Evaluation Method of Co-Benefits Project for Updating HOB in Mongolia By Using JCM Methodology

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1. What is the “Co-Benefit”?

- Doing Co-benefit measures achieves the environmental pollution control measures and emission reduction measures of GHG (mitigation action) effectively at the same time.
- Co-benefit approach is very important policy tool.
- The environmental pollution control measures are issues of great urgency in Asia countries because of the rapid economic growth.
- At the same time, all country requires the voluntary mitigation action on GHG emission reduction.

2. What is the “JCM”?

- Japan establishes and implements the JCM in order both to appropriately evaluate contributions from Japan to GHG emission reductions or removals in a quantitative manner achieved through the diffusion of low carbon technologies, products, systems, services, and infrastructure as well as implementation of mitigation actions in developing countries, and to use them to achieve Japan's emission reduction target.

Source: http://www.mmechanisms.org/e/initiatives/jcm.html (access date: 19 Jan. 2016)

3. What do we do?

- OLYMPIA INDUSTRIAL CO.,LTD.:
  - Technical Support and Transfer (Low carbon technology & air pollutant control measures technology)
- SUURI-KEIKAKU CO.,LTD.:
  - Estimation of GHG emission reductions based on JCM methodology which made by SUURI-KEIKAKU
  - Estimation of Air pollutant emission reductions based on JICA Capacity Development Project in Ulaanbaatar City (technical transfer of measurement survey method of air pollutant)
- JAPAN QUALITY ASSURACE ORGANIZATION:
  - Identification and solution of issues regarding MRV activity of JCM project, and Technical Support regarding the assessment of NREC (TPE of JCM)

3. Main Activity on this FS

- 3.1 Outline of FS on Co-Benefits Project
- 3.2 Issues of Co-Benefits Manual
- 3.3 Co-Benefits Estimation Method of this Feasibility Study
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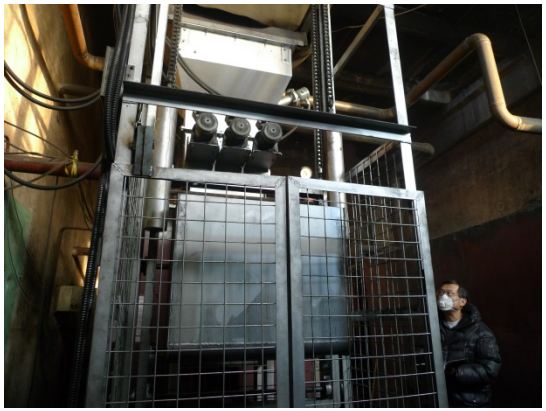
3.1 Outline of FS on Co-Benefits Project

- Feasible Study on Co-Benefits Project for Updating HOB (Improved MUHT (MUHT1, MUHT2); MUHT + Japanese Technology) in 65th School in Ulaanbaatar.
- Reference HOB is set as vertical HOB.
  - Same as Approval Methodology of “JCM” (NM_AM002)
- Evaluation of Co-Benefits of Reference HOB and Improved MUHT(MUHT1 and MHUT2)
- Case Study of Application of NM_AM002



←65thSchool (MUHT2)

79thschool
(Reference HOB)→

3.2 Issues of Co-Benefits Manual

- In the Co-Benefits Manual, the amounts of dry exhaust gas and the concentration of air pollutants are measured and quantified.
- Furthermore, monitoring frequency of the amounts of exhaust gas and the concentration of exhaust gas becomes once a month.
- These are not the sustainable monitoring activities in Mongolia. Particularly, it is difficult for Project Participants (PPs) to implement them.
- In the JCM project, the sustainable monitoring activity of PPs will be implemented. Based on this monitoring activity, the estimation of Co-Benefits are also evaluated.

