Validation report form for renewal of crediting period for CDM project activities

(Version 03.0)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title and UNFCCC reference number of the project activity	Title: Metro Delhi, India UNFCCC reference No:4463
Number and duration of the next crediting period	2nd Crediting period Duration: 30/06/2018 to 29/06/2025
Version number of the validation report	1.0 Aa
Completion date of the validation report	28/10/2019
Version number of PDD to which this report applies	Version 05 of 03/09/2019
Project participants	Delhi Metro Rail Corporation Ltd. Grütter Consulting AG
Host Party	India
Applied methodologies and standardized baselines	ACM0016: Baseline Methodology for Mass Rapid Transit Projects; Version 04
Mandatory sectoral scopes	7 : Transport
Conditional sectoral scopes, if applicable	NA
Estimated amount of annual average GHG emission reductions or GHG removals by sinks in the next crediting period	516,307 tCO_2e
Name and UNFCCC reference number of the DOE	RINA Services S.p.A. (RINA) E-0037
Name, position and signature of the approver of the validation report	Laura Severino Head of Certification Innovation & Sustainability Unit 

SECTION A. Executive summary

>>**Purpose and general description and location**:
The objective of the Metro Delhi is the establishment and operation of an efficient, safe, rapid, convenient, comfortable and effective modern mass transit system ensuring high ridership levels in the city of Delhi, India. The Mass Rapid Transit System (MRTS) is a partially elevated, partially underground and partially at-grade heavy duty metro. The CDM project includes all corridors of Phase II except New Delhi – Airport and Airport–Dwarka Sector 21 of Metro Delhi managed by DMRC (Delhi Metro Rail Corporation Ltd.).

Validation scope:
The objective of the Validation is to have an independent evaluation of a project activity by a designated operational entity against the requirements of the CDM as set out in decision 3/CMP.1, its annex and relevant decisions of the COP/MOP, on the basis of the project design document. In particular, the project's baseline, monitoring plan, and the project's compliance with relevant UNFCCC requirements and host Party criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).
The validation scope is to review the PDD against the UNFCCC criteria for CDM.
UNFCCC criteria for CDM refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures, and the subsequent decisions by the CDM Executive Board.
Validation is not meant to provide any consultancy towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

Validation process:
Validation was conducted using RINA procedures in line with the requirements specified in the CDM M&P, the latest version of the CDM Validation and Verification Standard, and relevant decisions of the COP/MOP and the CDM EB and applying standard auditing techniques.
The validation consisted of the following three phases:

- Document review;
- Follow-up actions;
- The resolution of outstanding issues and the issuance of the final validation report.

Conclusion:
Grütter Consulting AG has commissioned RINA to carry out the validation (renewal of crediting period) of the project activity "Metro Delhi, India" in India, with regard to the relevant requirements for CDM activities.

This report summarizes the findings from the validation of the updated PDD of the project, performed on the basis of UNFCCC criteria for CDM, as well as criteria given by the CDM Validation and Verification Standard, CDM Project Cycle Procedure and CDM Project Standard and included an assessment of:
(a) The impact of new relevant national and/or sectoral policies and circumstances on the baseline taking into account relevant guidance from the Board with regard to renewal of the crediting period at the time of requesting renewal of crediting period.

(b) The correctness of the application of an approved baseline methodology for the determination of the continued validity of the baseline or its update, and the estimation of emission reductions for the applicable crediting period.

In conclusion, it is RINA's opinion that the project meets all the relevant requirements for the renewal of the crediting period.

SECTION B. Validation team, technical reviewer and approver

B.1. Validation team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interview(s)	Validation findings
1.	Team Leader & Validator	IR	Buragohain	Champok	RINA India	√	√	√	√
2.	Technical Expert	IR	S. Nair	Sajitha	RINA India	√	√	√	√

B.2. Technical reviewer and approver of the validation report for RCP

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer	IR	Zhou	Jun	RINA China
2.	Approver	IR	Severino	Laura	RINA HQ

SECTION C. Means of validation

C.1. Desk/document review

>>The PDD, version 05 of 03/09/2019 and previous version 01 of 25/07/2019 **/01/**, in particular the applicability of the methodology, the baseline determination, the additionality of the project activity, the starting date of the project, the monitoring plan, the emission reduction calculations provided in the form of a spreadsheet (CER sheet.xlsx) **/02/** were assessed as part of the validation.
Appendix 3 lists the documentation that was reviewed during the validation.

C.2. On-site inspection

Duration of on-site inspection: 17/08/2019 to 17/08/2019				
No.	**Activity performed on-site**	**Site location**	**Date**	**Team member**
1.	Access the project activity, technical specifications, operational status	DMRC office, Delhi	17/08/2019	Champok Buragohain & Sajitha S. Nair
2.	Review and discuss 'Baseline scenario			
3.	Review and discuss 'Project Boundary			
4.	Review and discuss 'Applicability of methodology'			
5.	Review and discuss 'Monitoring plan, monitoring and measuring systems			
6.	Review and discuss 'Data management and reporting, QA/QC systems			

C.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Singhal	Vikash	Deputy General	17/08/2019	- Project activity - Baseline	Champok Buragohain & Sajitha S. Nair

			ManagerEnvironment, Delhi Metro		scenario - Project boundary - Applicability of the methodology - Monitoring plan - Data management and reporting, QA/QC systems - Monitoring / measuring systems - Metering guidelines , Meter specifications – Accuracy, make - Calibration requirements – procedure, frequency/schedule	
2.	Kurien	Anil	Manager-Environmen, Delhi Metro			

C.4. Sampling approach

>>Not applicable

C.5. Clarification requests (CLs), corrective action requests (CARs) and forward action requests (FARs) raised

Area of validation findings	No. of CL	No. of CAR	No. of FAR
Compliance with PDD form		1	
Application and selection of methodologies and standardized baselines			
Validity of original baseline or its update		1	
Estimated emission reductions or net anthropogenic removals	1		
Validity of monitoring plan			
Crediting period			
Project participants			
Post-registration changes			
Others (please specify)			
Total	1	2	0

SECTION D. Validation findings

D.1. Compliance with PDD form

Means of validation	The updated PDD/1/ has been validated against the valid version of the applicable PDD form version 11 /07/ and the instructions therein for filling out the PDD form.
Findings	CAR 01 was rasied as updated PDD was not completed as per instructions to fill the PDD to which PP has updated the PDD with all relevant details and hence CAR was closed.
Conclusion	RINA confirms that the updated PDD is in compliance with the latest version of the PDD form (version 11) and the instructions therein for filling out the PDD form. RINA also confirms that the project participants have updated the relevant sections of the PDD in accordance with the relevant requirements in the Project Standard. RINA further confirms that the information transferred to the updated version of the PDD is materially the same as that in the registered PDD.

