



Monitoring report form for CDM project activity
(Version 07.0)

MONITORING REPORT

Title of the project activity	10 MW Manjanadka Hydro project, Karnataka, India	
UNFCCC reference number of the project activity	9467	
Version number of the PDD applicable to this monitoring report	01.1	
Version number of this monitoring report	01	
Completion date of this monitoring report	27/01/2020	
Monitoring period number	01	
Duration of this monitoring period	01/01/2013 to 31/12/2019 (Inclusive of both the days)	
Monitoring report number for this monitoring period	01	
Project participants	M/s Bhoruka Power Corporation Limited	
Host Party	India	
Applied methodologies and standardized baselines	AMS-I.D. ver. 17 - Grid connected renewable electricity generation	
Sectoral scopes	Sectoral Scope 1 : Energy industries (renewable/ non-renewable sources)	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0 tCO ₂ e	85,585 tCO ₂ e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	207,585	

SECTION A. Description of project activity

A.1. General description of project activity

The purpose of the run-of-river 10 MW hydro power project activity in Kodagu district in the state of Karnataka is to generate green electricity utilizing the natural available water resources in the state of Karnataka (India) and export to grid through KPTCL. Electricity generation is achieved by installing two 5 MW horizontal Francis turbines. The project activity utilizes flows in the Manjanadka River and a gross head of about 50 meters at the location of the project activity. The river, over a length of about 2 km upstream of road-bridge near Chettugai village, has many rapids resulting in a total head of about 50 meters which can be utilized advantageously to generate power. The Project has led to reduced greenhouse gas emissions because it displaces electricity from fossil fuel based electricity generation plants. In the absence of the CDM project activity, the equivalent amount of electricity would have been generated from the connected / new power plants in the southern regional grid (now synchronized with erstwhile NEWNE grid and form INDIAN grid) leading to GHG emission as grid is dominated by fossil fuel based power plants.

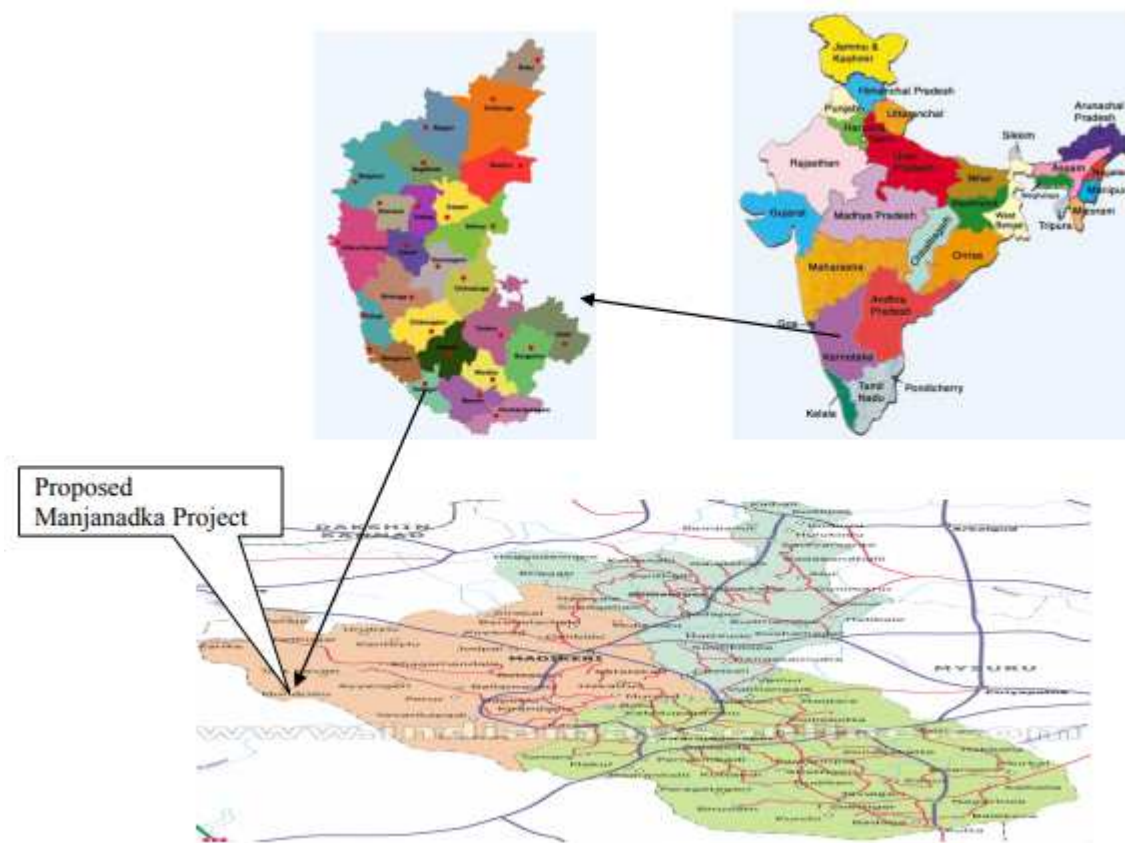
The construction of the project activity started in January 2007 and commissioned on 27 June, 2009. The project activity is operational with normal operation and maintenance during current monitoring period i.e. 01/01/2013 to 31/12/2019. The project activity has supplied 101,537 MWh electricity to grid during current monitoring period, which has resulted emission reduction of 85,585 tCO₂e.

