal, waste tires, rubbish etc.). The fuel makes serious air pollution at Ulaanbataar.
- Ulaanbataar city is the coldest city in the world. The heating system is needed 9 months per a year because the temperature is too low. Most of the "Ger" villagers use old-fashioned steel stove.

- Also, in the "Ger" village, villagers use various construction materials nowadays. However, villagers use the existing stove because the city doesn't have enough infrastructure.
- Especially, during the winter, the Ulaanbaatar's atmosphere has the particulate matter that induce the disease. It is being on the rise as a social problems.
- (The development goals of recipient countries) In this situation, the Mongolian government selected a reduction of the air pollution as a part of the national development strategy 2007-2015.
- Other donor organizations, including the World Bank, are promoting the "Ulaanbaatar Clean Air Project (UBCAP)" from 2008. The following is main project.

- The analysis ability of air pollution in Mongolia and the strengthening ability to improve social awareness
- Replace the old stove in the "Ger" village
- Replacement of the old large boiler(50 units in the Ulaanbataar)

- ("Yeontan" of Korea) Korea was prepared the institutional basis for the maintain of Yeontans quality and protecting the air pollution. Korea has a experience about protecting the air pollution problems, so Mongolia government promoted the Korea Yeontan project.
- (The pilot project for reduction of air pollution as Yeontan supply) ○ KOICA, Ulaanbaatar air pollution control division and Mongolia's government planned a pilot project for reduction of the air pollution before the main project.
- Pre-investigation 2008, March, conference execution 2008, August to 2009, March.

- Pre-investigation 2008, March. Through a conference execution from August 2008 to March 2009, it executed as a pilot project. 2013, after 4 years, this project was selected as a post-project evaluation, and it was enforced as a ex-post evaluation.

2) Purpose of the Evaluation

- The evaluation is an ex-post evaluation for the comprehensive evaluation of the reduction of Mongolia air pollution pilot project to assess whether the project has supported the refugees to settle and improved capacity of their spontaneous development. It has conducted its analysis based on the criteria of evaluation suggested by OECD/DAC; Relevance, Efficiency, Effectiveness, Influence and Sustainability.
- The focus of the evaluation was on the drawing implications that can be utilized in similar projects in the future, by suggesting improvements on the KOICA's programs policies, project planning, and implementing as well as evaluation process.

3) Description of the Evaluated Project

- The following table summarizes the project duration, objective, details, target area, and beneficiaries.

<Table 1-1 Summary of the Evaluated Project>

Project name		Heating culture improvement pilot project for reduction of air pollution in Mongolia
Period		2008-2009
Project Objective		Through the heating culture improvement in a tent village, air pollution can be reduced. The project contribute to the Environmental improvement of recipient country.
Project details		<ul style="list-style-type: none"> • Support 5000 briquette stoves. • Support 500,000 briquettes (100 briquettes each house) • Dispatch of experts : Briquette education and air pollution monitoring experts • Invited training : Manager course(2persons, 1week), Practitioners couse(2persons, 1 week)
Project Size		\$700,000
Target area		District of Khan uul, Ulaanbataar city, Mongolia
Beneficiaries		Up to 100,000 people in Ulaanbataar
Enforcement agencies	Korea	Korea International Cooperation Agency(KOICA)
	Mongolia	Ulaanbataar Municipality

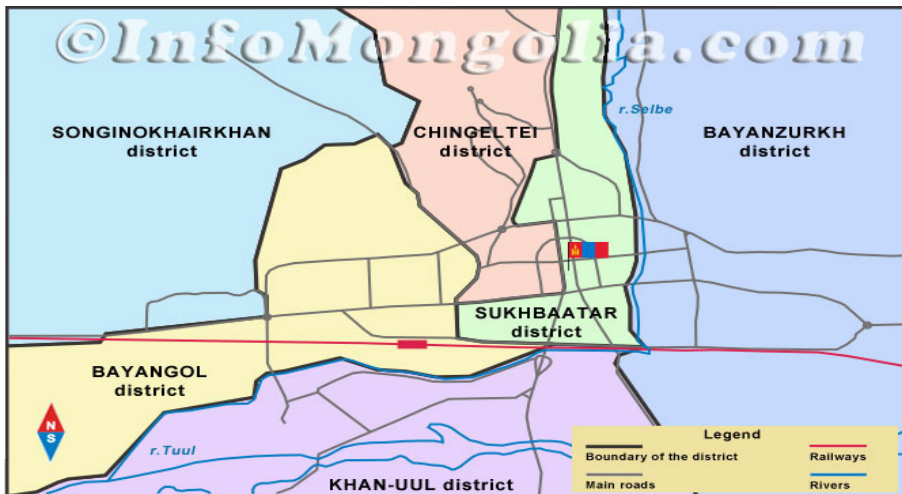
- \$700,000 scale of the pilot project was implemented during 2years from 2008 to 2009. Project contents were providing a Yeontan and stoves, training support and sending experts to the "Ger" village and villagers.
- This project was enforced for a reduction of a air pollution in the Ulaanbaatar city. 1) Providing a Yeontan stoves 2) Educating how use it3) Teaching a technic about Yeontan production

<Figure 1-1 Mongolia project area>



*Source: Nations Online (www.nationsonline.org)

<Figure 1-2 Map of Ulanbaataar (district level)>



*Source:: www.infomongolia.com

4) Scope of the Evaluation

○ The current evaluation study were conducted within the following project scope.

Design	Domestic research	Fieldwork	Analysis of result	Submit of report
<ul style="list-style-type: none"> ▪ Evaluation criteria and methodology ▪ Division of roles ▪ Interview and survey ▪ Evaluation planning 	<ul style="list-style-type: none"> ▪ Literature investigation ▪ KOICA and other donor agencies policy documents ▪ Mongolian National Development and heat supply system documents ▪ The main social and economic indicators Survey 	<ul style="list-style-type: none"> ▪ Fieldwork Schedule ▪ Survey ▪ report of local survey results 	<ul style="list-style-type: none"> ▪ Analyse the collected data 	<ul style="list-style-type: none"> ▪ Meeting and review ▪ Final supplement ▪ Submit report

5) Implementation Schedule

○ This project was implemented as shown in the following schedule.

No.	Project stage	Working plan	Output	Schd'I
1	Starting briefing	<ul style="list-style-type: none"> • Design of post evaluation plan • Starting briefing 	<ul style="list-style-type: none"> • Starting report 	6/4
	Domestic research	<ul style="list-style-type: none"> • Research of literature, statistics • Select experts 	<ul style="list-style-type: none"> • Basic research • Interview questionnaire, transcript, recording file, Consulting result report 	May to mid-june

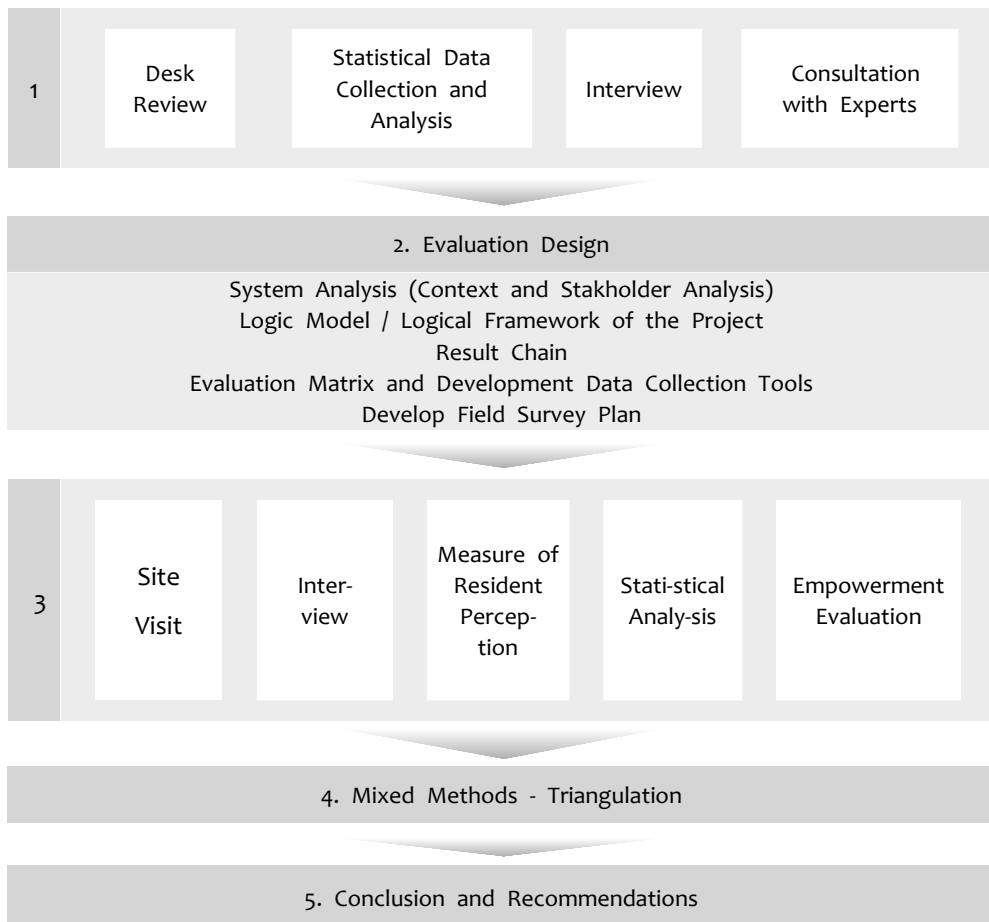
No.	Project stage	Working plan	Output	Schd'II
2	Establish evaluation plan	<ul style="list-style-type: none"> Established evaluation criteria and research methods Establish a detailed post evaluation plan Development of local research tools 	<ul style="list-style-type: none"> Plan of services Local research tools 	5/30
3	Planning and preparing for fieldwork	<ul style="list-style-type: none"> Select a local survey data 		Early August
		<ul style="list-style-type: none"> Select a local interpreter and coordinator 		
		<ul style="list-style-type: none"> Confirm a field schedule 	<ul style="list-style-type: none"> Report of task plan and services plan 	
		<ul style="list-style-type: none"> Report a field work plan 	<ul style="list-style-type: none"> Action plan 	
4	Fieldwork	<ul style="list-style-type: none"> Field survey 	<ul style="list-style-type: none"> Survey results, transcript, recording file 	8/11 - 21
		<ul style="list-style-type: none"> Meeting 	<ul style="list-style-type: none"> R/D (Minutes of consultation) 	
		<ul style="list-style-type: none"> Request more basic data 		
		<ul style="list-style-type: none"> Field survey 	<ul style="list-style-type: none"> Field survey results 	
		<ul style="list-style-type: none"> Observation 	<ul style="list-style-type: none"> Field note 	
		<ul style="list-style-type: none"> Meeting with an agency 		
5	Apply of assessment strategies and methods	<ul style="list-style-type: none"> Apply monitor strategies 	<ul style="list-style-type: none"> Evaluation results 	July to September
		<ul style="list-style-type: none"> Enforce a post evaluation 		
6	Data analysis and advisory	<ul style="list-style-type: none"> Data Analysis Consultation through relevant organizations and networks 	<ul style="list-style-type: none"> Completed data of evaluation and analysis 	July to September
7	Midway report	<ul style="list-style-type: none"> Interim briefing session 	<ul style="list-style-type: none"> Local Survey Results Report 	8/27
8	overall analysis of survey results	<ul style="list-style-type: none"> Comprehensive analysis of domestic and local survey results 		10/16
9	Final briefing session	<ul style="list-style-type: none"> Final briefing session (11/11) 	<ul style="list-style-type: none"> Draft of final report (10/30) 	11/11
10	Final report	<ul style="list-style-type: none"> KOICA Evaluation Committee's review and confirm 	<ul style="list-style-type: none"> The confirmed report 	The end of November, will be