D.2. Application and selection of methodologies and standardized baselines

Means of validation

The PP has applied the methodology ACM0016 Version 04. This version of the methodologies is the latest version and currently valid for the submission of project activity. The project activity meets the criteria defined in the baseline methodology as described below:

Criteria	Means of verification
The project constructs a new rail-based infrastructure or segregated bus lanes: (a) For rail systems, the project needs to involve the construction of a new infrastructure (new rail lines); (b) For BRTs, the project can be based on existing road infrastructure, but which separates physically bus lanes from mixed traffic. The methodology is applicable for the segregated BRT bus lanes or the rail-based MRTS replaces existing bus routes (e.g. through scrapping units or through closing or re-scheduling existing bus routes) operating under mixed traffic conditions.	The MRTS is new rail-based mass transit system and replaces partially bus operations operating under mixed traffic conditions. The rail infrastructure is new. Bus routes and schedules are adapted to metro. Evidence of this is the listing of bus routes to be eliminated along Delhi Metro[1] as well as urban planning documents for multi-mode transport schemes coordinating bus and metro services[2]. Hence, applicability condition is justified.
Fuels including (liquified) gaseous fuels or biofuel blends, as well as electricity can be used in the baseline or project case. The following conditions apply in case of biofuels: (a) The project buses shall use the same biofuel blend (same percentage of biofuel) as commonly used by conventional comparable urban buses in the country i.e. the methodology is not applicable if project buses use higher or lower blends of biofuels than those used by conventional buses; (b) The project buses shall not use a significantly higher biofuel blend than cars and taxis.	The project is rail-based and uses electricity. Baseline transport fuels are diesel, gasoline and gaseous fuels. No bio-fuels are used in the baseline or project case. Baseline buses use CNG while the project uses electricity. Thus more natural gas is used in the baseline than in the project case as passengers switch partially from buses to metro. The project does not operate any buses (no project buses). Hence, applicability condition is justified.
The methodology is applicable for urban or suburban trips. It is not applicable for interurban transport	The MRTS is purely urban transport. Hence, condition is justified.
The methodology is not applicable for: (a) Operational improvements (e.g. new or larger buses) of an already existing and operating bus lane or rail-based MRTS; (b) Bus lanes replacing an existing rail-based system i.e. the existing urban or suburban rail infrastructure shall	The MRTS is a new metro with new infrastructure. The MRTS is rail-based only. No air or water-based transport is included. Hence, applicability condition is justified.

[1] File 45
[2] File 46

	remain fully (in its full length) operational; (c) The implementation of air- and water-based transport systems	
	The methodology is applicable if the most plausible baseline scenario is the continuation of the use of current modes of transport.	The identified baseline is a continuation of the current urban transit system. Hcenc, applicable.
Findings	N/A	
Conclusion	RINA hereby confirms that the selected baseline and monitoring methodology has been previously approved by the CDM Executive Board, and is applicable to the Project, which complies with all the applicability conditions therein and the selected version is valid at the time of submission of the proposed project activity for renewal of crediting period. It is also confirmed that the methodology is correctly applied by comparing it with the actual text of the applicable version of the methodology and there is no deviation from the selected methodology.	

D.3. Validity of original baseline or its update

Means of validation	The project participant has included the assessment of the validity of the original baseline as per the tool "Assessment of the validity of the original/ current baseline and update of the baseline at the renewal of a crediting period", Version 3.0.1 /**08**/, which has been concluded to be still valid and applicable for the project The tool consists of two steps. The first step provides an approach to evaluate whether the current baseline is still valid for the next crediting period. The second step provides an approach to update the baseline in case that the current baseline is not valid anymore for the next crediting period. Step 1: Assess the validity of the current baseline for the next crediting period Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies The project is a new rail-based mass transit system. The baseline scenario is continuation of existing modes of transport including bus, car, taxi, motorcycle, 3-wheelers, sub-urban rail or Non-Motorized Transport. All these modes of transport are legally alloed to operate within the project boundary. No policy restrict the operation of these modes of transport system /**17**/. Therefore, the baseline scenario is still valid as per the original registered PDD. Thus it can be concluded that original baseline scenario will remain valid for next crediting period. Step 1.2: Assess the impact of circumstances The project activity is a a new rail-based mass transit system as alternative transport mode against bus, car, taxi, motorcycle, 3-wheelers, sub-urban rail or Non-Motorized Transport. In the absence of the project, the equivalent passengers would have used other modes of transport system (bus, car, taxi, motorcycle, 3-wheelers, sub-urban rail or Non-Motorized Transport). There are no new national/sectoral policies/legislation/circumstance that could affect the baseline scenario during the renewal of the crediting period. There is no change observed in this regard and it can be concluded that the conditions used to determine the baseline emissions in the previous crediting period are still valid. Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested. In the absence of the project activity, equivalent passengers that are covered under the MRTS would have used other modes of transport system (bus, car, taxi, motorcycle, 3-wheelers, sub-urban rail or Non-Motorized Transport). Vehicle renewal takes place which involve change of fuel types or emission factors of baseline vehicles. Therefore an investment is not the most likely scenario for the crediting period for which renewal is requested. Step 1.4: Assessment of the validity of the data and parameter "Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission

factors, values or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the CDM project activity".

Following data parameters are updated from registered PDD:

Data/Parameter	Value in registered PD	Value in updated PD	Assessment
Specific fuel consumed of passenger cars (C) and taxis (T) using gasoline or diesel ($\mathbf{SFC_{C/T, G/D}}$)	Gasoline: 53.98 g/km (Passenger car) Diesel: 48.59 g/km (passenger car) 6.07 g/km gasoline (Taxi)	Gasoline car/taxi: 44 g/km Diesel car/taxi: 42 g/km	The updates value is as per 'methodological tool: Baseline emissions for modal shift measures in urban passenger transport' which is consistent with methodology options /04/,/18/. Hence accepted.
Specific fuel consumed of passenger cars (C) and taxis (T) using CNG ($\mathbf{SFC_{C/T, CNG}}$)	64.00 g/km	63 g/km	The updated value is as per international literatute /**11**/ which is alternative 2 to consider value for the parameter as per the applied methodology /**04**/. Hence, accepted.
Specific fuel consumed of motorcycles ($\mathbf{SFC_M}$)	13.43 g/km	15 g/km	The updates value is as per 'methodological tool: Baseline emissions for modal shift measures in urban passenger transport' which is consistent with methodology options /04/,/18/. Hence accepted.
Specific fuel consumed of motorized auto-rickshaws ($\mathbf{SFC_{TR}}$)	32 g/km	35 g/km	The updated value is as per National literature /**19**/ which is alternative 2 as per applied methodology and hence accepted.
Specific fuel consumed of buses ($\mathbf{SFC_B}$)	348.43 g/km	459 g/km	The updated value is as per official statistics of Delhi Transport Corporation that manages all public buses in Delhi /**12**/ which is consistent with alterbative 1 of Methodological tool: Baseline emissions for

					modal shift measures in urban passenger transport. Hence accepted.	
		Percentage of passenger cars using fuel type: gasoline, diesel or CNG ($N_{C,G/D/CNG}$)	Gasoline: 81.8% Diesel: 10.6% CNG: 7.6%	Gasoline: 62.6% Diesel: 25.8% CNG: 11.6%	The updated value is as per actual share of vehicles registered under Department of Transport, Delhi, for the year 2017 /**13**/. Hence accepted the updated value.	
		Emission factor of the grid (EF_{Grid})	0.8409 kg CO2/kWh	0.92 kg CO2/kWh	The updated value is as per official data published by Central Electricity Authority, Govt. of India in June 2018 /**14**/ and latest available data for the country. The grid emission factor is calculated by the authority as per 'Tool to calculate baseline, project and/or leakage emissions from electricity consumption; and hence value is accepted.	
		Average technical transmission and distribution losses for providing electricity (TDL)	3.91%	2.6%	The value is considered from official data published by National Load dispatch center for the period April-June 2019 /**15**/. Highest reported value for Northern region is considered conservatively. Hence, accepted by the validation team.	
		Average occupation rate of passenger cars (C), taxis (T) and motorcycles ($OC_{C,T,M}$)	Car= 1.60 Taxi = 1.16 Motorcycle =1.40	Car= 2 Taxi = 1.1 (excluding driver) Motorcycle =1.15	The updates value is as per 'methodological tool: Baseline emissions for modal shift measures in urban passenger transport' which is consistent with methodology options /04/,/18/.	