A.2. Location of project activity

The project is located in Chetugai village, just upstream of the bridge on the Bhagamandala Karike road across Manjanadka river, in Kodagu district of Karnataka. Manjanadka River is one of the many west flowing streams of Karnataka. The stream, which originates in the Brahmagiri hill ranges of the Western Ghats near Bhagamandala, traverses through Karnataka and Kerela and joins Payaswini river, which empties into Arabian sea near Kasargod. The project site is about 22 KM from Bhagamandala, and 55 KM from the district town of Madikere and about 300 KM from the state capital Bangalore. The geo-coordinates of the project location are:

Latitude: 12° 26' 40" N, Longitude: 75° 25' 9" E

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A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host)	Bhoruka Power Corporation Limited (Private entity)	No

A.4. References to applied methodologies and standardized baselines

Sectoral Scope 1: Energy industries (renewable - / non-renewable sources)
AMS-I.D. ver. 17 - Grid connected renewable electricity generation¹

A.5. Crediting period type and duration

01 January 13 – 31 December 2022 (Fixed)

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

The project activity is implemented and operated as per registered PDD, there were no incident which affects the applicability of applied baseline and monitoring methodology. The project activity is a 10 MW run-of-river hydroelectric project, which utilizes hydro potential to generate GHG

¹ <https://cdm.unfccc.int/UserManagement/FileStorage/V9LRSXKP24Q7YT6HZDUBO3C0ING8AJ>

emission-free electricity and exports it to the regional grid. The project was commissioned on 27/06/2009 and since then the project is operational. The 10 MW hydro power plant has undergone normal shutdown periods (because of maintenance) periodically and the details have been provided in the Appendix 1.

The technology employed for power generation in the small scale project activity involves the conversion of potential energy available in the water flow into mechanical energy using hydro turbines and then into electric energy using alternators. The generated power is evacuated to KPTCL’s existing sub -station at Sulya by a 17.5 km long double circuit 33 kV transmission line.

Two horizontal Francis turbines of 5 MW each are used for power generation. The type of turbine is of horizontal shaft Francis type directly coupled to the Horizontal synchronous generator. The turbine is with adjustable guide vanes for control of the flow. The guide vanes are actuated by the guide vane servomotor through the governor. The main parameters of the proposed turbine are furnished below:

Turbines	
Rated Capacity	5000 kW
Rated Flow	12.25m ³ / sec
Rated Head	47 m
Runner diameter	1325 mm
Rated Speed	428 rpm

Each of the synchronous generators is 5 MW, 11 kV, 3 phase 0.85 PF (lag), 50 Hz with static or brushless excitation system, suitable for parallel operation with the KPTCL grid. The speed of the generator was decided by the vendor to provide the most economical and optimum design to match the turbine speed. The generator winding is class F insulation with temperature rise limited to class B and is star connected. The generator neutral is earthed through neutral grounding transformer with secondary resistance. The details of the generators and the hydrology are given below:

