Developing Methodology for the **Joint Crediting Mechanism**

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Overseas Environmental Cooperation Center, Japan (OECC)
Shigeo Aoki

What is MRV?

M Measurement/Monitoring

➡ Grasping reduced GHG emissions

R Reporting

➡ Reporting GHG reductions with prescribed excel form

V Verification

➡ Verifying Monitoring report by TPE

Why MRV Methodology necessary?

Reduced GHG emissions in JCM project

→ To be used to achieve emission reduction target of Japan (and partner country)

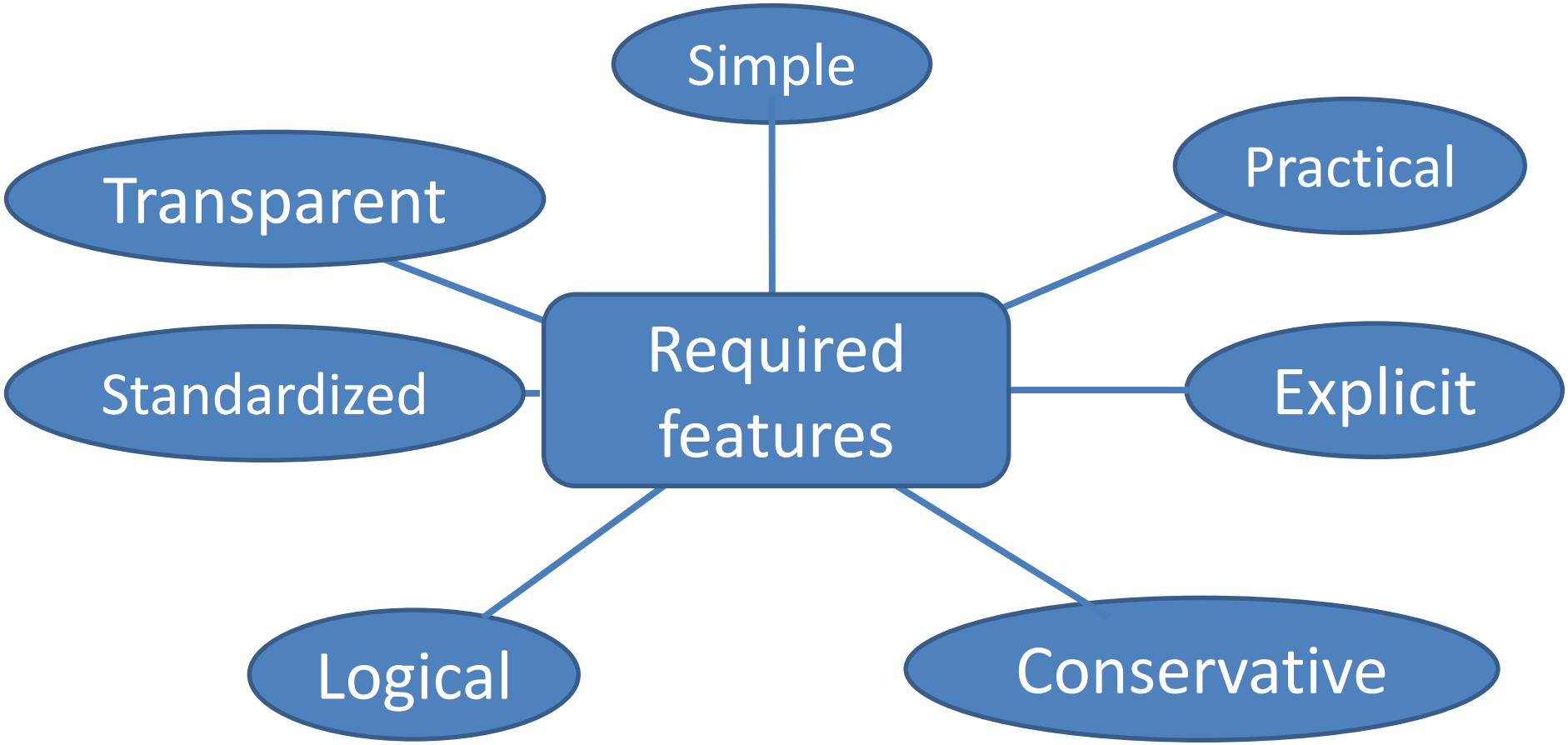
- To be appropriate qualitatively
- To be objectively handled
- To be proved authentic