					Hence accepted.	
		Average occupation rate of motorized rickshaws ($\mathbf{OC_{TR}}$)	1.40	1.16	The updated value is as per survey of occupation rate for Delhi realized by 3rd Party. The survey was performed July 2019 in Delhi. The survey results are provided and sample size is determined as per Guideline "Sampling and surveys for CDM project activities and programmes of activities" Version 04.0 **/20/, /21/**. The approach is as per applied methodology and hence accepted.	
		Average occupation rate of buses (OC_B)	43 passengers and 57%	53 passengers and 80%	The updated value is as per publicly available data for public buses in Delhi which is 53 passengers per bus **/22/** and considering average occupancy of 80% as per default value from methodological tool: Baseline emissions for modal shift measures in urban passenger transport' **/18/**, 42.4 is arrived at. Hence, accepted.	
		Total passengers transported by baseline suburban rail-system per year ($\mathbf{P_{EL,R}}$)	2,887,200	2,557,000	The updated value is as per actual statistic for the year 2017-18 **/23/** and hence comply the methodology requirements.	

	<table><tr><td>Quantity of electricity consumed by the baseline rail system per annum ($EC_{EL,R}$)</td><td>3,855</td><td>2,636</td><td>The updated value is as per actual statistic for the year 2017-18 /**23**/ and hence comply the methodology requirements.</td></tr></table> Considering the guidance provided under this step, calculation of emission factor and baseline emissions are updated for the next crediting period as per step 2. Step 2: Update the current baseline and the data and parameters Since, the existing baseline scenario is still valid, this step is not applicable. Finally, it is concluded that the original baseline scenario is valid and assessment is complete as per "Tool for the assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period v3.0.1.
Findings	CAR 02 was rasied as validity of original baseline assessment as per the tool 'Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period' was not transparent in the updated PDD which PP has further clarified and rephrased in line with the tool. Hence, response is accepted and CAR is closed.
Conclusion	RINA concludes that the original baseline is valid and assessment is done as per methodological tool 'Tool for the assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period v3.0.1'. The assessment meets VVS Standard v. 2.0 paragraph 404.

D.4. Estimated emission reductions or net anthropogenic removals

Means of validation	As per para 96 of the applied methodology **/04/**, emission reduction is calculated as below: ERy =BEy-PEy-LEy Where, BEy-Baseline emissions PEy-Project emissions LEy-Leakage emissions. As per para 39 of the applied methodology /**04**/ , baseline emissions include the emissions that would have happened due to the transportation of the passengers who use the project activity, had the project activity not been implemented. This is differentiated according to the modes of transport (relevant vehicle categories) that the passengers would have used in the absence of the project. As per para 41 or equation 1 of the applied methodology, baseline emission is calculated as below: $$BE_y = \frac{P_y}{P_{SPER}} \sum_p \left(BE_{p,y} \cdot FEX_{p,y} \right)$$ Where: BE_y Baseline emissions in the year *y* (g CO_2) $BE_{p,y}$ Baseline emissions per surveyed passenger *p* in the year *y* (g CO_2) $FEX_{p,y}$ Expansion factor for each surveyed passenger *p* surveyed in the year *y* (each surveyed passenger has a different expansion factor) P_y Total number of passengers in the year *y* P_{SPER} Number of passengers in the time period of the survey (1 week) Total number of passengers in the year *y* (Py) is **monitored data**. For ex-ante purpose, constant value (518,402,062) is assumed based on the average number of passengers in the years 2015-2017.

Expansion factor for each surveyed passenger *p* surveyed (each surveyed passenger has a different expansion factor) ($FEX_{p,y}$) **is monitored data**.

The baseline emission per surveyed passenger is calculated based on the mode used, the trip distance per mode and the emission factor per mode:

$$BE_{p,y} = \sum_{i} BTD_{p,i,y} \cdot EF_{PKM,i,y}$$

Where:

$BE_{p,y}$	Baseline emissions per surveyed passenger *p* in the year *y* (g CO_2)
$BTD_{,p,i,y}$	Baseline trip distance *p* per surveyed passenger using mode *i* in the year *y* (PKM)
$EF_{PKM,i,y}$	Emission factor per passenger-kilometre of mode *i* in the year *y* (g CO_2/PKM)
i	Relevant vehicle category
p	Surveyed passenger
y	Year of the crediting period

The baseline is a continuation of various transport modes between which the population chooses includes Non-Motorized Traffic with bikes and per foot, Private passenger car, taxis, motorcycles, motorized rickshaws, buses and suburban rail. The survey includes also induced traffic i.e. trips which in absence of the project would not have been made.

Determination of the emission factor per passenger-kilometre ($EF_{PKM,i,y}$)

For the suburban rail (electricity-based vehicle category), the following equation is used:

$$EF_{PKM,i,y} = \frac{TE_{EL,i,y}}{P_{EL,i,y} \cdot TD_{EL,i}}$$

Where:

$EF_{PKM,i,y}$	Emission factor per passenger-kilometre of suburban rail for year *y* (gCO_2/PKM)
$TE_{EL,i,y}$	Total emissions from suburban rail for year *y* (tCO_2)
$P_{EL,i,y}$	Total passengers transported per year by suburban rail for year *y* (passengers)
$TD_{EL,i}$	Average trip distance of passengers using suburban rail prior to project start (km)
i	Suburban rail
y	Year of the crediting period

The electricity consumed and the passengers transported are monitored annually to track technological improvements in the rail-based system leading to changes in the emission factor per passenger transported.

For all other fuel-based vehicle categories, the emission factor per PKM is calculated as below:

$$EF_{PKM,i,y} = \frac{EF_{KM,i,y}}{OC_i}$$

Where:

$EF_{PKM,i}$	Emission factor per passenger-kilometre of vehicle category *i* in the year *y* (g CO_2/PKM)
$EF_{KM,i}$	Emission factor per kilometre of vehicle category *i* in the year *y* (g CO_2/km)
OC_i	Average occupation rate of vehicle category *i* prior project start (passengers)