Generators	
Number	2
Type	Horizontal Synchronous
Rated output	5000 kW
Generation voltage	11 kV

Hydrology	
Catchment area	45 Sq. km (up to Diversion Weir)
Average annual Rainfall	5269 mm
Design Peak Flood	750 m ³ /second (estimated)

Evacuation of Power Generated

It is proposed to evacuate the power generated at Manjanadka Mini Hydel Scheme to the existing 33/11 kV sub- station at Sulya by using two step-up transformers and a double circuit 33 kV transmission line. The route length of the transmission line is about 17.5 km.

There was no event or situation occurred during current monitoring period that may had impact the applicability of the baseline and monitoring methodology. There were no hindrance in the operation of the project during the current monitoring period but there were some minor overhaul times and downtimes of the equipment. The project activity was operation with normal operation and maintenance during current monitoring period i.e. 01/01/2013 to 30/11/2019. There were no shut down during current monitoring period.

B.2. Post-registration changes**B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents**

There was no deviation from registered monitoring plan and or applied methodology during current monitoring period.

B.2.2. Corrections

There was no correction from registered PDD during current monitoring period.

B.2.3. Changes to the start date of the crediting period

There was no change in crediting period start date.

B.2.4. Inclusion of monitoring plan

Not applicable

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

There were no changes from registered monitoring plan, applied methodology during current monitoring period.

B.2.6. Changes to project design

No change in project design during current monitoring period.

B.2.7. Changes specific to afforestation or reforestation project activity

As the project activity falls under Sectoral Scope 1: Energy industries (renewable - / non-renewable sources) this section is not applicable.

SECTION C. Description of monitoring system

The energy exported by Boruka Power is recorded from independent Main meter installed at Pilakala substation. In the event, the Main meter is not in operation, and the reading from Check meter is used for billing. The calibration of monitoring equipment is being maintained as per the requirement of KPTCL and the same is being done regularly. Electricity export to grid & electricity import from grid is being recorded daily and the same is being verified by the plant in-charge.

MONITORING ORGANISATION STRUCTURE

The company Boruka Power Corporation Ltd. is managed by a Board of Directors. The company is managed professionally with a full time Managing Director. He is assisted by Sr. Vice President (Technical), who is in charge of all technical aspects, and a Vice President (Finance), Sr. Vice President (Technical), responsible for all projects, has under him a Deputy General Manger (O&M), who is responsible for operation & maintenance of all the running plants. He in turn is assisted by Plant Manager for each of the Hydro Plants. The Plant Manager is assisted by engineers/Asst.

Managers for each activity of operation & maintenance in the respective plant.

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data of the CDM activity rests with Sr. Vice President (Technical), For monitoring activities of GHG and preparation of necessary reports, for review by the management, the responsibilities rest with concerned plant manager.

The responsibility of storage and archiving of information in good condition also lies with Plant Manager. Sr. Vice President (Technical) undertakes periodic verification and onsite inspections to ensure the quality of the data collected by the team and initiate steps in case of any abnormal conditions.

The readings from energy meters (i.e., Electricity supplied to the grid (EG_{y}), electricity export by the project $EG_{export, y}$ & Grid electricity import to the project activity ($EG_{import, y}$) is being taken on a daily basis by the shift supervisor and recorded in logbooks. This daily data is being signed off at the end of every subsequent day by the shift in charge/ power plant manager.

Energy meters needs to be calibrated every quarter and sealed as per the PPA, Hence, high quality is ensured for all the above parameters. Generated energy is fed in to the Grid by two lines. Hence for measurement purpose there are total two main meters and two check meters for two lines.

The Power Purchase Agreement signed by the Project Participants and the KPTCL provides procedures for monitoring the energy fed to the grid, emergency preparedness, calibration of monitoring equipment as well as operation and maintenance responsibilities of the company. These parameters are regularly reviewed. Hence, no separate procedures for QA/QC are provided in this monitoring plan.