2. Evaluation methodology

1) Evaluation methods

- This research method of evaluation can be described as evaluation design, data collection and analysis these are based on system and science.
- After the domestic research, the evaluation framework is designed for the effective research and evaluation. The tools development is for the collect scientific data.



2) Evaluation procedures

(1) Literature survey

<Table 1-2 List of literature survey>

Survey data	
KOICA internal Document	• End of the evaluation report
	• Conduct consultations result report
	• Pre-survey report
	• List of invited trainees
	• PDM
	• PMC Final Report
Recipient countries Document	• MCA(Millennium challenge account Mongolia) (2012), Monitoring & Evaluation plan mongolia
Ect.	• International Development Cooperation Committee (2012), Country Cooperation Strategy CPS of Mongolia
	• Ministry of Foreign Affairs (2012), Overview of Mongolia
	• ERINA(2013), Trends in Northeast Asia
	• Munhwa Ilbo(2000년), Towards the global no.1. Extending public enterprise to abroad
	• KIM Bongsub(2008), The Pilot Project to Reduce Air Pollution by Improving Heating System in Ulaanbaatar, Mongolia
	• Mine Reclamation Corporation Mongol office (2011) - The report for improvement atmospheric environment, Mongolia

(2) Data collection of statistics and present condition and analysis

- The data was compared with statistics data for take a effectiveness and influence of this project.
- Web site of OECD/DAC, World Bank and UNDP like a aid agency's statistics data was utilized.

(3) In-depth interviews with local officials

- Through in-depth interviews, raised understanding about this project.
- Through the meeting with experts and advisory panels, raised understanding about this project.
- Interview and question contents
 - structured interviews for the specific data
 - Secure a data, information and a consultation for a successful evaluation
- The list of domestic interviewer

Division	Interviewer	
KOICA	KIM Hangju	Evaluation part / Director
external experts	KIM Bongseok	Mine Reclamation Corporation / Director
	YOUN Seongmun	Mine Reclamation Corporation / Section chief

3) Abroad fieldwork

- Abroad fieldwork was enforced through various ways such as an site visit, an in-depth interview and an workshop.
- Beneficiaries participatory evaluation enforcement - Empowerment Evaluation
 - For mutual understanding about this project
 - Through direct participatory, supplement insufficiency
 - Learn a lesson themselves

(1) Site visit

- Visited the "Ger" village. (khan ull, Songinkhairkhan, Bayanzurkh)
- Visited a G-saver regenerator assembly plant Mongolia branch of Good Neighborhoods.

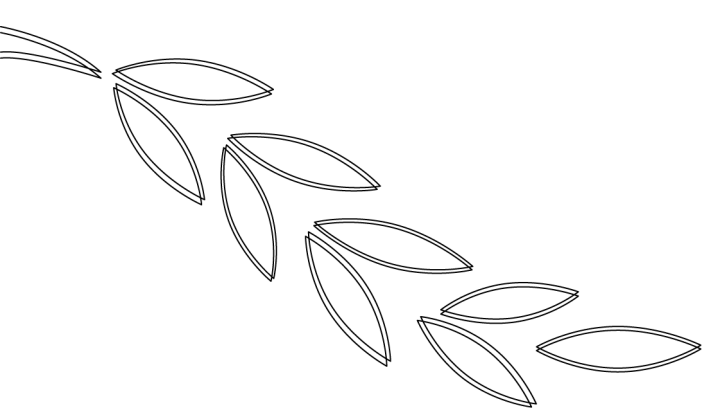
(2) In-depth interviews of stakeholders and project associates

- It was enforced with major stakeholders.
- Utilization of the structured and in-depth interview
 - A method for the in-depth interview should be structured.
 - Basis of literature investigations, go through Formative evaluation process. This process is very important to get detailed information.
 - Through this process, it was improved a Validity and Reliability.
 - All interview was recorded for analysis.
- Beneficiaries participatory evaluation enforcement - Empowerment Evaluation
 - For mutual understanding about this project
 - Through direct participatory, supplement insufficiency
 - Learn a lesson themselves



3. Limitations of evaluation

- (Lack of willingness of material cooperation of cooperation nation's agency) Ulaanbaatar Service Improvement Project is cooperative relations with Air pollution control division. Including the UBCAP (Ulaanbaatar Clean Air Project), they are controlling problems of Ulaanbaatar air pollution.
- (Limited evaluation budget and period) This project was had limitation about not enough period and budget like extensive site visits and surveys.
- Because of the Ulaanbaatar traffic situation, like a heavy traffic and far from the each project location, it made difficult to do a survey during 1 week.
- Because the short period, in-depth field research was difficult. Thus for the effective evaluation, first project trip is necessary.
- (Relevance of evaluation's time) Visited not heating season(summer), so it was difficult to find an operating conditions.
- (Difficult to find an agency and related data) The political situation in Mongolia administration is if the president is replaced, all officials are replace also. Thus, it is difficult to find an agency and related data.



II . Evaluation Framework and Matrix

1. Contextual Review of the Evaluated Project
2. Evaluation Framework
3. Evaluation Matrix



II

Evaluation Framework and Matrix



1. Contextual Review of the Evaluated Project

[Climate of Mongolia]

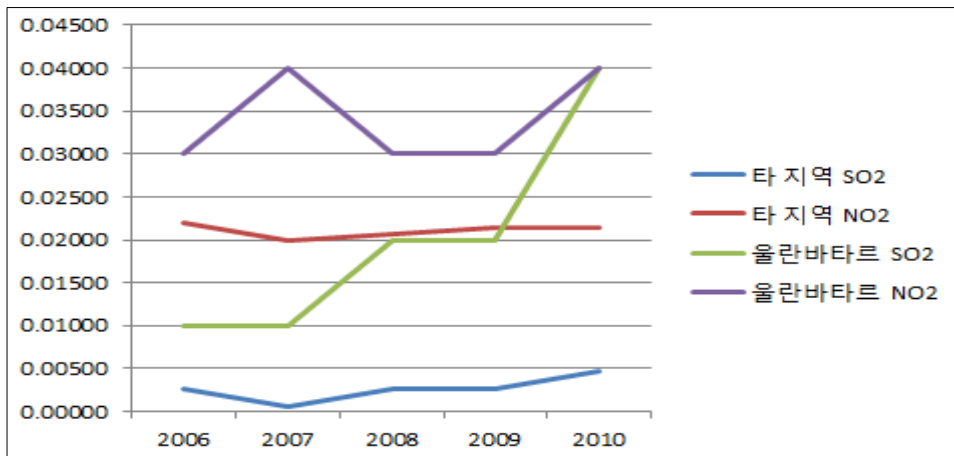
- Mongolia has a dry subarctic climate. So in the winter, the climate conditions ranging from minus 40 degrees. This nation is the coldest nation in the world. Because long-term winter, this nation requires a heating system for 9 months throughout the year. Therefore, stable heating system is required essentially.
- A short period of 1-2months in the summer(except for some areas such as Gobi Desert) is pleasant climate to around 20 degrees but the winter, mid-October to April, is from minus 20 degrees to minus 30 degrees averagely.
- The coldest period is from mid-December until the end of February. The winter temperatures of the Gobi region are minus 40 degrees, some regions fall minus 50 degrees.
- The winter temperatures of the Gobi region are minus 40 degrees, some regions are down to minus 50 degrees.
- Average annual sunshine amount of Mongolia is from 220 to 260 days. Average annual precipitation is 216 mm, and from June to September in the year most of the rainfall is concentrated.