	i Relevant vehicle category y Year of the crediting period The average occupation rate of vehicle category *i* is determined based on visual occupation studies. In the case of taxis, the driver is not included. Formula (5) of the methodology is not required as also for buses the occupation rate has been determined based on visual occupation studies. Relevant fuel types, for each vehicle category, have to be identified. The emission factor per kilometre is re-calculated annually based on the recorded share of fuels per category. In case biofuel blends are used the biofuel share of the blend is accounted for with zero emission factor ($EF_{CO2,x,y}$). All other vehicle categories except suburban rail apply the following formula: $$EF_{KM,i,y} = (IR_i)^{t+y} \cdot \frac{\sum_x \left(SFC_{i,x} \cdot NCV_{x,y} \cdot EF_{CO2,x,y} \cdot N_{x,i} \right)}{N_i}$$ Where: $EF_{KM,i,,y,}$ Emission factor per kilometre of vehicle category *i* in the year *y* (g CO_2/km) $SFC_{x,i}$ Specific fuel consumption of vehicle category *i* using fuel type *x* prior project start (g/km) $NCV_{x,y}$ Net calorific value of fuel *x* in the year *y* (J/g) $EF_{CO2,x,y}$ Carbon emission factor for fuel type *x* in the year *y* (g CO_2/J) $N_{x,i}$ Number of vehicles of category *i* using fuel type *x* prior to project start (units) $N_{x,i}$ Number of vehicles of category *i* prior to project start (units) IR_i^{t+y} Technology improvement factor for the vehicle of category *i* per year *t+y* (ratio) i Relevant vehicle category x Fuel type t Years of annual improvement (dependent on age of data per vehicle category) y Year of the crediting period For train (idem for metro) using electricity the EF is calculated based on the Tool 05 "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" baseline and or leakage emissions from electricity consumption" (equation 1). $$EF_{KM,i} = SEC_{KM,i} \times EF_{grid,CM} \times (1 + TDL)$$ *Where:* $EF_{KM,i}$ Emission factor per kilometre of vehicle category *i* (train/metro) (gCO_2/km) $SEC_{KM,i}$ Quantity of electricity consumed per kilometre of vehicle category *i* train/metro (kWh/km) $EF_{grid,CM}$ Emission factor for electricity generation in the grid based on combined margin (gCO_2/kWh) TDL Average technical transmission and distribution losses for providing electricity The combined margin emission factor ($EF_{grid,CM}$) is fixed ex-ante to be 0.92 kgCO2/kWh as per latest report from CEA /**14**/. TDL is also fixed ex-ante to be 2.6% as per latest national report for northern region /**15**/. Emission factors per kilometre are transparently calculated based on above formulae in accordance with the methodology in the CER spreadsheet (PDD table 15) and are reported per vehicle category and per annum. Accordingly, the baseline emissions per passenger is: 1,842 gCO2e/passenger. Baseline emissions

estimate ex-ante to be 954,897 tCO2 per year.

Project Emissions:
Project emissions are based on the electricity consumed by the metro for train traction (direct project emissions) plus emissions caused by project passengers from their trip origin to the entry station of the metro and from the exit station of the metro to their final destination (indirect project emissions).

$$PE_y = DPE_y + IPE_y$$

Where:

$PE_{,y,}$	Project emissions in the year *y* (tCO_2)
DPE_y	Direct project emissions in the year *y* (tCO_2)
IPE_y	Indirect project emissions in the year *y* (tCO_2)
y	Year of the crediting period

Direct project emissions (DPEy):
The project activity involves an electricity-based transport system. The emissions from electricity consumption are based on the Tool05 “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation Only electricity consumed for train propulsion is included in rail-based MRTS. Electricity usage is monitored. The CM and TDL are determined ex-ante. For ex-ante estimation, electricity usage is taken average value for the year 2015-2017 to be 220,547,060 kWh.

Indirect project emissions (IPEy):
Indirect project emissions are those caused by passengers from their trip origin up to the project activity entry station, and from the project activity exit station up to the trip final destination.
Following core steps are realized:
Step 1: Realize a survey in which for each surveyed passenger the trip distance per mode used to/from the MRTS is determined.

The trip distance is monitored.

Step 2: Calculate for each surveyed passenger his indirect project emissions.

Step 3: Apply to each surveyed passenger an individual expansion factor in accordance with the survey sample design and summarize these to get the total indirect project emissions of the week surveyed. To get the annual (or monitoring period) indirect project emissions the indirect project emissions of the surveyed week are calculated per passenger of the week and multiplied with the total passengers transported per year (or period).

The expansion factor is monitored.

Step 4: Application of the upper 95% confidence interval to the total indirect project emissions

$$IPE_y = \frac{P_y}{P_{SPER}} \sum_p \left(IPE_{p,y} \cdot FEX_{p,y} \right)$$

Where:

IPE_y	Indirect project emissions in the year *y* ($g\ CO_2$)
$IPE_{p,y}$	Indirect project emissions per surveyed passenger *p* in the year *y* ($g\ CO_2$)
$FEX_{p,y}$	Expansion factor for each surveyed passenger *p* surveyed in the year *y* (each surveyed passenger has a different expansion factor)
P_y	Total number of passengers in the year *y*
P_{SPER}	Number of passengers in the time period of the survey (1 week)
p	Surveyed passenger

	y Year of the crediting period The indirect project emissions per surveyed passenger are calculated based on the transport mode used, the trip distance per mode and the emission factor per mode: $$IPE_{p,y} = \sum_i IPTD_{p,i,y} \times EF_{PKM,i,y}$$ Where: $IPE_{p,y}$ Indirect project emissions per surveyed passenger *p* in the year *y* (g CO_2) $BTD_{,p,i,y}$ Indirect project trip distance *p* per surveyed passenger using mode *i* in the year *y* (PKM) $EF_{PKM,i,y}$ Emission factor per passenger-kilometre of mode *i* in the year *y* (g CO_2/PKM) i Relevant vehicle category p Surveyed passenger y Year of the crediting period Emission per passenger is taken the average of values obtained from upper bound values (281 for phase 2 and 609 for phase 1). Accordingly, the ex-ante project emission is estimated to be 438,868 tCO_2 per year. **Leakage Emissions**: Leakage emissions include the following sources: • Emissions due to changes of the load factor of taxis and buses of the baseline transport system due to the project; and, • Emissions due to reduced congestion on affected roads, provoking higher average vehicle speed, plus a rebound effect. • Upstream emissions of gaseous fuels (LEUP,y). The impact on traffic (additional trips) induced by the new transport system is included as project emissions and thus is not part of leakage. This is addressed by including, as project emissions, the emissions from the trips of passengers who would not have travelled in the absence of the project. Leakage emissions are calculated as follows: $$LE_y = LE_{LFB,y} + LE_{LFT,y} + LE_{CON,y} + LE_{UP,y}$$ Where: LE_y Leakage emissions in the year *y* (tCO_2) $LE_{LFB,y}$ Leakage emissions due to change of load factor buses in the year *y* (tCO_2) $LE_{LFT,y}$ Leakage emissions due to change of load factor taxis in the year *y* (tCO_2) $LE_{CON,y}$ Leakage emissions due to reduced congestion in the year *y* (tCO_2) $LE_{UP,y}$ Leakage emissions due to upstream emissions of gaseous fuels in year y (tCO_2) y Year of the crediting period For each component leakage shall be included if it has a positive value. **Determination of emissions due to change of load factor of buses ($LE_{LFB,y}$)** The project could have a negative impact on the load factor of the conventional bus fleet. Load factor changes are monitored for the entire city as the potential impact is not necessarily in the proximity of the project MRTS (buses can be used in other parts of the city). The load factor of buses is monitored in the years 1 and 4 of the crediting period. Leakage from load factor change of buses is only included if the load factor of buses has decreased by more than 10 percentage points comparing the monitored value with the baseline value, and are calculated as:

$$LE_{LFB,y} = \frac{1}{10^6} \cdot N_{B,y} \cdot AD_B \cdot EF_{KM,B,y} \cdot \left(1 - \frac{OC_{B,y}}{OC_B}\right)$$

Where:

$LE_{LFB,y}$	Leakage emissions due to change of load factor of buses in the year *y* (tCO_2)
$N_{B,y}$	Number of baseline buses in the year *y* (buses)
AD_B	Average annual distance driven by baseline buses (km/bus)
$EF_{KM,B,y}$	Emission factor per kilometre of baseline buses in the year *y* (g CO_2/km)
$OC_{B,y}$ (passengers)	Average occupancy rate of baseline buses in the year *y*
OC_B (passengers)	Average occupancy rate of baseline buses prior project start
y	Year of the crediting period

The occupancy rate of buses is monitored through visual occupation studies.