Officially approved Methodology is necessary

MRV Methodology in JCM Structure

(Sourced from IGES Presentation)

Required features for Methodology



Contents of Methodology

Methodology defines;

- Eligibility criteria
- Calculation of Reference Emissions
- Calculation of Project Emissions
- Calculation of Emission Reductions
- Data & Parameters
- Others

Eligibility Criteria

Eligibility Criteria : Conditions to be satisfied as a JCM Project

Examples: MN_AM002 for HOB Pj in Mongolia

Category	Example of Eligibility Criteria
Type of Technology	Technology employed : Coal-fired Heat Only Boiler for Hot Water Supply
Objective of project	New HOB installation to replace existing one
Capacity	Capacity of Project HOB ranges between 0.1MW and 1.0MW
Performance level	Catalogue value of new boiler efficiency (η) > 80 %

Calculation of Emission Reductions – (1)

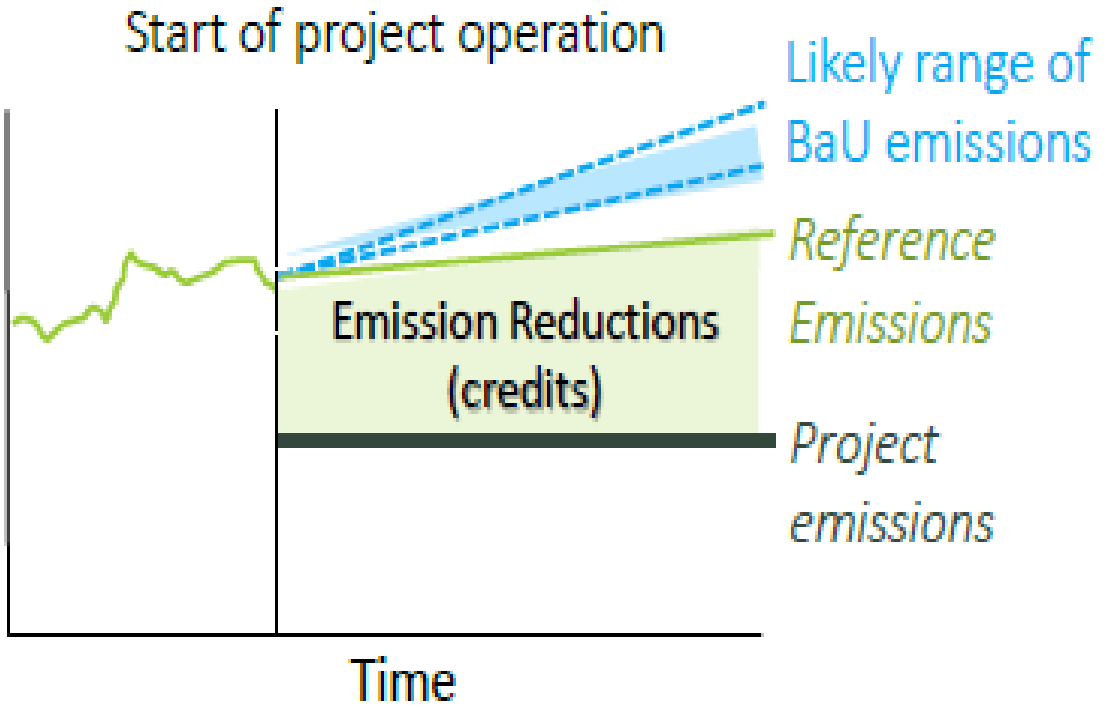
♦ Setting conservative reference emissions:

ER = RE – PE

RE < BaU Emissions

BaU (Business as Usual)