3.3 Co-Benefits Estimation Method of this Feasibility Study

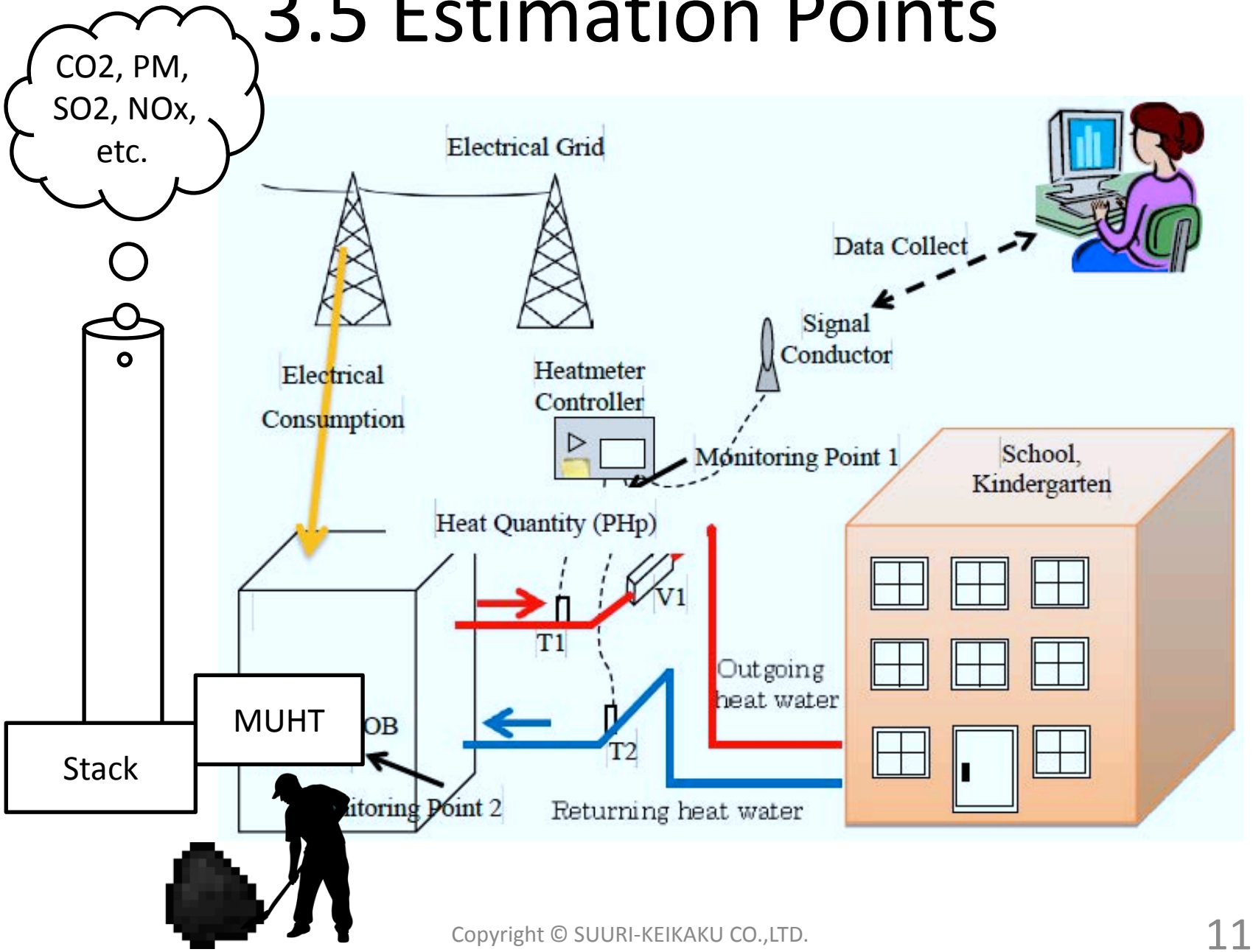
- In consideration of the diverseness and sustainable development of the developing countries, the evaluation method of co-benefits should reflect the independence of the country concerned.
- The Evaluation methods have the high Transparency and high Fairness.
- The Results of the Evaluation have Reproducibility.
- The Simple and Quick Evaluation is Possible.

3.4 Estimated Item of Co-Benefits

SO2	The Amounts of Emission Reductions “Emissions” = “Activity Data” x “Emission Factor” Activity Data = “Net heat quantity which is supplied to the building” / “Boiler Efficiency”
NOx	
DUST	
CO2	

Heat quantities	Monitoring Item
Emission Factors	Default Values (set this FS)
Boiler Efficiency	Default Values (set this FS)
Net Calorific Value	Default Values (Coal Analysis)
Concentration of Air Pollutant	Measuring Item of this FS

3.5 Estimation Points



3.6.1 JCM Project in Mongolia

- Two JCM Projects have already been registered in Mongolia.
- Project: MN001; Installation of high-efficiency Heat Only Boilers in 118th School of Ulaanbaatar City Project (30 Jun. 2015)
- Project: MN002; Centralization of heat supply system by installation of high-efficiency Heat Only Boilers in Bornuur soum Project (30 Jun. 2015)
- PP of both projects is “ANU-SERVICE CO.,LTD” and “SUURI-KEIKAKU CO.,LTD”.

3.6.2 Approval JCM Methodology in Mongolia

- MN_AM002: “Replacement and Installation of High Efficiency Heat Only Boiler (HOB) for Hot Water Supply Systems”
- URL:
  - https://www.jcm.go.jp/mn-jp/methodologies/13
- Date of approval : 28 Jan 15
- Methodology Proponent: SUURI-KEIKAKU CO., LTD., Climate Experts LTD.