Determination of emissions due to change of load factor of taxis ($LE_{LFT,y}$)

The project could have a negative impact on the load factor of taxis. Taxis include cars as well as motorized rickshaws realizing taxi services. For both types of services, the load factor change is monitored separately. Load factor changes are monitored for the entire city as taxis operate all over the city and are not confined to deliver their services in certain areas. The load factor of taxis is monitored in the years 1 and 4 of the crediting period. This leakage is calculated as:

$$LE_{LFT,y} = \max\left(N_{T,y} \cdot AD_T \cdot EF_{KM,T,y} \cdot \left(1 - \frac{OC_{T,y}}{OC_T}\right) \cdot \frac{1}{10^6}; 0\right)$$

Where:

$LE_{LFT,y}$	Leakage emissions due to change of load factor of taxis in the year *y* (tCO_2)
$N_{T,y}$	Number of taxis in the year *y* (taxis)
AD_T	Average annual distance driven per taxi (km/taxi)
$EF_{KM,T,y}$	Emission factor per kilometre of taxis in the year *y* (g CO_2/km)
$OC_{T,y}$	Average occupancy rate of taxis in the year *y* (passengers)
OC_T (passengers)	Average baseline occupancy rate of taxis prior project start
y	Year of the crediting period

The maximum load factor change attributed to taxis is the emission reductions due to passengers switching from taxis to the project (calculated by the emission factor per passenger-kilometre for taxis, the trip distance and the number of passengers transported by the project, which would have used taxis in absence of the project). This maximum condition is established as load factors might worsen citywide also due to factors external to the project and leakage from a load factor change taxis due to the project can at maximum be according to the number of passengers transported by the project which in absence of latter would have taken a taxi.

The occupancy rate of taxis is monitored through visual occupation studies counting the number of passengers.
Ex-ante it is estimated zero.

Determination of emissions due to reduced congestion ($LE_{CON,y}$)

In the case that the implementation of the project activity leads to a reduction of road capacity available for individual motorised transport modes, the impact of changes in congestion shall be monitored in the year 1 and 4 of the crediting period. In other cases (e.g. the project provides a new road infrastructure not taken from the existing road space in the city), monitoring of these changes is not

	required. DMRC has not taken away any existing road space. Therefore, based on ACM0016 Version 04.0 no monitoring is required. In Equation 11 of the methodology RS_{BL} (road space baseline) is identical to RS_{PJ} (road space project). Therefore ARS (additional road space available) cannot be negative. **Upstream emissions from gaseous fuels** Upstream leakage of gaseous fuels shall be only included if the project vehicles consume more gaseous fuels than baseline vehicles. Project metro only consumes electricity. Therefore, in the baseline more gaseous fuels are used than in the project situation. Upstream emissions from gaseous fuels are therefore not considered. Since the project consumes only electricity, emissions from gaseous fuel is zero. Therefore, leakage emission for the project estimated ex-ante to be zero. Net emission rediuctions from the project activity estimated to be 516,307 tCO_2e per year. The validation team confirms that all formulas for Baseline, project and leakage emission calculations are correctly applied in accordance with the approved methodology. All data has been inserted appropriately and all calculations have been performed correctly. All estimates of the project emissions can be replicated using the data and parameter values provided in the PDD.
Findings	CL 1 was raised to calrify the baseline emission factor value arrived for estimating emission reductions to which PP has provided appropriate clarification and transparently presented the same in PDD and supporting ER sheet. Hence, response is accepted and CL is closed.
Conclusion	RINA confirms, the PDD correctly lists assumption and data used by the PP for estimating emission reduction including their references and sources. Source of data and assumptions are correctly quoted and interpreted in the PDD. All values used in the PDD including GWPs are considered reasonable in the context of the proposed CDM project activity. The baseline methodology and corresponding tools have been correctly applied to calculate project, baseline and leakage emissions, and emission reductions. All estimates of the baseline emissions can be replicated using the data and parameter values provided in the PDD.

D.5. Validity of monitoring plan

Means of validation

The monitoring plan in the PDD is prepared using latest methodology, ACM0016. Version 04. Validation team confirmed from the document review that the list of parameters including the means of monitoring is described in accordance with the applied methodology. Following are the parameters to be monitored:

Parameter	Monitoring procedure
$NCV_{G/D/CNG}$; Net calorific value of gasoline, diesel and CNG (MJ/kg	PP has already considered to apply IPCCC default values (table 1.2, lower 95% confidence interval). The values are 42.5 for Gasoline, 41.4 for Diesel and 46.5 for CNG. Any future revision from IPCC shall be taken into account.
$EF_{CO2,G/D/CNG}$; CO_2 emission factor for gasoline, diesel and CNG (gCO_2/MJ)	PP has already considered to apply IPCCC default values (table 1.4, lower 95% confidence interval). The values are 67.5 for Gasoline, 72.6 for Diesel and 54.3 for CNG. Any future revision from IPCC shall be taken into account.
$EF_{KM,B,CH4}$; CH_4 emission factor of CNG buses per kilometre in CO_{2eq} (gCO_{2eq}/km)	IPCC default value has been considered (table 3.2.4). Any future revision from IPCC shall be taken into account.
$EF_{KM,C/T/TR,CH4}$; CH_4 emission factor of CNG cars, taxis and	IPCC default value has been considered (table 3.2.4). Any future revision from IPCC shall be

	auto-rickshaws per kilometre in CO_{2eq} (gCO_{2eq}/km)	taken into account.
	$N_{x,C/T/TR}$; Number of passenger cars (C), taxis (T) and rickshaws (TR) using fuel type *x (*Vehicles*)*	Registration statistics from Department of Transport, Delhi shall be used. Monitoring frequency is annual.
	P; Total passengers transported by the project (Passengers)	Turnpike controls at stations and electronic smart cards. Only passengers are included which enter stations of the lines include in the project. Passengers entering line 1 and line 2 stations of Phase I are not included. In case line 1 and/or line 2 have joint stations with project lines the entering passengers are allocated proportionally i.e. if e.g. a Phase 1 line has a joint station with a Phase II line the passengers are distributed 50:50 between the 2 phases. Continuously monitored and aggregated at least annually by DMRC.
	EC_{PJ}; Electricity consumed by MRTS (trains) (MWh)	Traction energy is continuously monitored in energy meters. The electricity meters are calibrated by the local electricity board of the state government and are sealed. They can only be opened by officials of the electricity board therefore the project owner cannot realize independent calibrations. There is also a check meter with controls realized by the local electricity department in case of large variations between readings. Electricity consumtion is aggregated at least annually. Electricity invoices shall be used to cross check.
	$BTD_{p,i}$; Baseline trip distance of the cluster *p* of surveyed passengers using mode *i* (Kilometre)	Based on survey as detailed in the PDD. Survey is in line with methodology.
	$IPTD_{p,i}$; Indirect project trip distance of the surveyed passenger using mode *i* (Kilometre)	Based on survey as detailed in the PDD. Survey is in line with methodology.
	P_{SPER}; Number of passengers in the time period of the survey (1 week)	Turnpike controls at stations and electronic smart cards. Only passengers are included which enter stations of the lines include in the project. Passengers entering stations of Phase I are not included. In case Phase I lines have joint stations with project lines the entering passengers are allocated proportionally i.e. if e.g. line 1 and Phase II line x have a joint station passengers of that station are distributed 50:50 between the two lines. The survey is realized in the years 2020 and 2023 of the crediting period. This is consistent with the methodology requirement.
	FEX_p; Expansion factor for each surveyed passenger *p* surveyed (each surveyed passenger has a different expansion factor)	As per survey. Frequency of survey is on 1 and 4 year of the crediting period. This is consistent with the applied methodology.
	$EC_{EL,R}$: Quantity of electricity consumed by the baseline rail system per annum	This shall be sourced from annual report from Indian Railways. Monitoring frequency is annual.
	$P_{EL,R}$: Total passengers transported by baseline rail-	This shall be sourced from annual report from Indian Railways. Monitoring frequency is

	system per year | annual or the latest published version. The monitoring plan was in compliance with the applied methodology. Validation team also confirm, based on the interview of the PP, that monitoring plan is feasible with the design. Further, the PP had sufficiently detailed the plan including data management, quality assurance and quality control procedures to ensure that emission reduction can be reported and verified.
Findings	N/A
Conclusion	RINA confirms that the monitoring plan included in the updated PDD is valid as per the applied methodology and conforms the registered PDD.