- Ulaanbaatar is the coldest capital in the world, and the average annual temperature is minus 2.4 degrees. A Records of the highest temperatures and the lowest temperatures are 38.6 degrees(101.5°F) and minus 49(-56°F) degrees.
- January temperature is -36°C (-33°F) to -40°C (-40°F) before sunrise. Altitude 1350m and surrounded by mountains topographic affect this climate.

[Air pollution in Ulaanbaatar]

- These geographical features make exacerbation the air pollution in Ulaanbaatar by prevent the circulation of air and make accumulation.
- Because the dry climate and precipitation, there is a lack of green space in the city. This issue also deepen the air pollution.
- These issues brought out a health, urban environment and aircraft take-off and landing problems. The following is a monitoring data about a real threat to the health of residents by air pollutants (annual average concentration of sulfur dioxide and nitrogen dioxide). Indicators of the late-2000s significantly higher than in other regions.
- In particular, the concentration of sulfur dioxide in the project district of Ulaanbaatar is increasing, also the concentration of nitrogen dioxide was reduced but again increasing.

<Figure 2-1 2006-2010' The concentration of sulfur dioxide and nitrogen dioxide>



*Source: NSO(National statistical office of Mongolia)

- World Bank study of air pollution in Mongolia's Ulaanbaatar city in 2003, according to a report the cause of sulfur dioxide and nitrogen dioxide, combined heat and power plants (44%), transport 39% and 9% of the district heating heat-only boilers, home of 8% in order.
- According to the world bank report about air pollution in Mongolia's Ulaanbaatar city in 2003, specific configuration of the sulfur dioxide and the nitrogen dioxide's occurrence is 44% of the combined heat and power plants, 39% of the transport, 9% of the heat-only boilers and 8% of the home.
- But the concentration of sulfur dioxide and nitrogen dioxide during winter when required a demand of home heating is higher than the other period. Other period emit a certain amount of pollutants. Since there are many home heating demand in winter the reason of pollution is from home.
- In addition, particulate matter from the village inflames urban environment. In severe cases, visibility reduced less than 30m.

- Ulaanbaatar city's children under the five years of age had a bronchitis 5 ~ 15 times higher than the other region.
- Ulaanbaatar city's children under five were taken with a bronchitis. This happening rate is a 5~15 times more than the other regions because the particulate matter.
- These atmospheric environment result from the coal. Because the coal is easy to obtain, it was used as the main heating fuel in Mongol.
- As an example, according to 2005's report, coal consumption appears 66% of an electricity of generation, 21% of home and 13% of "Ger" heating in order.

Source
International Economic Policy. (2011). Journal of strategic depth research area IV - Mongolia, Turkey
NSO(National statistical office of Mongolia)
G.Enkhee, N.Saijaa, and Sh.Enkhtsetseg, 2007, Implementation.
Batbayar, T.S. 2006. Air Pollution in Ulaanbaatar City, its Mitigation Approaches and Cooperation. T.S. Batbayar, Mayor and Governor of Ulaanbaatar City.
ADB. 2005. Mongolia: Country Environmental Analysis.
Climatological Normals of Ulaanbaatar. Hong Kong Observatory. Retrieved from http://www.hko.gov.hk/wxinfo/climat/world/eng/asia/china/ulaanbaatar_e.htm .

[Rapid urbanization in Ulaanbaatar]

- Due to recent rapid urbanization, urban population increased. 60% of the urban population lives in "Ger". As the villager's heating system, air pollution is over the 12 times more than the international limits. Especially, in the "Ger" village uses lower fuel for heating and cooking. It was became for serious pollution and various diseases as well as social problems.

- Ulaanbaatar was became a city of 60,000 people since residence occurred in 1778.
- The present shape of Ulaanbaatar was designed by former Soviet Union's support after World war II. In 1960 ~ 1985, the city was changed into Soviet Union style apartment from traditional house style, and was modernized the roads and blocks.
- A group of residential district came into such as Soviet Union style apartment. District heating using electricity is installed and heating was supplied over a long period.
- The Mongol that switched to market economy in the 1990's had the urbanization process. The nation was suffered side effects of urbanization such as environment, traffic, social problems and etc.
- In 2008, the population of Ulaanbaatar was sharply increased. The house was a short supply, so residential costs are skyrocketed. The new population installed a "Ger" on the outskirts of the city and vacant land in the city.
- Especially in the 2009 ~ 2010, many livestock froze to death. Nomads are coming into the Ulaanbaatar, the city was expended continually. According to the unofficial statistics, Ulaanbaatar population is already over 1.2million people.(Mongoliapopulation is 2.9million people, according to 2013 statistics.)
- They are expanding their area of residence. Despite of the efforts of government of Mongolia and international organizations, there is no sign of traffic, environment and social problem improvements.
- Therefore, government of Mongolia is selecting the details of projects about city planning and construction development. The giving organization, including the Korea International Cooperation Agency, supports a construction of infrastructure for a consolidation of foundation.

[Cooperation Administration]

- Mongolia devised a "National development strategies, strategic objectives of economic growth and environmental development policies(2007 ~ 2021)". This project's related policy is energy development, fuel development and environment.
- Especially, fuel supply part was set up as a detailed program in the fuel development policy. Also action plan was set up for Ulaanbaatar air pollution reduction in the environment policy.

[International organization and other aid donors]

- International organization held a conference and executed UBCAP(Ulaanbaatar Clean Air Project) with the World Bank at its center. As this project, the Mongolia improves a social identity and an analysis ability of air pollution. Also the international organization is replacing old stoves, old boilers of 150,000 units in the "Ger" district.

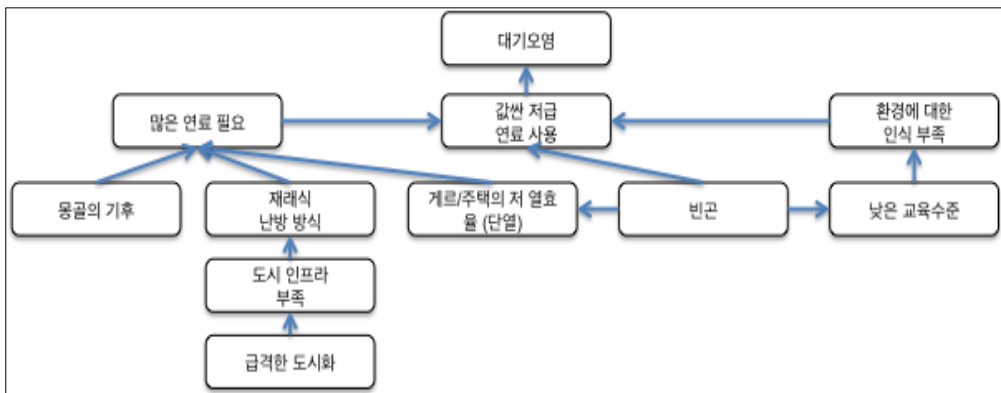
[KOREA]

- KOREA is contributing to the Mongolia development policy strategies by the EACP(East Asia Climate partnership) project. through the heating and hot-water supply construction in the Baruun-Urt, the urban waste recycle facility in the Ulaanbaatar and the water supply in the Yarmag. KOICA received attention from the World Bank. Because the use of coal for the reduction of air pollution earned positive reviews.
- Korea prepared and implemented an institutional basis about using Yeontans. The number of Yeontan stoves increasing and large company

starting a production of Yeontans stoves. Thus domestic companies are able to contribute to them.

[Analysis of project environment]

○ The basic information(project-related) of evaluates and the result of the project environment analysis are as follows;



- As a result, a direct reason of air pollution is to use a lot of low-grade fuels.
- To be solved the problems, it must be grasp the causal relation and analyse. For each factor, the appropriate measures is needed condignly.
- (breaking down structure of the problem) The immediate cause of using the low-grade fuels is that needs a lot of fuels. Climate, simple structure heating system and low efficiency of housing are another immediate cause for the recurrence.
- Therefore, in order to solve the problem, heating system and efficiency of housing should be resolved first.

- The fundamental problem is that "Ger" villager's earning is not enough. Partial solution, including environmental awareness can not achieve the goal of this project.
- In this evaluation, these elements are reviewed as the one section. The sections's contents are project formation, planning, and reflection. Thus the contents derived suggestions to the similar project. Thus, the contents are to induce suggestions to the similar project in the future.
- evaluation frameworks and matrix created as the information of evaluation analysis and project.



2. Evaluation Framework

- Below is the result chain of the project developed based on the Project Design Matrix (PDM) of the project's feasibility study.

Input (Resources)	Activity	Output	Outcome	long-term Outcome & Impact
<ul style="list-style-type: none"> •Budget •Personnel •Project Site •Knowledge & Technology 	<ul style="list-style-type: none"> •"Yeontan" stove and "Yeontan" •Dispatch experts •Training •Other supports 	<ul style="list-style-type: none"> •Yeontan stove •Yeontan production technology •Fuel quality improvement •Public awareness campaign •Related policy and program 	<ul style="list-style-type: none"> •Reduce air pollution •Raise environmental awareness •Reduce living expense •Improve living condition •Reduce respiratory illnesses. •Transfer of related technology 	<ul style="list-style-type: none"> •Upgrade the quality of lives •Upgrade the health conditions for the residents •Industrial technology development

- Based on the result chain above, outcome evaluation matrix was set as described in the following section
- The evaluated project was originally designed for the purpose of reducing air pollution in Ulanbataar. However, the project scope was limited to providing stoves to only 5,000 among 150,000 Ger households. As a result, the project could not cover significant number of Ger household to create impacts in air quality.
- Thus, the evaluated project was defined by KOICA as a pilot project that aimed to contribute to achieving goal of reducing air pollution by providing scientific data, lessons for design and implementation of related projects in the future.