➡ Plausible emissions if JCM Pj would not be implemented



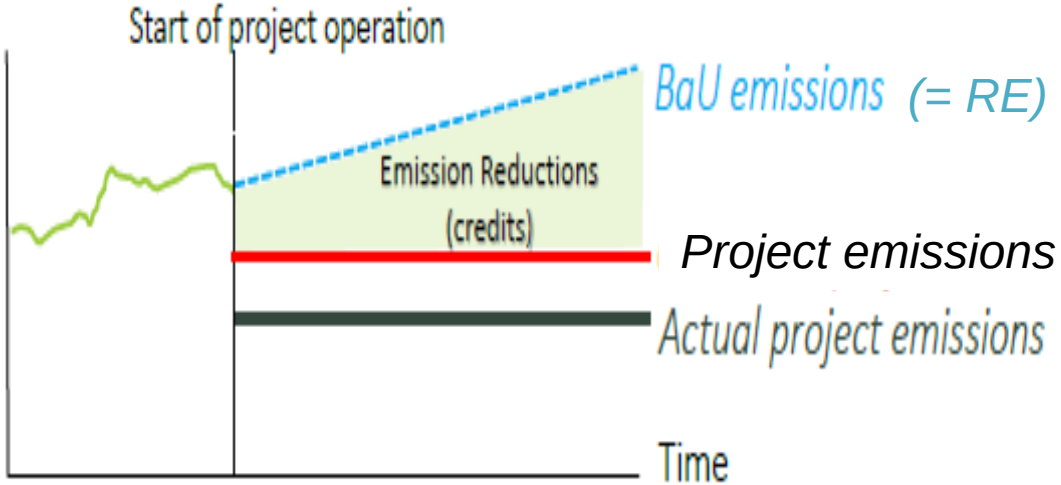
(Partly sourced from IGES Presentation)

Calculation of Emission Reductions – (2)

- Setting conservative project emissions:

ER = RE – PE

RE = BaU
PE = Actual PE



(Partly sourced from IGES Presentation)

Calculation of Reference Emissions – case 1

Example of setting conservative Reference Emissions
in case of Replacement of HOB (MN_AM002)

$RE = PH / \eta_{RE,HOB} \times EF_{CO2,coal} < BE$

RE : Reference missions

PH : Net heat quantity by the project HOB [GJ/p]

$\eta_{RE,HOB}$: Boiler efficiency of the reference HOB [-]

$EF_{CO2,coal}$: CO2 emission factor of coal [tCO2/GJ]