D.6. Crediting period

Means of validation	In accordance to paragraph 270 of the PCP version 02 /06/, 'the new crediting period shall start on the day immediately after the expiration of the current crediting period regardless of the date when the crediting period is deemed renewed'. Therefore, the start date of next crediting period is 30/06/2018. Further, as per paragraph 278 of PCP version 02 /06/, submission for RCP shall be made no earlier than 270 days prior to, but no later than one year after, the expiry of the crediting period. If a submission misses the deadline, the crediting period of the project activity may no longer be renewed. In that way, the deadline expired on 29/06/2019 itself. However, as per decision of CDM EB (EB100), paragraph 32-(iv), the grace period for the submission of renewal request for the existing registered project activities whose crediting period has expired but has not been renewed (i.e. overdue for renewal) is to be by 31 December 2019. Therefore, the start date of next crediting period is considered correctly as 30/06/2018 and length would be from 30/06/2018 to 29/06/2025. The first commissioning date under the project activity is 04/06/2008 /24/ and with expected operational lifetime of 30 years the project life ends on 04/06/2038. Therefore, the project is expected to be operational during the second crediting period.
Findings	N/A
Conclusion	RINA confirms that the second period was correctly and clearly defined as from 30/06/2018 to 29/06/2025 as per CDM project cycle procedure.

D.7. Project participants

Means of validation	RINA confirm the list of project participants from the review of project view page at UNFCCC website for the activity (UNFCCC Ref: 4463). RINA also reviewed the letter of approval (No.4/2/2010-CCC) dated: 06/08/2010 issued from the DNA of India and approval from Govt. of Switzerland (Reference: G514-3487) dated 25/11/2010 and the latest MoC dated: 01/08/2012 to confirm the name of the project participants.
Findings	N/A
Conclusion	RINA confirms that the project participants of the proposed CDM project activity is listed in the updated PDD and this information is consistent with the information provided in the section that contains the contact information for project participants.

D.8. Post-registration changes

Type of post-registration changes (PRCs)	**Confirmation** (Y/N)	**Validation report for PRCs**	
		Version	**Completion date**
Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents[3]	N		

[3] Other standards, methodologies, methodological tools and guidelines (to be) applied in accordance with the applied(selected) methodologies are collectively referred to as the other (applied) methodological regulatory documents).

Corrections	N		
Change to the start date of the crediting period	N		
Inclusion of a monitoring plan	N		
Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents	Y	Version 1.0	05/12/2016
Changes to the project design	N		
Changes specific to afforestation and reforestation project activities	N		

SECTION E. Internal quality control

>>The draft final validation report before being submitted to request for registration is subjected to an independent internal technical review to confirm that all validation activities had been completed according to the pertinent RINA instructions.
The technical review was performed by a technical reviewer(s) qualified in accordance with RINA's qualification scheme for CDM validation and verification.

SECTION F. Validation opinion

>> RINA has undertaken the validation for renewal of the second crediting period for the registered project activity, "Metro Delhi, India" (UNFCCC Ref. 4463). The validation was performed on the basis of requirements of CDM as set out in Article 12 of the Kyoto Protocol, the CDM M&P, the present annex, subsequent decisions made by the COP/MOP and CDM-EB, procedures for renewal of the crediting period of a registered CDM project activity and also on the criteria given to provide for consistent project operations, monitoring and reporting.
The project activity is a new Mass Rapid Transit System (MRTS) ensuring high ridership levels in the city of Delhi, India. In the absence of the project activity same riders would have continued with existing modes of transport including bus, car, taxi, motorcycle, 3-wheelers, sub-urban rail or Non-Motorized Transport leading to higher release of GHGs in atmosphere. Therefore the project leads to reduction in GHG emissions.
To arrive at the final validation conclusions and opinion, RINA carried out review of project documents, assessment of compliance with and application of the approved baseline and monitoring methodology as well as the approved methodological tools, field survey and physical on site assessment of the project site. Validation team confirms that project information remains materially same as in the registered PDD.

The validation team is of the opinion that the project activity correctly applies approved methodology ACM0016: Baseline Methodology for Mass Rapid Transit Projects; Version 04.0 and conforms to all the relevant UNFCCC requirements for the CDM as well as the host country's national requirements and that the monitoring arrangements described in the monitoring plan are feasible within the project design. The project participants are able to implement the monitoring plan and it is deemed likely that the forecasted emission reductions of be 3,614,146 tCO2e over 7 years of the second crediting period, averaging 516,307 tCO2e annually, will be achieved, given that the underlying assumptions do not change. Therefore, RINA requests the renewal of crediting period of "Metro Delhi, India" (UNFCCC Ref: 4463) to the CDM Executive Board.

Appendix 1. Abbreviations

Abbreviations	Full texts
BE	Baseline Emissions
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM M&P	Modalities and Procedures CDM
CER(s)	Certified Emission Reduction(s)
CH4	Methane
CL	Clarification Request
CO2	Carbon dioxide
CO2e	Carbon dioxide equivalent
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
EF	Emission Factor
EIA	Environmental Impact Assessment
ER	Emission Reductions
FAR	Forward Action Request
GHG(s)	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
kW	Kilo Watt
LoA	Letter of Approval
MoC	Modalities of Communication
MoV	Means of Verification
MR	Monitoring Report
ODA	Official Development Assistance
PDD	Project Design Document
PE	Project Emission
PP(s)	Project Participant(s)
Ref.	Document Reference
RINA	RINA Services S.p.A.
SS(s)	Sectoral Scope(s)
TA(s)	Technical Area(s)
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Validation and Verification Standard

Appendix 2. Competence of team members and technical reviewers

RINA

CERTIFICATO DI QUALIFICA
QUALIFICATION CERTIFICATE

Si attesta che il sig./sig.ra:
We declare that Mr/Mrs/Ms: **Champok BURAGOHAIN**

è qualificato come[1]:
is qualified as: **CDM –TEC, -VAL, -VER, -TL ITRP, REG-EXP[2]**

per le seguenti aree tecniche:
for the following technical areas: **1.1, 1.2, 2.1, 13.1, 13.2**

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA *TECHNICAL AREA DESCRIPTION*	SCOPO SETTORIALE *SECTORAL SCOPE*
1.1	Thermal energy generation	1
1.2	Renewables	1
2.1	Electricity distribution	2
13.1	Solid waste and wastewater	13
13.2	Manure	13

In accordo alle istruzioni dell'unità Certificazione, Innovazione e sostenibilità.
In accordance with the instructions of the. Head of Certification Innovation & Sustainability Unit

REVISIONE *REVISION*	DATA *DATE*	MOTIVAZIONI PER LA REVISIONE *REASON FOR THE REVISION*
0	19-01-2011	-
13	10-10-2019	Update qualification as TEC in TA 1.1

Il Resp. CEINS
Head of CEINS

[1] Legend:
VAL: Validator
VER: Verifier
TEC: Technical Expert
TL: Team Leader
FIN-EXP: Financial Expert
DET: Determiner

CDM: Clean Development Mechanism
VCS : Verified Carbon Standard
GS: Gold Standard
SCS: SocialCarbon Standard
JI: Joint Implementation

[2] India, Nepal, Sri Lanka, Thailand, Indonesia, Vietnam.