- Therefore, the current evaluation employed process and outcome evaluation matrix considering characteristics of the pilot project as suggested in the following section.



3. Evaluation Matrix

- Evaluation matrix organizes evaluation subjects, items, and corresponding indicators by OECD/DAC 5 criteria.
- Evaluation subjects for process evaluation are basically the major steps of the evaluated project, namely project formation, project planning and design, project implementation, project's sustainability.
- Evaluation subjects and items are identified and categorized as summarized in the matrix in order to review major components of the project and draw conclusions and recommendations systematically.

<Table 2-1 Process Evaluation Matrix>

Criteria	Evaluation item	Specific question for the evaluation	Evaluation indicator	Data source
① Project formation				
Relevance	1. Consistency with the development policies of the cooperation country	<ul style="list-style-type: none"> ○ Whether the project meets the development strategies and policy direction of the cooperation country 	<ul style="list-style-type: none"> ○ Status of the ODA reception for the cooperation country ○ Weight for each sector and trend ○ Contents of the policy documents and strategic documents 	<ul style="list-style-type: none"> ○ Request for support ○ Report on the project feasibility ○ Plan on the project implementation

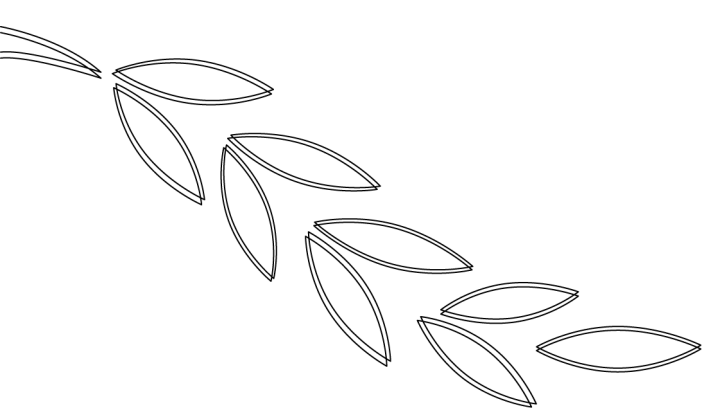
Criteria	Evaluation item	Specific question for the evaluation	Evaluation indicator	Data source
	2. Consistency with the support strategies of KOICA	<ul style="list-style-type: none"> Whether the project meets the development strategies and policy direction of KOICA 	<ul style="list-style-type: none"> Support status of the cooperation country by KOICA Portion and trend in the aid budget Priority Contents of the policy documents and strategic documents 	<ul style="list-style-type: none"> Strategic documents for each cooperation country of KOICA Use as the statistical data on the aid for the cooperation country with KOICA
	3. Relevance of the project selection	<ul style="list-style-type: none"> Properness for the survey and study on the project demand Project efficiency Realization of the project Whether the project contains meaningful ripple effect and impact 	<ul style="list-style-type: none"> Specific grounds for the demand analysis and basic survey Project element 	<ul style="list-style-type: none"> Survey report on the project feasibility, interview with the officials
② Project planning				
Relevance	1. Feasibility for the purpose	<ul style="list-style-type: none"> Whether the short-, mid- and long-term goals of the project are properly established 	<ul style="list-style-type: none"> Logical relation with the process in achieving the goals Understand the external factors Understand the major assumptions Whether to reflect on the design 	<ul style="list-style-type: none"> Project feasibility survey Plan on the project implementation Report on the site survey result PDM review
	2. Design Feasibility	<ul style="list-style-type: none"> Whether the project design is proper and the solutions to various issues in the project implementation are appropriate 	<ul style="list-style-type: none"> Relevance of the technical supports related to the feasibility review Relevance of the injection (budget, technology, human resources) - Effective, efficient 	<ul style="list-style-type: none"> Project feasibility survey Plan on the project implementation Interview the responsible officials PDM review

Criteria	Evaluation item	Specific question for the evaluation	Evaluation indicator	Data source
			<ul style="list-style-type: none"> ○ Allocate the support from KOICA with the cooperation country against the total project cost ○ Select the proper purchase method ○ Consider risks, external conditions and major assumptions in achieving the expected effect of the project 	
③ Project implementation				
Effi- -ciency	1. Progress against the plan	<ul style="list-style-type: none"> ○ Is the project completed without modification based on the implementation plan? 	<ul style="list-style-type: none"> ○ Difference in the actual implementation from the plan ○ Delay the project cost, procurement and implementation 	<ul style="list-style-type: none"> ○ Review the project report ○ Interview the implementing organizations ○ Site survey
	2. Injection element	<ul style="list-style-type: none"> ○ Are all the resources effectively injected into the purchase and construction? 	<ul style="list-style-type: none"> ○ Price changes in various equipment during the project ○ Additional cost due to unexpected technical flaws ○ Unexpected cost on the environment 	<ul style="list-style-type: none"> ○ Review the project report ○ Interview the implementing organizations ○ Site survey
	3. Structural issues	<ul style="list-style-type: none"> ○ Are there any structural causes inhibiting the efficiency? ○ Are the problems in the structural causes effectively solved? 	<ul style="list-style-type: none"> ○ Constraints recognized by each stakeholder 	<ul style="list-style-type: none"> ○ Interview with project officials

Criteria	Evaluation item	Specific question for the evaluation	Evaluation indicator	Data source
Effectiveness	4. Participation from the cooperation country	<ul style="list-style-type: none"> How much does the cooperation country join the project design and implementation? 	<ul style="list-style-type: none"> Participation of the cooperation country in the project selection and purchase procedure Participation of the stakeholders in the project for support 	<ul style="list-style-type: none"> Request for support Plan on the project implementation Interview with the officials in the cooperation country Interview with the recipients
④ Sustainability				
Sustainability	1. Sustainability for the human and institutional system	<ul style="list-style-type: none"> Is there any stability in the human or institutional system to back up the project sustainability? 	<ul style="list-style-type: none"> Whether to secure human resources for the proper maintenance and management Concreteness and realization for the exit strategy Concreteness and realization for the following measures Concreteness and realization for the ex-post management Ownership and willingness of the cooperation country for the project 	<ul style="list-style-type: none"> Interview with government officials Implementation cooperation Report on the final construction Interview the responsible officials Interview the implementing organizations
	2. Financial sustainability	<ul style="list-style-type: none"> Is there any financial stability to back up the project sustainability? 	<ul style="list-style-type: none"> Price of the output from the supporting project Financial soundness in the project organizations Secure the budget for the proper management and maintenance 	

<Table 2-2 Outcome Evaluation Matrix>

Outcome Level	Specific Outcomes	Indicators
Long-Term	<ul style="list-style-type: none"> • Growth of alternative energy industries • Improvement of mining industry • Upgrade the quality of lives • Upgrade the health conditions for the residents • Industrial technology development 	<ul style="list-style-type: none"> • Alternative energy related policy and production • Population • Economic indicators such as average household income. • Gross Domestic Production • Residents' perception
Mid-Term	<ul style="list-style-type: none"> • Reduce air pollution • Raise environmental awareness • Reduce living expense • Improve living condition 	<ul style="list-style-type: none"> • Air quality measures • Health statistics • Household income and expenses • Residents' perception of health and environmental issues
Short-Term	<ul style="list-style-type: none"> • Reduce respiratory illnesses. • Reduce heating expense • Transfer of related technology 	<ul style="list-style-type: none"> • Health statistics • Household's heating cost • Residents' perception of health and air pollution • Residents' perception of the outcomes
Output	<ul style="list-style-type: none"> • Yeontan stove • Yeontan production technology • Fuel quality improvement • Public awareness campaign • Related policy and program 	<ul style="list-style-type: none"> • Utilization state of Yeontan (number of stoves in use, Yeontan consumption, etc.) • Yeontan production and sales statistics • Residents' perception of health and air pollution • Residents' perception of the outputs • Policies and programs related to reduction of air pollution



III. Evaluation Result

1. The evaluation result according to the five DAC evaluation criteria
 - 1) Relevance
 - 2) Efficiency
 - 3) Effectiveness
 - 4) Impact
 - 5) Sustainability



III

Evaluation Result



1. The evaluation result according to the five DAC evaluation criteria

- In chapter 3, evaluation is classified, presented and analyzed according to the five DAC criteria.

1) Relevance

(1) Evaluation of project formation

- Project formation is first step for establish an appropriate approach direction and a strategy.
- Premise the feasibility and viability of the project are examined sufficiently in the previous step.
- It is based upon the premise that is the feasibility and realistic possibility of the project were examined sufficiently in the previous step. Project evacuation and feasibility study were excluded in this range of evaluation.
- But, it evaluate a selection of relevance about realistic possibility and group of beneficiary.
- Evaluation items and questions for the project formation of evaluation are as follows;

Evaluation items	Evaluation questionnaires	Criteria
1. Consistency of partner country's development policy	Is it consistence with partner coutry's policy?	appropriacy
2. Consistency of KOICA's support strategy	Is it consistence with KOICA's policy?	
3. The relevance of selected project	Is it appropriate of the research about the project demand?	
	Is the project has an effectiveness?	
	Is the project has a feasibility?	
	Is the project has an influence?	