The project has necessary provisions for emergency preparedness so that any unforeseen events such as fire etc. could be averted. The provisions include fire fighting systems, standby features for critical items etc.

All the data monitored under the monitoring plan is being kept in electronic form and hard copy format for 2 years after the end of crediting period or the last issuance of CERs for this project activity whichever occurs later. The monitored data has been presented to the DOE to whom verification of emission reductions is assigned. The company, as corporate policy, delegated and upgraded the responsibilities of various functional heads. These revisions are updated in the ISO procedures.

MONITORING INFORMATION

All the parameters mentioned in the monitoring plan are being maintained at the plant. The entire process of monitoring is made available in the required format during the verification process and for subsequent useful purposes. The calibration of monitoring equipment is being maintained as per the requirement of KPTCL and the same is being be done regularly.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	EF_{grid, CM,y}
Unit	tCO ₂ / MWh
Description	Combined margin emission factor of Southern grid
Source of data	CO2 Baseline Database version 07.0 published by CEA
Value(s) applied	0.8429

Choice of data or measurement methods and procedures	The fixed ex-ante combined margin emission factor is used in the calculation of emission reductions. The combined margin has been calculated as per “Tool to calculate the emission factor for an electricity system” (Version 02.2.1) with 3 years vintage data of simple OM and recent data of BM. The calculation is based on 50% of OM and 50% of BM values approach.
Purpose of data/parameter	For the calculation of baseline emissions
Additional comments	This database is an official publication of Government of India for the purpose of CDM baseline. It is based on most recent data available to the Central Electricity Authority and hence considered authentic. As the calculation of baseline emission has been done ex ante its value will remain fixed for the entire crediting period.

Data/Parameter	EF_{OM, y}
Unit	tCO ₂ / MWh
Description	CO ₂ Operating margin emission factor of the grid
Source of data	CO ₂ Baseline Database version 07.0 published by CEA
Value(s) applied	0.9521
Choice of data or measurement methods and procedures	Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with “Tool to calculate the emission factor for an electricity system” version 2.2.1.
Purpose of data/parameter	For the calculation of baseline emissions
Additional comments	This database is an official publication of Government of India for the purpose of CDM baselines. It is based on most recent data available to the Central Electricity Authority and hence considered authentic. As the calculation of baseline emission has been done ex ante its value will remain fixed for the first crediting period

Data/Parameter	EF_{BM, y}
Unit	tCO ₂ / MWh
Description	CO ₂ Build margin emission factor of the grid
Source of data	CO ₂ Baseline Database version 07.0 published by CEA
Value(s) applied	0.7338
Choice of data or measurement methods and procedures	Build Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with “Tool to calculate the emission factor for an electricity system” version 2.2.1.
Purpose of data/parameter	For the calculation of baseline emissions
Additional comments	This database is an official publication of Government of India for the purpose of CDM baselines. It is based on most recent data available to the Central Electricity Authority and hence considered authentic. As the calculation of baseline emission has been done ex ante its value will remain fixed for the first crediting period

D.2. Data and parameters monitored

Data/Parameter	EG_{export y}
Unit	MWh
Description	Electricity exported to the grid by the project during the year y.
Measured/calculated/default	Measured
Source of data	Joint Meter reading (Form-B) by KPTCL.

Value(s) of monitored parameter	Year	Electricity Exported to the grid	
	2013	18366.75	
	2014	14535.75	
	2015	13162.50	
	2016	11651.25	
	2017	12110.25	
	2018	15753.75	
	2019	16641.75	
	Total	102222	
Monitoring equipment	Line 1		
	Particulars	Main Meter	Check Meter
	Serial No.	8036496	8036501
	Maximum allowable error	±0.2%	±0.2%
	Line 2		
	Serial No.	8036521	8036523
Maximum allowable error	±0.2%	±0.2%	
Measuring/reading/recording frequency	Continuous monitoring and Monthly recording		
Calculation method (if applicable)	This parameter is measured by the equipment (energy meter) and considered accordingly; hence calculation method is not applicable		
QA/QC procedures	The value of this parameter can be cross checked with all the invoices generated for the sold electricity during the year y. Energy meters are calibrated every calendar quarter as per Power Purchase Agreement.		
Purpose of data/parameter	For the calculation of baseline emissions		
Additional comments	This data will be kept in electronic form and hard copy format for 2 years after the end of crediting period or the last issuance of CERs for this project activity whichever occurs later		