BE : BAU Emissions

$BE = PH / \eta_{BAU,HOB} \times EF_{CO2,coal}$ $\eta_{RE,HOB} > \eta_{BAU,HOB}$

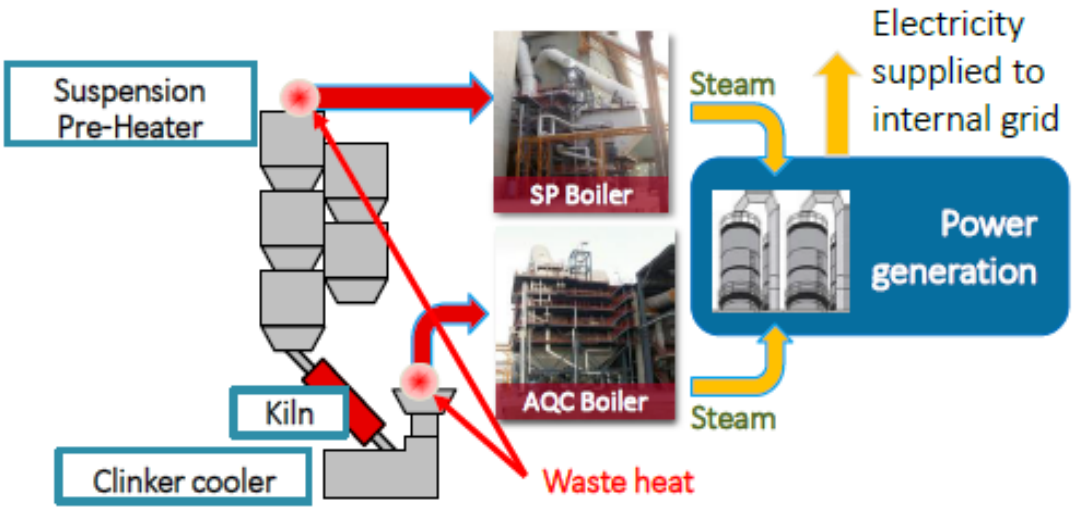
Default Value $\eta_{RE,HOB} = 0.533$

Calculation of Reference Emissions – case 2

Example of setting conservative Reference Emissions in case of WHR Project (ID_AM001)

(Partly sourced from IGES Presentation)

- Waste heat recovery (WHR) system to generate electricity in the cement production facility .



- The reference emissions are calculated based on;

The gross amount of electricity generated by the WHR

minus The electricity consumed for captive use

- The default value for electricity consumed for captive use is set as the **maximum rated capacity** of equipment of the WHR system assuming their operation is **24h/day, not the actual electricity consumption by the system.**

Calculation of Project Emissions – case 1

Example of setting conservative Project Emissions in case of Replacement of HOB (MN_AM002)

$$PE = PH / \eta_{PE,HOB} \times EF_{CO2,coal} + EC \times EF_{CO2,grid} > PE_{act}$$

PE : Project missions, : PE_{act} = Actual PE

PH : Net heat quantity by the project HOB [GJ/p]

$\eta_{PE,HOB}$: Boiler efficiency of the project HOB (=0.61)

$EF_{CO2,coal}$: CO2 emission factor of coal [tCO2/GJ]

$EF_{CO2,grid}$: CO2 emission factor of grid [tCO2/MWh]

EC : Electricity consumed by the project HOB

EC = RPC x HMP

RPC = Rated Power Consumption

HMP = Operation hours of the project HOB

Default Value $\eta_{PE,HOB} = 0.61 < \eta_{PE,HOB,\ act}$

Monitoring Methodology

Average monitoring parameters in 23 JCM Approved Methodologies : 2

Example 1: Replacement HOB for Hot Water Supply (MN_AM002)

- Net heat quantity
- HOB Operation hours

Example 2: WHR System for Cement production (ID_AM001)

- Electricity generated by the project
- Operation days

Monitoring Methodology

Monitoring Spreadsheet: JCM_MN_AM002_ver01.0

Sectoral scope: 01

Monitoring Plan Sheet (Calculation Process Sheet) [Attachment to Project Design Document]

1. Calculations for emission reductions	Fuel type	Value	Units	Parameter
Emission reductions during the period *p*	N/A	0	tCO_2/p	ER_p
2. Selected default values, etc.				
CO_2 emission factor of coal	Coal	0.0909	tCO_2/GJ	$EF_{CO2,coal}$
Boiler efficiency of the reference HOB	N/A	0.533	-	$\eta_{RE,HOB}$
Boiler efficiency of the project HOB	N/A	0.610	-	$\eta_{PJ,HOB}$
3. Calculations for reference emissions				
Reference emissions during the period *p*	N/A	0	tCO_2/p	RE_p
Reference Emissions	N/A	0	tCO_2/p	
Net heat quantity supplied by the project HOB	N/A	0	GJ/p	PH_p
Boiler efficiency of the reference HOB	N/A	0.533	-	$\eta_{RE,HOB}$
CO_2 emission factor of coal	Coal	0.0909	tCO_2/GJ	$EF_{CO2,coal}$
4. Calculations of the project emissions				
Project emissions during the period *p*	N/A	0	tCO_2/p	PE_p
Project emissions (Fossil fuel consumption)	N/A	0	tCO_2/p	
Net heat quantity supplied by the project HOB	N/A	0	GJ/p	PH_p
Boiler efficiency of the project HOB	N/A	0.610	-	$\eta_{PJ,HOB}$
CO_2 emission factor of coal	Coal	0.0909	tCO_2/GJ	$EF_{CO2,coal}$
Project emissions (Electricity consumption)	N/A	0	tCO_2/p	
Electricity consumption of the project HOB	Electricity	0	MWh/p	EC_p
Total hours of the project HOB operation	N/A	0	h/p	HMP_p
Rated power consumption of the project HOB	N/A	0	kW	$RPC_{PJ,HOB}$
CO_2 emission factor of the grid	Electricity	0.0000	tCO_2/MWh	$EF_{CO2,grid}$