A. Consistency of partner country's development policy

- MD(Based Comprehensive National Development Strategy of Mongolia)'s basic goal is "protect and strengthen the sovereignty of Mongolia and develop into the middle-income country".
- This strategy divided into 3ways. It is "human and social development", "economic growth and development" and "Environmental and regulation". Specific tasks are as follows;

<Figure 3-1 National Development Strategy of Mongolia>



*Source : Country Cooperation Strategy - Bangladesh, Uzbekistan, the Philippines, Mongolia, Cambodia (2012). p. 283

- Mongolia government selected the development policies for expansion of infrastructure as detailed tasks in the Ulaanbaatar. So, Korea supports the construction of infrastructure for urban development.
- This project is consistent with development strategy of Mongolia in the way that is sustainable urban development of Ulaanbaatar.
- Also this project is significant. Korea, including international organizations, supplies alternative fuels that for less pollution for the reduction of air pollution.
- This project was changed to promote that is the pilot project. It is included not only Yeontan stoves but also invitation training, dispatch experts and research.
- Civil life can be improved as a result of the project.

Source
International Development Cooperation Committee. (2012). Country Cooperation Strategy - Bangladesh, Uzbekistan, the Philippines, Mongolia, Cambodia
International Economic Policy. (2011). Journal of strategic depth research area IV - Mongolia, Turkey
Climatological Normals of Ulaanbaatar. Hong Kong Observatory. Retrieved from http://www.hko.gov.hk/wxinfo/climat/world/eng/asia/china/ulaanbaatar_e.htm .
KOICA (2009). Mongolia, Ulaanbaatar city district heating and water supply system improvement projects final reports

B. Consistency of KOICA's support strategy

- According to the Mongolia CPS strategic goals of KOREA, support goals are contribution for the balanced growth.
- Therefore, cooperation strategy of KOREA focused on 3 kinds of areas of cooperation.

- ① Improve the transparency and efficiency of public sector → Improve ICT-based public administration
- ② Balanced growth of the country and support sustainable development of cities → Urban Development
- ③ Improve agriculture productivity, enhance food security and income generation through → Agricultural Development

- This project is the second focus of cooperation in the field.
- Korea had experienced city problems because of rapid industrialization. Korea solved problems through a comprehensive land development plans and urban development plans.
- Based on these experiences, Korea had set goals for the development of Mongolia.

- Korea had enforced EACP(East Asia Climate Partnership) project for responding to Mongolia's climate change during 5 years. Contents are as follow;

Project	Period and Budget
Baurrun Urt City Heating and hot water supply system construction project	'09-12, \$ 500million
Bayannagur Utilizing Solar Water Resources Development Project	'09-12, \$150million
Ulaanbaatar City Recycling facilities construction projects	'09-12,\$350million
Light pollution and light pollution ICT Development Project Survey	'10-13, \$300million
Yarmag area. Water supply and water use efficiency projects	'11-13, \$260million

- The following is a support strategy of committee of international development cooperation for Mongolia.

<Figure 3-2 National Development Strategy of Mongolia>



○ This project is judged to be appropriate. Because it is able to help realize the development strategy.

Source

Source : Country Cooperation Strategy - Bangladesh, Uzbekistan, the Philippines, Mongolia, Cambodia (2012).

C. The relevance of selected project

○ This evaluation item is a review of the process of be selected.

- Is the research suitably for a project demand?
- Is high project effectiveness?
- Is high the project realistic possibility?
- Is there the project has a effectiveness?

○ It was judged the research is divided into Yeontan stoves and air pollution.

○ The examining of Yeontan stove from prior investigations is as follow;

Contents
1. Analysis of utilization of Mongolia Yeontan stove <ul style="list-style-type: none">• Investigation of the way of use, ease, using household and suitability of house structure
2. Grasp the current operating Yeoata plant situation <ul style="list-style-type: none">• Grasp the project condition, achievement ability, range of government support and technical level• Investigation of the production capacity, vehicles, condition of raw material purchase, equipment holdings and human resources
3. Survey of raw materials purchase <ul style="list-style-type: none">• Examination of the raw materials type and quality• Examination of the raw material price, purchasing convenience and purchase environment
4. Investigation the quality level of Yeontan <ul style="list-style-type: none">• Examination of the combustion time, seize and solidity
5. Grasp the current Yeoata plant situation
6. Grasp the manufacturer and expected using the Yeontan households
7. Market research of the stove installation and consumables
8. The present condition of the Yeontan production in Mongolia and agency

○ The examining of air pollution from prior investigations is as follow;

Contents	
1. Grasp of the environment pollution in the project site	<ul style="list-style-type: none"> • Grasp the pollution source, statistics and damage case
2. Ministry of Environment's management condition and institutional strategy (Related regulations)	<ul style="list-style-type: none"> • Operation condition (Organizations and human resources of Central government and local government) • Investigation • Investigation of the production capacity, vehicles, condition of raw material purchase, equipment holdings and human resources • Environment improvement-related planning and performance
3. Environmental Awareness of Ministry of Energy and Environment	<ul style="list-style-type: none"> • Awareness of the environmental pollution's real condition (The general public, professionals, government, Ect.) • Willingness and effort for improve environment
4. Grasp the environmental management capacity of Ministry of Energy and Environment	<ul style="list-style-type: none"> • Real condition of the law, organization and gravitation • Security of budget, long range plan, gravitation and research development program • Similar project result and performance
5. Grasp the area that need support	<ul style="list-style-type: none"> • Provision of human resource • System support
6. Data collection for the project feasibility examination	<ul style="list-style-type: none"> • Background of project request and examination of project purpose • Survey of demand • Pre-condition check
7. Calculate basis of the project budget and period	<ul style="list-style-type: none"> • Propriety examination of project request and budget allocation
8. Possibility examination of commitment element securement	<ul style="list-style-type: none"> • Possibility of human resources securement and supplement by training and technical • Possibility of financing and additional support
9. Other data research and on-site confirm	<ul style="list-style-type: none"> • Examination of the expected problems when carry forward a project • Judgement data of profitability and national economics • Data collection for the possibility of success and effect of grasping • Needed institutional supplementation device investigation • Determining data for determining the organizational structure

- "Is there a project effectiveness?"'s part is received positive feedback from residents. It is considered positive.
- "Is there the project has a significant effectiveness?" part's is considered positive. Residents are received a education about air pollution and support from government.
- International organization held a conference and executed UBCAP(Ulaanbaatar Clean Air Project) with the World Bank at its center. As this project, the Mongolia improves a social identity and an analysis ability of air pollution. Also the international organization is replacing old stoves, old boilers of 150,000 units in the "Ger" district.

Source
KOICA (2008). Heating culture improvement of Ulaanbaatar city for the reduction of Mongolia

(2) Evaluation of project planning

- Project planning and design has been reviewed as the progress direction.

Evaluation items	Evaluation questionnaires	Criteria
1. Feasibility of setting goals	Is set properly as Short-term and long-term performance of the project?	appropriac y
2. Feasibility of design	Is set properly the design and problem-solving approach?	

A. Feasibility of setting goals

○ The following is reviewed for a propriety.

- Logical connection of the objectives achievement process
- Identify external factors
- Identify the major premise
- Reflected in the design

- Examination was accomplished based on the "preliminary research report", "conduct consultation result report" and "intermediate evaluation result report".
- Comprehensive objective was changed to a more specific goal after the enforce consultation.
- Then, residents's participation and Mongolia government's credibility were insufficiency.
- More economic research is needed. Because this project's fuel is requested manufacturing processing, economic research is needed about supply and sale.
- At that time, research and cooperation are more needed. Then, old stoves replacement project was being progress.(2007.)
- The Mongolia government executes Enlightenment activity to abstain to use low-grade fuel.
- It is positively judged as suggest a objective data of air pollution.
- But, it has a limitation to test about reduction of the air pollution. Because, the project provides a Yeontan stoves to 3.3% of "Ger"residents only.

B. Feasibility of design

○ The following was reviewed from the documents that is related design. The topic of discussions are "appropriate project design", and "appropriate problem-solving approach".

- Adequacy of the technical support related to the feasibility examination
- Adequacy of Input(budget, technique, human resources)
- Distributed the total project cost
- The selection of an appropriate purchase method
- Consideration or not of risks, external factors and main prerequisite

○ But it was judged that essential project design documents are not exist.

○ thus, it is too difficult to judge to whether or not the enforce. Also the proposed index is not appropriate to apply.

Problems	Contents
It is predicted that is difficult to improve effectiveness.	Through this project, only 3% of residents will receive a stoves. So, the effectiveness is not enough.
Due to lack of time, difficulties are expected to supply stoves.	Local manufacturers are not able to produce the stoves. Considering the climate of Mongolia, there are effectiveness if the stoves were diffused before August.
expectation of problem for human	Because "Ger" villager uses low grade fuel, toxic substance occurs. This project's fuel also occurs a CO(Carbon monoxide), but it is less than now.

*Source: Conduct consultations result report(2008)

○ (Consider the risk factors) When it watching that the project didn't connect to next project, enough investigation is doubtful.

- The following is the analyzed risk elements. It is not included such as sustainability.
- (Considering the other external factors) In order to use a different fuel, local residents habits are required. It is another limited requisites.
- When considering the pilot project attribute, it was not efficient. It didn't have any plan after the project.
- First of all, it didn't reflect any data and measures to the design.

C. Participation of partner country

- The partner country's involvement is a big factors as propulsion.

- Participation of partner country in the purchase process and selections.

- Ulaanbaatar city hall was mainly cooperated. Main project was education to residents, demand survey and project supports.
- The following is a responsibility and tasks of each nation. When problems occurs, go ahead after consultation and documentation.