RINA Services S.p.A. è accreditato da UNFCCC, quale Entità Operativa Designata (DOE), per condurre la Validazione e la Verifica di Progetti CDM, da VCSA per condurre la Validazione e la Verifica di Progetti VCS, da GS Foundation, per condurre la Validazione e la Verifica di Progetti GS, da Ecologica Institute per condurre la Validazione e la Verifica di rapporti SCS

RINA Services S.p.A. is accredited by the UNFCCC, as Designated Operational Entity (DOE), to carry out Validation and Verification of CDM Projects, by the VCSA, to carry out Validation and Verification of VCS Projects, by the GS Foundation, to carry out Validation and Verification of GS Projects and by the Ecologica Institute, to carry out Validation and Verification of SCS Reports

GHG_QUAL_CERT_EN_07_18 Page 1 of 1

CERTIFICATO DI QUALIFICA
QUALIFICATION CERTIFICATE

Si attesta che il sig./sig.ra: *We declare that Mr/Mrs/Ms:*	SAJITHA Sunil Nair
è qualificato come[1]: *Is qualified as:*	CDM TEC
per le seguenti aree tecniche: *for the following technical areas:*	7.1

AREE TECNICHE *TECHNICAL AREAS*	DESCRIZIONE DELL'AREA TECNICA *TECHNICAL AREA DESCRIPTION*	SCOPO SETTORIALE *SECTORAL SCOPE*
7.1	Transport	7

In accordo alle istruzioni dell'unità Sustainability & Food Certification Compliance.
In accordance with the instructions of the Sustainability & Food Certification Compliance Unit.

REVISIONE *REVISION*	DATA *DATE*	MOTIVAZIONI PER LA REVISIONE *REASON FOR THE REVISION*
0	05/08/2019	First Issue

Il Resp. CCPLS
Head of CCPLS

[1] Legend:

VAL:	Validator	CDM: Clean Development Mechanism	
VER:	Verifier	VCS : Verified Carbon Standard	
TEC:	Technical Expert	GS4GG: Gold Standard For Global Goals	
TL:	Team Leader	SCS: SocialCarbon Standard	
FIN-EXP:	Financial Expert	JI: Joint Implementation	
DET:	Detrocker		

RINA Services S.p.A. è accreditata da UNFCCC, quale Entità Operativa Designata (DOE), per condurre la Validazione e la Verifica di Progetti CDM, da VCSA per condurre la Validazione e la Verifica di Progetti VCS, da GS Foundation, per condurre la Validazione e la Verifica di Progetti GS, da Ecologica Institute per condurre la Validazione e la Verifica di rapporti SCS

RINA Services S.p.A. is accredited by the UNFCCC as Designated Operational Entity (DOE), to carry out Validation and Verification of CDM Projects, by the VCSA, to carry out Validation and Verification of VCS Projects, by the GS Foundation, to carry out Validation and Verification of GS4GG Projects and by the Ecologica Institute, to carry out Validation and Verification of SCS Reports

CERTIFICATO DI QUALIFICA
QUALIFICATION CERTIFICATE

Si attesta che il sig./sig.ra: / *We declare that Mr/Mrs/Ms:* **Jun ZHOU**

è qualificato come[1]: / *is qualified as:* **CDM- TEC, - VAL, -VER, -TL ITRP, REG-EXP[2]**

per le seguenti aree tecniche: / *for the following technical areas:* **1.1, 1.2, 5.1, 7.1, 11.1, 13.1**

AREE TECNICHE *TECHNICAL AREAS*	DESCRIZIONE DELL'AREA TECNICA *TECHNICAL AREA DESCRIPTION*	SCOPO SETTORIALE *SECTORAL SCOPE*
1.1	Thermal energy generation	1
1.2	Renewables	1
5.1	Chemical industry	5
11.1	Emission of fluorinated gases	11
13.1	Solid waste and wastewater	13

in accordo alle istruzioni dell'unita Sostenibilità & Cambiamenti Climatici.
in accordance with the instructions of the Sustainability & Climate Change Unit.

REVISIONE *REVISION*	DATA *DATE*	MOTIVAZIONI PER LA REVISIONE *REASON FOR THE REVISION*
0	12/10/2009	-
10	20/04/2017	Update qualification as ITRP
11	30/07/2018	Update qualification as REG-EXP

Il Resp. CCPLS
Head of CCPLS

[1] Legend:

VAL:	Validator	CDM: Clean Development Mechanism
VER:	Verifier	VCS : Verified Carbon Standard
TEC:	Technical Expert	GS: Gold Standard
TL:	Team Leader	SCS: SocialCarbon Standard
FIN-EXP:	Financial Expert	JI: Joint Implementation
DET:	Determiner	

[2] China, Philippines

RINA Services S.p.A. è accreditato da UNFCCC, quale Entità Operative Designate (DOE), per condurre la Validazione e la Verifica di Progetti CDM, da VCSA per condurre la Validazione e la Verifica di Progetti VCS, da GS Foundation, per condurre la Validazione e la Verifica di Progetti GS, da Ecologica Institute per condurre la Validazione e la Verifica di rapporti SCS

RINA Services S.p.A. is accredited by the UNFCCC, as Designated Operational Entity (DOE), to carry out Validation and Verification of CDM Projects, by the VCSA, to carry out Validation and Verification of VCS Projects, by the GS Foundation, to carry out Validation and Verification of GS Projects and by the Ecologica Institute, to carry out Validation and Verification of SCS Reports

GHG_QUAL_CERT_EN_07_18 Page 1 of 1

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1	Grutter Consulting AG	Updated CDM-PDD for project activity 'Metro Delhi, India'	Version 01 of 25/07/2019 and version 05 of 03/09/2019	PP
2	Grutter Consulting AG	Registered CDM-PDD for the project activity 'Metro Delhi, India'	Version 4.0 of 05/12/2016	PP
3	Grutter Consulting AG	Emission reduction worksheet 'CER sheet.xlsx'	Submitted on 25/07/2019 and on 03/09/2019	PP
4	UNFCCC	ACM0016 'Large-scale Consolidated Methodology: Mass rapid transit projects'	Version 04	Others
5	UNFCCC	CDM Validation and verification standard	Version 02.0 of 29/11/2018	Others
6	UNFCCC	CDM project cycle procedure for project activities	Version 02.0 of 29/11/2018	Others
7	UNFCCC	CDM project standard for project activities	Version 02.0 of 29/11/2018	Others
8	UNFCCC	Methodolgical tool 'Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting periodî	Version 03.0.1	Others
9	UNFCCC	Project 4463 : Metro Delhi, India	https://cdm.unfccc.int/Projects/DB/SQS1297089762.41/view	Others
10	International Energy Agency	Energy Statistics Manual	September 2004	PP
11	European Enviornment Agency	Air pollutant emission inventory guidebook 2016	Update Jul. 2018	PP
12	Delhi Transport Coporation	Operational Statistics	March 2019	PP
13	Department of transport, Govt. of Delhi	Total Number of Vehicles registered between 01-01-2017 and 31.12.2017	As per data available in VAHAN 4.0 Database as on 26.09.2018	PP
14	Central Electricity Authority	CO_2 Baseline Database for the Indian Power Sector	Version 13.0, June 2018	PP
15	Power system Operation Corporation Limited	Applicable Transmission Loss		PP
16	School of Planning & Architecture New Delhi	RAPID ASSESSMENT OF TRAVEL PATTERNS IN DELHI - HORIZON YEAR 2030 & 2050	May 2017	PP
17	Trasnport Department, Govt. of Delhi	Modes of transportation system, policy, rules etc, in Delhi	http://transport.delhi.gov.in/home/transport-department	Others
18	UNFCCC	Methodological tool: Baseline emissions for modal shift measures in urban passenger transport	Version 01.0	Others
19	Reynolds et.al. (2011)	Determinants of PM and GHG emissions from natural gas-fuelled auto-rickshaws in Delhi	Transportation Research Part D Transport and	PP