[List of Default Values]

CO_2 Emission Factor of Coal used in HOBs	$EF_{CO2,coal}$	unit
Default emission factor applied to Lignite in fuel according to "2006 IPCC Guidelines for National Greenhouse Gas Inventory"	0.0909	tCO_2/GJ

Boiler Efficiency of coal-fired HOB in Mongolia	η	unit
Boiler Efficiency of Reference the HOB	0.533	-
Boiler Efficiency of the Project HOB	0.610	-

Monitoring Methodology

Monitoring Spreadsheet: JCM_MN_AM002_ver01.0

Sectoral scope: 01

Monitoring Plan Sheet (Input Sheet) [Attachment to Project Design Document]

Table 1: Parameters to be monitored *ex post*

(a) Monitoring point No.	(b) Parameters	(c) Description of data	(d) Estimated Values	(e) Units	(f) Monitoring option	(g) Source of data	(h) Measurement methods and procedures	(i) Monitoring frequency	(j) Other comments
1	PH_p	Net heat quantity supplied by the project HOB during the period *p*.		GJ/p	Option C	Logged data of net heat quantity supplied by the project HOB	Measurement methods which are using a heatmeter meet the industrial standards (host country or international standard). Monitoring data is the amount of heat supplied from the project HOB. This monitoring data is recorded in the data logger that is built into the heat meter. Electric data recorded on the data logger is input to the spreadsheet properly. In these monitoring activities, QA/QC be implemented. - In the case that heatmeter with verification is used, the verification validity for the heatmeter does not expire till the last date of the monitoring period. - If the heatmeter with the verification is not required in the industrial standard, uncertainty of the calibration data of the monitoring equipment meet the following conditions; - It is within accepted level of the verification. - It is within the accuracy level of industry standard requires. Required calibration frequency is the frequency which can be confirmed to be within the accuracy level of the requirement of industrial standard.	Measuring frequency: Continuously Recording frequency: Hourly	Trouble shooting procedure of missing data; Completed by the hourly minimum value (excluding abnormal value) of available recorded data during the monitoring period.
2	HMP_p	Total hours of the project HOB operation during the period *p*		hours/p	Option C	Identified by monitoring period	Total time from the start time of monitoring to the end time of monitoring	---	---

Table 2: Project-specific parameters to be fixed *ex ante*

(a) Parameters	(b) Description of data	(c) Estimated Values	(d) Units	(e) Source of data	(f) Other comments
$RPC_{PJ,HOB}$	Rated power consumption of the project HOB		kW	Catalog value provided by the manufacturer of the project HOB	
$EF_{CO2,grid}$	CO_2 emission factor of the grid electricity consumed by the project HOB		tCO_2/MWh	The most recent value available at the time of validation is applied and fixed for the monitoring period thereafter. The data is sourced from CDM Mongolia unless otherwise instructed by the Joint Committee.	

Table3: *Ex-ante* estimation of CO_2 emission reductions

CO_2 emission reductions	Units
0	tCO_2/p

[Monitoring option]

Option A	Based on public data which is measured by entities other than the project participants (Data used: publicly recognized data such as statistical data and specifications)
Option B	Based on the amount of transaction which is measured directly using measuring equipments (Data used: commercial evidence such as invoices)
Option C	Based on the actual measurement using measuring equipments (Data used: measured values)

Reference：JCM Approved Methodologies (1)