<Table 3-3 Discussion minutes of consultations between the two countries>

Korea	Mongolia
<ul style="list-style-type: none"> • Donating equipment (Stove and Yeontans) <ul style="list-style-type: none"> - 5000 of stoves - 500,000 of Yeontans • Invited training • Dispatch of experts <ul style="list-style-type: none"> - Yeontans experts 4person, 1 time, 2 weeks - Atmosphere experts 2 person, 2 times, 1 week 	<ul style="list-style-type: none"> • Preparation and submission of distribution Plan • Campaign of Yeontans stoves • Strengthening the relevant authorities network • Equipment clearance cooperation

- After the executing organization survey, it was considered that they had a steps for follow up management.
- In case of campaign, Mongolia had a strong will and put something action.

(3) Adequacy of Evaluation Result

- Through the evaluation of the project formation and project process, this project was examined. The relevance of project was evaluated with 3 ways and 6 ways each.
- Each evaluation items had examined 3~4 indicators. The result are as follows;

Evaluation items	Evaluation questions	Scores	
1. Consistency of partner country's development policy	Is it consistence with partner coutry's policy?	3	
2. Consistency of KOICA's support strategy	Is it consistence with KOICA's policy?	3	
3. The relevance of selected project	Is it appropriate of the research about the project demand?	2	3
	Is the project has an effectiveness?	3	
	Is the project has a feasibility?	3	
	Is the project has an influence?	3	
1. Feasibility of setting goals	Is set properly as Short-term and long-term performance of the project?	2	
2. Feasibility of design	Is set properly the design and problem-solving approach?	1	
The participation of partner countries	Participation of partner country in the purchase process and selections.	2	
Overall relevance- Very appropriate		14/18	

- (Evaluation of project formation) The project is proper in terms of evaluation of project formation because of it accords with policy of partner country as well as it is urgent to solve environmental problem.
- KOICA have executed to study the improvement of the fuel and stove pilot project contribute to improve air pollution in the future.
- The project is an exemplary practice from the point of an effort to increase accountability.
- It is problems that is the urgent demand, development policy and practical difficulties in the partner country.
- Partner country has an urgent demand, development policy and practical difficulties. therefore this project try to solve this problems, so it is proper in terms of the relevance of selected projects.
- In the research process, eventhough an infrastructure for the production of Yeontans and stoves lacked, it was selected without a risk management plan. This is unfortunate part.
- (Evaluation of project planning) The selection and progress of the project are appropriate, but planning process and the contents are slightly insufficient.
- First of all, the goal,"improve the culture", has set beyond the scope of the project on the validity of goals.
- When considering that is the pilot project, it was not reflected a project connection and a utilization report for action in the plan.
- Synthetically, this project are believed that that is appropriate. It is judged that is very appropriate in the project formation and sectionally appropriate in the project plan.

- Total points are 14. Odds scores are 18. Standard is 78%. It was judged "very appropriate".

2) Efficiency

(1) Evaluation of project implementation

- The follow is a evaluation items that related with efficiency.

Evaluation items	Evaluation questions	Criteria
1. Transition degree	Is it finished on time?	Efficiency
2. Commitment element	Are all resources put efficiently?	
3. Structural factors	- Is disturb cause about efficiency exist? - Are the structural factors problems solved efficiently?	
4. Participation of partner country	Is the partner country participate in project design and performance initiatively?	Appropriacy, Efficiency

A. Transition degree

- Transition degree was reviewed as 2 ways.

- difference existence and nonexistence of the plan and execution
- The delay of project costs, procurement and implementation.

- (difference existence and nonexistence of the plan and execution) This project had decided to increase the scale of support gradually according to effects and reaction of residents.
- After the pilot project, the Yeontan factory was closed, so it was not expanded to main project. This part going to review about transition degree.

- The following is execution contents. It is about 85% respectively, compared to the retention plan.

Division	Plan	Execution
Stove	5,000	4,237
Yeontan	500,000	423,700
Training	Manager process - 2 persons for 1 week Practitioners course - 2 persons for 1 week	Same as the Plan
Dispatch of experts	Yeontans Education training - 2 experts for 2 weeks Air pollution monitoring training - 3 experts for 4 days (2times)	Yeontan production training - 4 experts for 6 days Air pollution monitoring training - 4 experts for 4 days (2 times)

- Because 2008 rose of exchange rate, the plan was difficult to execute.
- It seems that is the planned supply was adjusted because the project expense. The following is enforcement history.

Division	Budgeting(US\$)	Amount of enforcement(KRW)
Dispatch of experts	45,740	58,978,157
Invited trainees	16,304	13,978,157
Support equipment	621,739	553,691,160
Project management	16,304	15,766,000
Total	700,000	642,358,425

*Rates: 2008. \$1=920₩, 2009. \$1=990₩

*Source: PMC project final report

- (The delay of project costs, procurement and implementation.) The project was ended within the project period. Because the Mongolian winter is starting on October.

Date	Contents
2007.12	Ulaanbaatar requests the project
2008.03	Dispatch the pre-feasibility investigators
2008.05	Selected new project in 2008
2008.06	Project consultation and agreement signed minute book (6.18 to 21)
2008.08	Exchange agreement between the government(8.6)
2008.08	Selected concessionaire(Mine Reclamation Corporation)
2008.09	Dispatch the project research group.(8.31~9.3)
2008.09	Contract equipments / dispatch air pollution expert
2008.10	Dispatch Coal, Yeontans technical experts / equipment presentation ceremony
2008.11	Training of invited(11.30~12.6)
2009.02	Dispatch the ir pollution measurement experts(2.17~21)
2009.03	Result reporting
2009.10	Finish evaluation

*Source: Completion Evaluation Report

- Project was carried out without delay. But actual process affected to efficiency.

B. Commitment element

- Check that all resources has used efficient.

- Check whether price change about equipment is true or not
- Check whether unexpected additional price result from mechanical failure is true or not
- Check whether unexpected environment cost is true or not

- The 3 ways are for a countermeasures. Major target is whether troubleshooting is true or not.

- According to the finish report, because of the increasing of equipment price, providing level was expected lower than original plan.
- Thus, for the efficient project execution, budget increase was proposed.

<Table3-4 Differences in initial budget request, and change request>

Unit: \$1,000

Division	Initial budget	Change request	Additional budget
Equipment	420	626	+206
Dispatch of experts	40	42	+2
Invited trainees	15	17	+2
Other (administration fees)	25	15	-10
Total	500	700	+200

*Source: Results of a report conducted in consultation

- For the project effectiveness improvement, it was judged to need at least 5000 stoves more.
- It was not happen unexpected additional costs in part of mechanical and environment.
- When this evaluation team arrived there, residents didn't use the provided stoves and fuel. Because the factory closed, Yeontan couldn't supply to them.
- After completion of the pilot project, low-grade Yeontan was produced for a long period of time.
- According to residents, in Mongolia case, the manufacturer use a garbage instead of clay. Thus, the Yeontans was broken easily.

- This problem was not carry out an unexpected additional costs, but it should be considered as a risk management.
- It is able to bring unexpected additional costs and a structural problem.

C. Frame Factors

- It is detailed section to check the frame factors which could be limited to conduct for successful project through the interview with the stakeholders.

- a limit factor being aware by each stakeholders

- (Limits of international development cooperation project) It was deemed that there were the frame factors which could be the limit factors of project efficiency such as difficulty of cooperation due to a lack of owner spirit of stakeholders in cooperation bureau, the issues that be happened by unfamiliar of local culture and no residence of PMC agency.
- (Stability of fuel supply) It was structural issue to give a influence to its 'efficiency' due to the hinderance of 'effectiveness' in demonstration project by closing the only Yeontan manufacturer produced by Korean method as mentioned above.
- (Political situation) First considering special political situation in Mongol, changes in government led to discontinuities in relationship of personnel. This is definitely one of limit factor in view of construction companies and PMC.
- (Conducted other air-pollution projects at same period) Currently as the air-pollution has been one of critical issue in Mongol, the project for

reducing air-pollution from other agencies were conducted, however, it left much to be desired that there were no connection and cooperation between them.

D. Participation of Cooperation Countries

- It was deemed that Mongol government and implementing agency supported properly according to the agreement of discussed execution.
- However, there was no participation of local manpower during the process of research development. Mostly the research was conducted by Korean specialists, therefore, it could be limit factors being utilized the research outcomes and data by local stakeholder in future.
- In the case of the demonstration region, excepting Khan-uul Province, the local civil servants in working-level didn't know about the project itself and further didn't know to whom the stoves were delivered.
- In fact, it was deemed that the ex-post monitoring was not conducted at all after distributing the stoves.

(2) Summary for efficiency evaluation results

Through the evaluation of project execution process, the project efficiency was reviewed and the following detailed evaluation of 4 items were evaluated.

Item	Detailed evaluation questionnaire	grade
Execution	was the project completed as execution plan ?	2
Input	Were all materials put efficiently for procurement and construction?	2
Structural factor	Were there any structural factors existed for reducing its 'efficiency'?	2
Participation of cooperation countries	How did cooperation countries participate dominantly in the project execution?	2
Overall - Partially efficiency		2

- Nevertheless, there were extra budget and inputs added, due to raising the material cost and exchange rate, the supply quantity of stove and Yeontan was not reached as expected. Therefore, it was evaluated as being "partially efficiency".
- Due to the structural factors such as special political situation in Mongol, no stability of fuel production and supply, various alternative stoves existing in the marker, it was deemed that these issues were impacted on the project, therefore, ot was evaluated as being 'partially efficiency'.
- During the project execution, there was a difference in participation of cooperation countries according to the area in where the stoves were supplied, moreover, there was the participation of limited execution precess. For this reason, it was evaluated as being "partially efficiency'.