			Environment 16(2): 160-165 March 2011, table 3	
20	UNFCCC	Guideline: Sampling and surveys for CDM project activities and programmes of activities	Version 04	Others
21	Grutter Consulting AG	Saurvey worksheet for Average occupation rate of motorized rickshaws	File R9a OC rickshaws.xlsx	PP
22	CV Magazine	DTC: Modern and dependable	http://commercialvehicle.in/dtc-modern-and-dependable/	PP
23	Indian Railways	Annual Statistical Statement	2017-18	PP
24	ICONTEC	Verification report of the project activity 'Metro Delhi, India' covering monitoring period 30/06/2011 to 30/06/2012	Version 02, CDMVE-12-005-02	Others

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. CL from this validation

CL ID	01	**Section no.**	D.4	**Date:** 29/08/2019
Description of CL				
Kinldy clarify how Baseline emission factor per passenger (gCO2/passenger) value of 1,868 is arrived at referring EF of 2020 to 2026?				
Project participant response				**Date:** 03/09/2019
The baseline emission factor for projections uses 2 sources: *a). transport model with a factor of 1,842 gCO2e per passenger* *b). last survey result with a factor of 2,445 gCO2e per passenger* *For projections the lower (more conservative) of the 2 factors are used i.e. 1,842 gCO2e per passenger. Actual claimed emission reductions will be based on new surveys conducted during the monitoring period i.e. the factor of 1,842 is ONLY used for projection purposes.* *The factor of 1,842 gCO2 is based on the following sources: File R13 contains the used transport model based on a publication of CLIMATRANS. File R14 contains the calculation procedure. The calculation method is based on the equation:* *Baseline emission factor per passenger = share passengers using mode x multiplied with distance mode x multiplied with emission factor mode x summing up all modes. This is in practice:* *Baseline emission factor = share passengers bus * trip distance bus users * EF bus + share passengers car * trip distance car users * EF car + share motorcycle users * trip distance motorcycle users * EF motorcycle + share rickshaw users * trip distance rickshaw users * EF rickshaw* *In numbers:* *Baseline emission factor = 8% * 22km *27gCO2/pkm + 39%*25.7km*124gCO2/pkm + 37%*19.4km*50gCO2/pkm +15%*22.9km*55gCO2/pkm = 1,842 gCO2/passenger* *P= passenger* *pkm = passenger-kilometre*				
Documentation provided by project participant				
File R14 see sheet "calculations"				
DOE assessment				**Date:** 23/09/2019
The clarification is in consistent with the calculation provided in the worksheet. The projection is conservative compared to actual value realized in latest survey result and hence accepted for ex-ante estimation. CL is closed.				

Table 2. CAR from this validation

CAR ID	01	**Section no.**	D.1	**Date:** 29/08/2019
Description of CAR				
1. The history of the PDD template should not be deleted. *2. The version of the PDD should be the next value from the registered version.* *3. PP is requested to provide a track change version of the updated PDD* *4. The registered PDD stated the MRTS covers 102 km whereas updated PDD states 102.23 km. Kinldy clarify the same with credible reference.*				
Project participant response				**Date:** 03/09/2019
1. Has been added in new version number *2. Has been changed to 5.0* *3. Is provided separately* *4. The registered PDD version 4.0 states in table 1 p. 5 101.67 km. This has been copied to the new PDD. Difference between one and other sources are basically based on rounding. To avoid discrepancies the table 1 from the PDD version 4 has been copied.*				
Documentation provided by project participant				
Updated PDD				
DOE assessment				**Date:** 23/09/2019
PP has made ncesssary corrections in the updated PDD. Hence, CAR is closed.				

CAR ID	02	Section no.	D.3	Date: 29/08/2019
Description of CAR				
1. The tool 'Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period' is not transparently referred in the updated PDD. *2. Step 1.2 of the above tool require 'an assessment of the changes in market characteristics for the renewal of the crediting period' if the baseline scenario identified at the validation of the project activity was the continuation of the current practice without any investment. Please clarify what assessment is done.*				
Project participant response				**Date:** 03/09/2019
1. Has been included in section B1 and at the end of section B6 *2. This section has been expanded in the new version 5.0:* **Step 1.2.** Impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline emissions, without reassessing the baseline scenario: The baseline scenario identified at the validation of the project activity was the continuation of the current practice. This requires an assessment of the changes in market characteristics. The baseline scenario identified in the registered PDD (see registered PDD step 3, page 15) is a continuation of existing modes of transport including bus, car, taxi, motorcycle, 3-wheelers, sub-urban rail or Non-Motorized Transport. All of these modes continue to operate also 2019 i.e. currently in Delhi. All baseline transport modes continue to operate and are allowed to operate in Delhi. No regulation exist that such transport modes are not allowed to operate. Market characteristics have not changed the baseline scenario of available modes. Which mode passenger might use can change over time: this is monitored through the surveys which ask passengers for their mode of preference in absence of the metro. Vehicle renewal takes place and this can involve also change of fuel types or emission factors of baseline vehicles. This does however not change the baseline scenario which are the different modes which can be used by passengers but only the emission factors used for baseline modes of transport which are thus re-assessed and fixed newly for the 2nd crediting period. The market characteristic of the baseline scenario is therefore still valid.				
Documentation provided by project participant				
Updated PDD				
DOE assessment				**Date:** 23/09/2019
The updated PDD transparently described the validity of original baseline applying the latest tool '*Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period'* and provided sufficient justifications. Hence, response is accepted and CAR is closed.				

Table 3. FAR from this validation

FAR ID	xx	Section no.		Date: DD/MM/YYYY
Description of FAR				
Project participant response				**Date:** DD/MM/YYYY
Documentation provided by project participant				
DOE assessment				**Date:** DD/MM/YYYY

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Document information

Version	*Date*	*Description*
03.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM validation and verification standard for project activities" (CDM-EB93-A05-STAN) and version 02.0 of the "CDM project cycle procedure for project activities" (CDM-EB93-A06-PROC); • Make editorial improvements.
02.0	31 October 2017	Revision to align with the requirements of the "CDM validation and verification standard for project activities" (version 01.0).
01.0	23 March 2015	Initial publication.

Decision Class: Regulatory
Document Type: Form
Business Function: Renewal of crediting period
Keywords: crediting period, project activities, validation report