No	Meth No	Rev	Title	Country	Tech. Type
1	MN_AM001	1.0	Installation of energy-saving transmission lines in the Mongolian Grid	Mongol	Transmission-Line
2	MN_AM002	1.0	Replacement and Installation of High Efficiency Heat Only Boiler (HOB) for Hot Water Supply Systems	Mongol	Heat Only Boiler
3	ID_AM001	1.0	Power Generation by Waste Heat Recovery in Cement Industry	Indonesia	WHR
4	ID_AM002	2.0	Energy Saving by Introduction of High Efficiency Centrifugal Chiller	Indonesia	Chiller
5	ID_AM003	2.0	Installation of Energy-efficient Refrigerators Using Natural Refrigerant at Food Industry Cold Storage and Frozen Food Processing Plant	Indonesia	Refrigerator

Reference：JCM Approved Methodologies (2)

No	Meth No	Rev	Title	Country	Tech. Type
6	ID_AM004	2.0	Installation of Inverter-Type Air Conditioning System for Cooling for Grocery Store	Indonesia	Air-Conditioner
7	ID_AM005	2.0	Installation of LED Lighting for Grocery Store	Indonesia	LED Lighting
8	ID_AM006	2.0	GHG emission reductions through optimization of refinery plant operation in Indonesia	Indonesia	Distributed Control/Advan-ced Control
9	ID_AM007	1.0	GHG emission reductions through optimization of boiler operation in Indonesia	Indonesia	Utility Optimization Control
10	ID_AM008	1.0	Installation of a separate type fridge-freezer showcase by using natural refrigerant for grocery store to reduce air conditioning load inside the store	Indonesia	Separate type fridge-freezer showcase

Reference：JCM Approved Methodologies (3)

No	Meth No	Rev	Title	Country	Tech. Type
11	ID_AM009	1.0	Replacement of conventional burners with regenerative burners for aluminum holding furnaces	Indonesia	Regenerative Burner
12	ID_AM010	1.0	Introducing double-bundle modular electric heat pumps to a new building	Indonesia	Heat Pump
13	PW_AM001	1.0	Displacement of Grid and Captive Gen-set Electricity by a Small-scale Solar PV System	Palau	Solar PV System
14	VN_AM001	1.0	Transportation energy efficiency activities by installing digital tachograph systems	Vietnam	Digital Tachograph
15	VN_AM002	1.0	Introduction of Room Air Conditioners Equipped with Inverters	Vietnam	Inverter Air-conditioner
16	VN_AM003	1.0	Improving the energy efficiency of commercial buildings by utilization of high efficiency equipment	Vietnam	High efficiency Boiler, Heat Pump

Reference：JCM Approved Methodologies (4)

No	Meth No	Rev	Title	Country	Tech. Type
17	VN_AM004	1.0	Introducing double-bundle modular electric heat pumps to a new building	Vietnam	Heat Pump
18	VN_AM005	1.0	Installation of energy efficient transformers in a power distribution grid	Vietnam	Transformer in power distribution network
19	MV_AM001	1.0	Displacement of Grid and Captive Gen-set Electricity by Solar PV System	Maldives	Solar PV System
20	KE_AM001	1.0	Electrification of communities using Micro hydropower generation	Kenya	Micro hydropower
21	BD_AM001	1.0	Energy Saving by Introduction of High Efficiency Centrifugal Chiller	Bangladesh	Chiller
22	KH_AM001	1.0	Installation of LED street lighting system with wireless network control	Cambodia	LED
23	ET_AM001	1.0	Electrification of communities using Micro hydropower generation	Ethiopia	Micro hydropower

As of end of August, 2016

Reference (Sourced from IGES website)

Websites for further guidance on MRV and the JCM methodologies

Official JCM Webpage:

rules and guidelines for each country, JCM methodology, public inputs announcement, JCM projects

https://www.jcm.go.jp/

IGES JCM Database:

details of methodologies, project cycle, feasibility studies, duration, statistics, etc.

http://bit.ly/igesjcmdatabase

online version of a print guidebook titled "One Hundred Questions and Answers about MRV in Developing Countries." for better understanding the existing Measuring, Reporting, and Verification (MRV) schemes for greenhouse gases in developing countries.

http://www.iges.or.jp/en/climate/mrv100/index.html

IGES provides technical support for methodology development, PDD development and preparation of monitoring report.

Thank you!