3) Effectiveness

- The project outcomes are significant object of ex-post evaluation.
- In this evaluation, the outcomes were divided in mid/long-term, short-term, and output and utilized the various indexes, moreover, collected relevant references and interview sources in order to evaluation each sector.
- This project was conducted as the demonstration project. On its characteristic, commercial Yeontans produced by the research and its development was able to see one of output.
- The outcomes of research itself was the sources for upcoming development and meaningful as the outcomes of demonstration project.
- The project goal was analyzed as the demonstration project and its outcome evaluation items are following as :

Achievement	Outcome Evaluation Items
Output and short-term achievement	<ul style="list-style-type: none">• Supply of Yeontan stove• Scientific date regarding air-pollution• Yeontan development for Mongol type• Publicity program for improving heating culture• Base line date for project plan• Recommendation for project design

A. Supply of Yeontan Stove

- (Supply of Yeontan stove as its output) In 30 October 2008, it was verified to be acquired the contracted quantity: 4237 Yeontan stoves and 423700 Yeontans from the department of atmosphere-control in Ulaanbaatar City

- It was reported²⁾ that the distribution of Yeontan stove to actual local residents was completed after being instructed how to use by the manufacturer, Sun-Jin Energy Inc,

<Figure 3-8 Yeontan stove installed in Gerr>



*Source: PMC Project Final Report

- The distributed Yeontan stove was produced by local manufacturer according to the standards provided by project implementing agency.
- (Supply of Yeontan stove as short-term achievement) It was deemed as short-term achievement in terms of the supply of Yeontan stove and its utilizing condition.
- According to PMC project final report, it was conducted as visit-inspection for 8 users lived in 4-dong and 8-dong of Khan uul Province. however it was found that there was no evidence whether the distributed Yeontan stove and Yeontan were used actually or not.

2) PMC Project Final report (2009)

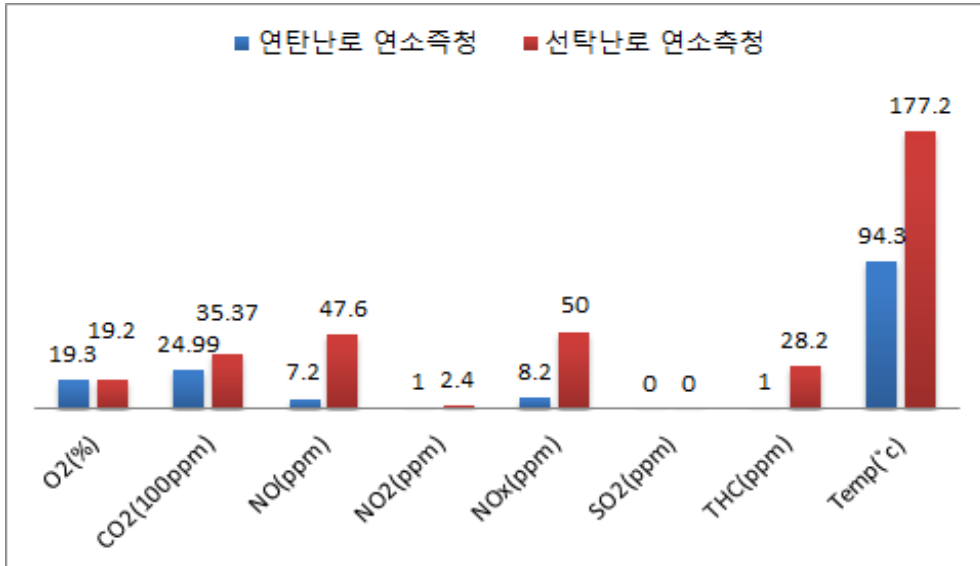
- During the interview with local residents, it was found that the stakeholders from the project implementing agency at Korea side did not come to visit for reflecting their opinions.
- However, according to the agreement and project structure itself, as above, the process of distribution of the stove and verification was done by the cooperation bureau side, and further it could be finalized that the Yeontan stove was used after the completion of project based on the information that actual extra selling quantities of Yeontan compared with supplied 100 Yeontan per household.

B. Scientific data regarding air-pollution

- The main input and activities of the demonstration project through conducting a development of fuel and stove could contribute to reduce an air-pollution. The plan for conducting the project effectiveness and scientific data produced in actual research results was suggested in the final report.
- For producing Yeontans in local area, it was analysed the contents of raw-coal in Mongol first and then produced the Yeontan selected in top-down combustion system. During this process, for developing the Yeontan for Mongol type, there was the data collected³⁾ through experiment regarding the exhaust gases and containments from Yeontan.

3) The combustion measurement of Yeontan's stove and coal's stove were conducted by the specialist being dispatched in the site. In scientific way, it confirmed its superiority of Yeontan stove to local stakeholders.

<Figure 3-8 Combustion measurement results of Yeontan stove and coal stove(combustion time: 120mins)>



*Source: PMC Project final report (blue bars - Yeontan stove, red bars - traditional steel stove)

- The research outcomes along with fuel development by the researcher's effort contributed to provide a significant information and data of future efforts in order to reduce air-pollution in Ulaanbataar not even only published in international academic journal⁴).

C. Yeontan Development for Mongol

- The Yeontan for Mongol is different in raw material and combustion method compared with the standard Yeontanr in Korea. It is produced by the local manufacture, SunJin Energy Inc. and supplied after having the quality-inspection (for checking its calorie and strength) of PMC.

4) Kim Bong-Seup(2008), Research of improvement of heating method for reducing air-pollution in Ulaanbataar City, Mongol

- In 22 October 2008, the material inspection team was dispatched in the site about 4days, and inspected the developed stove and Yeontan for Mongol.
- All parts for checking-dimensions were passed as weight 27kg, size(diameter 150mm, height 142mm), number of holes (22).
- The caloric value (sample test) was passed as above its standards.
- The developed Yeontan for Mongol has more other features as follows :

- It is suitable in the features of heating that to be burned slowly and to be maintained optimal temperature.
 - Recycle materials from coals can be used in Yeontan.
 - There is no difference in cost compared with coal.
 - After using Mongol Yeontan, ashes are reclaimed (acting as modling), if residents bring it back, the constant price is paid, and using as materials of brick.
- Director Mr. Kim Bong-Seup in Korea Mine-Damage Management Cooperation
(Project PM)

- Through the development of Mongol Yeontan, it was verified as good alternative fuel being able to reduce air-pollution and provide scientific data regarding an effective reduction of air-pollution. However, there was actual difficulty found in use by local residents through workshop and interview with stakeholders and residents.

D. Other Output and Short-term Outcome

- Considering as the short-term outcomes in this demonstration project, the following lists were difficult to conduct the proper review and the evaluation due to its insufficient information.

- Promotional program for improving heating culture
- Base line data for project plan
- Recommendation for project design

- Actually, as the above items listed were not included in the project scope, it was not reflected on the overall evaluation but it was reviewed as derivation purpose for future similar project as below:
- (Promotional program for improving heating culture) The promotional program should be combined with how to influence in their life environment and health not just only looking at the supply of Yeontan and then it is considered to improve the heating culture for achieving the goal.
- (Base line data for project) It is necessary to organize the fundamental data which are about what the environmental factors are for project design, what factors are considered for bring the expected effectiveness in order to utilize it in actual world.
- (Recommendation for project design) There was no suggestion in the plan and the specific strategy for achieving the project goal, additional supply or following projects. It was necessary to conduct as being included the following project design in the project scope of demonstration project or as the results of demonstration project.

E. Result of Effectiveness Evaluation

- Generally by means of demonstration project, the output and short-term outcomes were evaluated as being 'effective'.
- However, it left much to be desired that there were no outputs and specific inputs regarding the follow-up steps for air-pollution and the promotional program of heating culture improvement.

Evaluation Items	Questionnaires	Grade
Supply of Yeontan stove	Current status (number of using, Yeontan consumption, cost of fuel)	2
Scientific data for reducing air-pollution	Research for heating fuel development	3
Yeontan development for Mongol	Exhaust harmful gas per calorie	2
Promotional program for improving heating culture	Execution outcomes	N/A
Base line data for project plan	Expecting risk-factors, external factors and pre-conditions for achieving expected effect	
Recommendation for project design	Project basic design including Goal, Target, Strategy and Execution plan	
Overall - Effective		3

4) Impact

- In the view of mid/long-term, the impact on this project was expected to achieve as following:

Level	Evaluation Items
Outcomes in mid/long term	<ul style="list-style-type: none">• Policy/system in order to improve the heating culture• Promotional outcomes in order to improve the heating culture• Improvement of the heating method• Skill instruction of relevant industries• Strengthening of ability of Mongol government and utilizing information• Connection of following project

- However, it was limited having reduction effect of air-pollution by using Yeontan through supplying Yeontan and its stove to 3% (supply 4237 pieces of Yeontan stove to 150,000 householders) of householder in Ger.
- Also considering its demonstration project, it was difficult to expect in giving the impact as a change of heating culture and mid/long-term achievement.
- On the other hand, there was effectiveness to give an detailed alternative for fuel with the relevant data to project stockholders (for reducing air-pollution) and policy decision-maker.
- (Policy/system in order to improve the heating culture) The research results in fuel development for its effectiveness was published in Forensic Science International by efforts of chief of research.
- This outcome was not included in the project scope at planning stage. This research outcome not only contributed to academic world but also provide important information and data for future efforts in order to reduce the air-pollution in Ulaanbataar.