3.6.3 Basic Estimation Equation

- Reference Emissions
  - $RE_p = PT_p / \eta_{RE,HOB} \times EF_{CO2,coal}$
- Project Emissions;
  - $PE_p = PT_p / \eta_{PJ,HOB} \times EF_{CO2,coal} + EC_p \times EF_{CO2,grid}$
- Where;
  - $\eta_{RE,HOB}$: Boiler Efficiency of the Reference HOB
  - $\eta_{PJ,HOB}$: Boiler Efficiency of the Project HOB
  - PT_P: Net heat quantities supplied by the project HOB during the monitoring period p [GJ/p]
  - $EF_{CO2,coal}$: CO_2 Emission Factor of the consumed coal [tCO_2/GJ]
  - $EF_{CO2,grid}$: CO_2 Emission Factor of the grid consumed by the project HOB [tCO_2/MWh]

3.6.4 Boiler Efficiency of Reference

Table 4 Actual measurement of boiler efficiency for the reference HOBs

Boiler No.	Type of Boiler	Site	Measurement Day	Measurement equipment	Boiler efficiency (%)
R1	CLSG	TAVAN GAN TRADE LLC	Dec. 11, 2012	Heatmeter	53.4
R2	CLSG		Dec. 19, 2012		42.8
R3	CLSG		Nov. 1, 2012	"Thermocouple-type thermometer" + "Ultrasonic flowmeter" (TUF)	40.1
R4	CLSG		Nov. 2, 2012		40.6
R5	HP	87th school	Dec. 7, 2012		49.6
R6	HP	SEN-1 residence	Dec. 4, 2012		40.7
R7	HP		Dec. 10, 2012		43.6
R8	HP	79th school	Nov. 20, 2013	Heatmeter	60.0
R9	HP	79th school	Nov. 26, 2013		63.8
R10	HP	79th school	Nov. 27, 2013		37.1
R11	HP	79th school	Nov. 28, 2013		43.2
R12	HP	79th school	Dec. 16, 2013		51.4
R13	HP	79th school	Dec. 19, 2013		53.2
R14	HP	79th school	Dec. 20, 2013		45.0
R15	CLSG	TAVAN GAN TRADE LLC	Nov. 28, 2013		54.0
R16	CLSG	TAVAN GAN TRADE LLC	Dec. 18, 2013		44.0
R17	CLSG	TAVAN GAN TRADE LLC	Dec. 23, 2013		50.9
The average value of all data					47.8
The average value of data excluding one value (R9) which is not within the range of two times of standard deviation ($\mu \pm 2\sigma$)					46.9
The average value of data excluding one value (R9) which is not within the range of two times of standard deviation ($\mu \pm 2\sigma$), and excluding nine value (R2, R3, R4, R6, R7, R10, R11, R14, R16) which is less than the abovementioned average value (46.9)					53.3

Source:
<JCM_MN_AM002>
JCM_MN_PM002_ver01.0_Add_Info1

53.3%

3.7.1 Proposed Co-Benefits Methodology of SOx Estimation

- Reference Emissions
  - $RE_{SO2,p} = PT_p / \eta_{RE,HOB} \times 1/NCV_{coal} \times EF_{SO2,coal}$
- Project Emissions;
  - $PE_{SO2,p} = PT_p / \eta_{PJ,HOB} \times 1/NCV_{coal} \times EF_{SO2,coal}$
- Where;
  - $\eta_{RE,HOB}$: Boiler Efficiency of the Reference HOB
  - $\eta_{PJ,HOB}$: Boiler Efficiency of the Project HOB
  - PT_P: Net heat quantities supplied by the project HOB during the monitoring period p [GJ/p]
  - $EF_{SO2,coal}$: SO_2 Emission Factor of the consumed coal [kgSO_2/t]

3.7.2 Proposed Co-Benefits Methodology of NOx Estimation

- Reference Emissions
  - $RE_{NOx,p} = PT_p / \eta_{RE,HOB} \times 1/NCV_{coal} \times EF_{NOx,coal}$
- Project Emissions;
  - $PE_{NOx,p} = PT_p / \eta_{PJ,HOB} \times 1/NCV_{coal} \times EF_{NOx,coal}$
- Where;
  - $\eta_{RE,HOB}$: Boiler Efficiency of the Reference HOB
  - $\eta_{PJ,HOB}$: Boiler Efficiency of the Project HOB
  - PT_P: Net heat quantities supplied by the project HOB during the monitoring period p [GJ/p] or [kgCoal/p]
  - $EF_{NO2,coal}$: NO_2 Emission Factor of the consumed coal [kgNO_x/t]
  - NCV_{coal}: Net Calorific Value of the consumed coal [GJ/t]