Data/Parameter	EG_{import, y}	
Unit	MWh	
Description	Electricity import to the project activity during the year y	
Measured/calculated/default	Measured	
Source of data	Joint Meter reading (Form-B) by KPTCL.	
Value(s) of monitored parameter	Year	Electricity imported to the project activity
	2013	99.75
	2014	105.00
	2015	98.25
	2016	99.75
	2017	93.75
	2018	91.50
	2019	96.75
	Total	684.75

Monitoring equipment	Line 1		
	Particulars	Main Meter	Check Meter
	Serial No.	8036496	8036501
	Maximum allowable error	±0.2%	±0.2%
	Line 2		
	Serial No.	8036521	8036523
	Maximum allowable error	±0.2%	±0.2%
Measuring/reading/recording frequency	Continuous monitoring and monthly recording		
Calculation method (if applicable)	This parameter is measured by the equipment (energy meter) and considered accordingly; hence calculation method is not applicable		
QA/QC procedures	The value of this parameter can be cross checked with all the invoices generated for the sold electricity during the year y. Energy meters are calibrated every calendar quarter as per Power Purchase Agreement.		
Purpose of data/parameter	For the calculation of baseline emissions		
Additional comments	This data will be kept in electronic form and hard copy format for 2 years after the end of crediting period or the last issuance of CERs for this project activity whichever occurs later		

Data/Parameter	EG_y	
Unit	MWh	
Description	Net electricity supplied to the grid by the project activity during the year y	
Measured/calculated/default	Calculated	
Source of data	-	
Value(s) of monitored parameter	Year	Net electricity supplied to grid by the project activity
	2013	18267.00
	2014	14430.75
	2015	13064.25
	2016	11551.50
	2017	12016.50
	2018	15662.25
	2019	16545.00
	Total	101537.25
Monitoring equipment	-	
Measuring/reading/recording frequency	Monthly recording	
Calculation method (if applicable)	Net electricity is determined by the State electricity utility by subtracting the values of EG _{export, y} and EG _{import, y} which are being sourced from the Form-B $EG_y = \text{Electricity exported to the grid by the project during the year } y$ $(EG_{\text{export, } y}) - \text{Electricity import to the project activity during the year } y$ $(EG_{\text{import, } y})$	
QA/QC procedures	The value of this parameter is cross checked with all the invoices generated for the sold electricity during the year y. Furthermore, Energy meters are calibrated every calendar quarter as per Power Purchase Agreement.	
Purpose of data/parameter	For the calculation of baseline emissions	
Additional comments	This data will be kept in electronic form and hard copy format for 2 years after the end of crediting period or the last issuance of CERs for this project activity whichever occurs later	

D.3. Implementation of sampling plan

Sampling is not applicable in this project activity

SECTION E. Calculation of emission reductions or net anthropogenic removals**E.1. Calculation of baseline emissions or baseline net removals**

As described in the section above, the total emission reduction achieved in a year would be

$$ER_y = BE_y - PE_y - LE_y$$

Where,

ER_y is the Emission reductions during the year y

BE_y is the Baseline emissions during the year y

PE_y is the Project emissions during the year y

LE_y is the Leakage emissions during the year y

Baseline emissions:

The baseline emissions are calculated based on the given formula:

$$BE_y = EG_{BL,y} * EF_{CO_2,grid,y}$$

Where,

$EG_{BL,y}$ is the net electricity supplied to grid by the project activity

$EF_{CO_2,grid,y}$ is CO2 emission factor of the grid

$$EF_{CO_2,grid,y} = 0.8429 \text{ tCO}_2/\text{MWh}$$

Net electricity supplied to the grid by the Project during current monitoring period i.e. 01-January-2013 to 31-December-2019 = 101537.25 MWh (Please refer Spreadsheet for details of calculations)