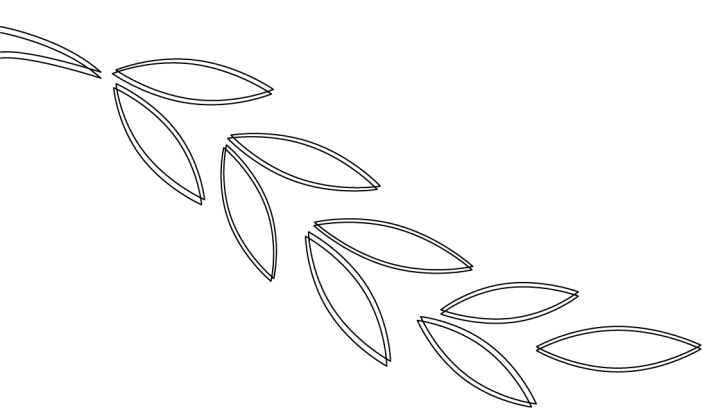
- In practice, the international organization (then conducting the air-pollution project with Mongolia government) and other donor agencies monitored this project with attention. The project outcomes provided a good information and lesson learned to other projects.
- The current social company was established by the regenerator called G-save. As many experts mentioned, the date and experience learned through this project would be great asset in upcoming project.
- In particular, after the project completion, in the case of the management cooperation for mine-damage, the project for recovering the damaged environment and polluted by an indiscreet mining is being carried out and successfully conducting to improve the method of approach as securing the law, system, political assistance first during the process of project design and planning.
- This was unexpected the ripple effect for cooperation with other donor agencies even from the view of Mongol.
- The outcomes of research development for Yeontan stove project was reflected on Other projects for stove development at the same time conducting and set the principles for no changing the method of fuel using. Therefore, it was contributed to be settled the using method of the stove supplied widely today.
- (Promotional outcomes for improving the heating culture and improvement of heating method) In the case of the region in Khan uul Province, through having an interview with local residents and stakeholder in borough office, it was found that changing the heating method could be alternative plan. This was significant outcome to be the pre-condition of alternation of awareness and change of heating culture.

- Currently, according to the comment from the stakeholders of Khan uul Province, they're considering other alternatives such as electronic or floor heating system.
- Actually, during the interview, they requested to support the project for the supply of small floor heating system operated by electronic in Gerr area.
- During the interview with local residents, it was found that some of them uses the electronic heating system.
- (Instruction of relevant industrial skills) There was no evidence found to influence the existing fuel-production and to instruct the skills related to Yeontan-production.
- (Strengthening of ability in Mongol government and utilizing the information) It was found during the interview that strengthening of ability of government has been performed in high achievement of outcomes with the cooperative project of international organization and other donor agencies (Germany GIZ, Aisa Development Bank, World Bank). However, there was no evidence whether the outcomes of this project was actually applied on other project, other department or not.
- (Connection with following project) As mentioned above, it left much to be desired that no connection to following project or project expansion and no Yeontan supply due to closing the manufacture and market situation as mentioned.
- Overall, the evaluation outcomes proved that there was some achievements in terms of the outputs in the impact and mid-long terms. It was expected to be connected to the ripple effect and long-term output.

Evaluation Item	Detailed Questionnaire	Grade
Policy/System in order to improve the heating culture	Establishment and Execution	3
Promotional outcomes in order to improve the heating culture	Awareness of local residents in heating culture	3
Improvement of heating method	Self-evaluation of local residents	3
Skill instruction of relevant industries	Yeontan production and raw-coal process	1
Strengthening of ability of Mongol government and utilizing information	Follow-up steps of Cooperation Bureau government and execution of relevant project	1
Connection of following projects	Follow-up steps of Korea and execution of relevant project	1
Overall for impact and mid-long term outcomes - positive		2

5) Sustainability

- The evaluation for sustainability (which is one of DAC 5 criteria) was held off because it was already conducted in the verification stage of project validity and its role for next project.



IV. Conclusion and Recommendations

1. Concluding Remarks
2. Recommendations



1. Concluding Remarks

1) Summary

- In the point of the view of goal setting, plan setting, and the execution process, the project was evaluated as having 'very relevance'. However, there was insufficient parts found in the sector of 'effectiveness' and 'impact', therefore, it was ultimately evaluated as being 'positive'.
- The evaluation for 'sustainability' was held off as considering its difficulty to evaluate human/institutional and financial sustainability. Nevertheless, it was deemed to give the impression of possibility with regards to new fuel to local residents and the relevant decision makers and make to be considered as one of alternative heating method. For this reason, this could be expected as sustainable effectiveness in future.

2) Grade

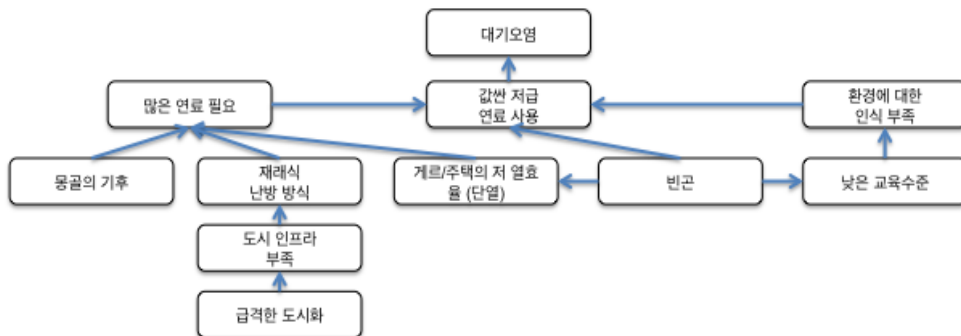
- It was evaluated as being "partly successful" 7 out of 9 points (refer to the below table).

Grade	Relevance	Effectiveness / Impact	Efficiency	Sustainability	Overall
Very Successful	3	3	2	Evaluation Hold	7/9



2. Recommendations

- It is necessary to make a study being able to conduct 'result-based design and management' during the process of 'in-depth plan'.
- Thorough analysis of context, stockholders, issues, and culture (called as 'front-end analysis') during the process of project development and plan is required in this project. Furthermore, In this project plan, it is necessary to have a comprehensive and in-depth study even though there being using a logic-model or change-theory method as known.
- In the matter of air-pollution, it was helpful to give a appropriate solution by analyzing 'immediate causes' brought each matters in reverses order as below:



- It is recommended to carry forward and research on a development of problemsolving access methodology provided by OECD conjointly with an academia and implementing agency. (It is to provides a systematic methodology to reach Environmental analysis, Change theory, Route analysis, Agenda setting, Verification of milestone, Change-control plan setting, Project design, Execution and M&E and to support an execution agencies and the main agent of project control in addition to improve its

execution. Ultimately it is necessary to improve an development effectiveness.)

- (Cooperation with other agencies) In terms of this project, it was required having efforts to prosecute a cooperative project, sustainable discussion with international organizations and other donor agencies.
- It was commented from the interview with the person in charge of UBCAP that cooperating and sharing the information with other agencies are required during KOICA project plan or execution.
- There was being concerned in the next KOICA project of air-pollution and further they want to cooperate with KOICA continually.
- (Project plan and execution) It was not a scope of project-control's body, however, it was verified that quality-control of the Yeontan supplied by private companies itself is one of factors to give an impact on 'effectiveness' during the project executing process.
- During a period of demonstration project, the feed rate contracted with the Yeontan manufacturer was 100 Yeontans per household and used maximum 10 Yeontans a day (expected 5 Yeontans by implementing agency but expected 10 Yeontans by the interview with local residents). Therefore, after being used 100 Yeontans (approx. 10 days), the excessive volumes should be purchased individually.
- Due to the internal problems in Yeontan's manufacturer being after demonstration project completed, a low quality of Yeontans were produced in a long time as a result, many residents stoped to use Yeontans.
- In Korea, Yeontans are made of good quality of materials such as red clay and this definitely makes to maintain its good shape and its strength. However, according to the comments from residents, the Yeontans were

- included some garbages instead of clay, which brought the following matters; it was easily broken, the burning time was much faster as expected. For this reason, the Yeontanrs were required more than as expected.
- Moreover, due to its weak strength, it was not able to properly rake out ashes from a stove. Therefore, there was some troubles found, for instance, it was impossible heating up until cleaning of the stove completed.
 - As such being issues at production process, it didn't bring on the costs of environmental things and project itself, however, under the precondition in order to secure the project effectiveness, it should be considered as its risk-control and at the same time, it is necessary to conduct as the type of ex-post management in terms of quality, supply and production during the execution process.
 - (Risk-control and Improvement plan for sustainability) During the process of pre-inspection and discussing execution in the stage of project plan, as considered risk factors were analysed but there was not reviewed in the risk factors, which influence on 'sustainability'. actually, considering the importance of advanced energy as unique Yeontans supplier, the factors such as financial stability of the company must be it must be deemed for future project.
 - (Limited evaluation budget and limited evaluation period) In this evaluation, there were limitations existing to conduct the widespread on-site visit, interviews and questionnaires under the condition of limited budget and period. Based on the new information found by the evaluation team through the site visit, it was verified that Yeontan's stoves were supplied not even only in Khan-uul Province area where was mentioned as project target area but also in Bayan-Olgii Province and Ger village in Chingeltei

Province. Unfortunately, the site-inspection of these areas was not possible because the stakeholders were out of reach, except for ones in Khan-uul Province. The period of site-inspection was not enough to reflect the new and variable information found during the site-inspection, therefore, site-inspection needs to be conducted, being sub-divided into site-explore and main-inspection in the future.

**Ex-post Evaluation Report on the Pilot Project to Reduce Air Pollution by
Improving Heating Culture in Ulaanbaatar, Mongolia**

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