3.7.3 Proposed Co-Benefits Methodology of CO Estimation

- Reference Emissions
  - $RE_{CO,p} = PT_p/\eta_{RE,HOB} \times 1/NCV_{coal} \times EF_{CO,coal}$
- Project Emissions;
  - $PE_{CO,p} = PT_p/\eta_{PJ,HOB} \times 1/NCV_{coal} \times EF_{CO,coal}$
- Where;
  - $\eta_{RE,HOB}$: Boiler Efficiency of the Reference HOB
  - $\eta_{PJ,HOB}$: Boiler Efficiency of the Project HOB
  - PT_P: Net heat quantities supplied by the Project HOB during the monitoring period p [GJ/p] or [kgCoal/p]
  - $EF_{CO,coal}$: CO Emission Factor of the consumed coal [kgCO/t]
  - NCV_{coal}: Net Calorific Value of the consumed coal [GJ/t]

3.7.4 Proposed Co-Benefits Methodology of DUST Estimation

- Reference Emissions
  - $RE_{DUST,p} = PT_p/\eta_{RE,HOB} \times 1/NCV_{coal} \times EF_{DUST,coal}$
- Project Emissions;
  - $PE_{DUST,p} = PT_p/\eta_{PJ,HOB} \times 1/NCV_{coal} \times EF_{DUST,coal}$
- Where;
  - $\eta_{RE,HOB}$: Boiler Efficiency of the Reference HOB
  - $\eta_{PJ,HOB}$: Boiler Efficiency of the Project HOB
  - PT_P: Net heat quantities supplied by the Project HOB during the monitoring period p [GJ/p] or [kgCoal/p]
  - $EF_{DUST,coal}$: DUST Emission Factor of the consumed coal [kgDUST/t]
  - NCV_{coal}: Net Calorific Value of the consumed coal [GJ/t]

4. Measurement and Estimation (Calculation) Results

- 4.1 Emission Factor (Measurement results)
- 4.2 Estimated Amounts of Activities
- 4.3 Draft Estimated Amounts of Emission

4.1 Draft Emission Factors

	Reference HOB (HP10-60Ж)	Target HOB 1 (MUHT1)	Project HOB 2 (MUHT2)
SO2	6.071 (t-SO2/t) This FS	6.071(t-SO2/t) This FS	6.071 (t-SO2/t) This FS
NOx	2.21 (kg-NOx/t) JICA Phase I	0.71 (kg-NOx/t) This FS	0.73 (kg-NOx/t) This FS
CO	82.82 (kg-CO/t) JICA Phase I	8.80 (kg-CO/t) This FS	12.27 (kg-NOx/t) This FS
DUST	9.91 (kg-DUST/t) JICA Phase I	3.20 (kg-DUST/t) This FS	5.57 (kg-DUST/t) This FS
CO2	0.074 (t-CO2/GJ) This FS	0.074 (t-CO2/GJ) This FS	0.074 (t-CO2/GJ) This FS

4.2 Estimated Amounts of Activities

65th School

Measured Activity

Period	Activity
9/17 ~ 12/31	2196.5 (GJ/p)

Estimated Activity

Period	Activity
9/15 ~ 5/15	5035 (GJ/p)

Type	Coal Consumption
Reference HOB (53%)	557 (t-Coal/p)
MUHT1 (74.4%)	446 (t-Coal/p)
MUHT2 (72.0%)	461 (t-Coal/p)

4.3 Draft Estimated Amounts of Emission

	Reference HOB Emissions	MUHT2 Emissions	Evaluation of Co-Benefits (Emission Reductions)
CO_2	699 (tCO_2/p)	517 (tCO_2/p)	182 (tCO_2/p)
SO_2	3382 ($kgSO_2/p$)	2798 ($kgSO_2/p$)	584 ($kgSO_2/p$)
NO_x	2131 ($kgNO_x/p$)	336 ($kgNO_x/p$)	895 ($kgNO_x/p$)
CO	46130 (kgCO/p)	5655 (kgCO/p)	40475 (kgCO/p)
DUST	5520 (kgDUST/p)	2567 (kgDUST/p)	2953 (kgDUST/p)

5. Demonstration of MRV Activity on the assumed JCM project

- MUHT2 is assumed as JCM Project, and the demonstration of MRV activity on JCM Project was carried out.
- NREC (Mongolian company, the **first** TPE of host country on JCM) made PDD and collected evidence. (main activity entity)
- We get the issues of developing this FS as JCM project.
  - Main support entity of Japanese side is JQA (Mr. Yamamoto).

5.1 Main Activity of Demonstration of MRV activity

- Confirm the importance of creating “Monitoring Plan” with considering “Verification”.
  - Arrangement of requirement on PDD and monitoring activity based on each Manuals of JCM in this FS.
  - Collection and Assessment of Evidence in this FS.
  - Confirmation of Issues of JCM MRV in this FS.
  - 22 Jan. 2016 (last Friday): Results briefing session
    - Participants : Ministry of Environment, Green Development and Tourism, Mongolian Agency for Standardization and Metrology, Regulatory Agency of the Government, etc.

Thank you !

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