Baseline emissions,

$$BE_y = 0.8429 \text{ tCO}_2\text{e/MWh} \times 101537.25 \text{ MWh} = 85585.75 \text{ tCO}_2\text{e}$$

Year-wise calculation of Baseline Emissions

Year	EG _{BL,y} (MWh)	EF _{CO₂,grid,y} (tCO ₂ /MWh)	BE _y (tCO ₂)
2013	18267	0.8429	15397.25
2014	14430.75	0.8429	12163.68
2015	13064.25	0.8429	11011.86
2016	11551.50	0.8429	9737.76
2017	12016.50	0.8429	10128.71
2018	15662.25	0.8429	13201.71
2019	16545.00	0.8429	13945.78
Total	101537.25		85585.75

Total Baseline Emissions (BE_y) = 85,585 tCO₂ (round-down value)

E.2. Calculation of project emissions or actual net removals

As per AMS I.D (Version 17), the project emissions are zero.

Therefore,

$$PE_y = 0 \text{ tCO}_2\text{e}$$

E.3. Calculation of leakage emissions

As per AMS I.D. (Version 17), and leakage emissions are to be taken into account “If the energy generating equipment is transferred from another activity, leakage is to be considered. Since transfer of equipment is not envisaged in the project activity, the leakage emissions will be equal to zero. Therefore,

$$LE_y = 0 \text{ tCO}_2\text{e}$$

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO ₂ e)	Project GHG emissions or actual net GHG removals (t CO ₂ e)	Leakage GHG emissions (t CO ₂ e)	GHG emission reductions or net anthropogenic GHG removals (t CO ₂ e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	83,094	0	0	0	83,094	83,094

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (t CO ₂ e)	Amount estimated ex ante for this monitoring period in the PDD (t CO ₂ e)
83,094	207,585

E.5.1. Explanation of calculation of “amount estimated ex ante for this monitoring period in the PDD”

Considering the annual average emission reductions as per the registered PDD which is 29,655 tCO₂e per year, the number of days covered during the current monitoring period comes out to be 2556 days, based upon which the estimated emission reductions attributed to this monitoring period comes out to be 207,585 tCO₂e. The detailed calculation can be referred from the emission reduction sheet.

E.6. Remarks on increase in achieved emission reductions

During this project activity, the actual emission reductions obtained is lower than the estimated value.

E.7. Remarks on scale of small-scale project activity

The project activity remain as a small scale project activity for the entire period.

Appendix 1: Outage details

Year-wise plant outage details (in hours) are provided here:

YEAR	SO-Mech.	SO-Elect	SO-Civil	USO - Mech.	USO-Elect	KPTCL (Grid failure)	USO-Irrigation.	Loss due to high river discharge	Any other outage	Total

CDM-MR-FORM

2012-13	19.96	0.0	2.91	10.07	0.0	345.71	0.0	0.0	21.5	400.14
2013-14	0.0	22.0	149.35	0.0	8.53	682.37	0.0	0.0	0	862.25
2014-15	0.0	35.01	59.74	14.2	0.73	1161.95	0.0	0.0	6.3	1277.925
2015-16	0.0	16.47	67.11	8.2	4.19	718.28	0.0	0.0	0.0	814.25
2016-17	0.0	0	2.99	0.0	23.56	635.01	0.0	0.0	0.0	661.56
2017-18	0.0	210.08	12.87	0.0	9.04	769.58	0.0	0.0	0.0	1001.57
2018-19	16.5	15.0	279.14	0.0	19.12	1421.36	0.0	0.0	0.0	1751.12
2019-20	0.0	16.24	51.68	0.0	0.0	1151.21	0.0	0.0	318.2	1537.3
Total	36.46	314.80	625.79	32.47	65.164	6885.467	0.00	0.0	27.80	8306.131

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
07.0	31 May 2019	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 02.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period; • Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods; • Make editorial improvements.
06.0	7 June 2017	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 01.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

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