Project Verification Report

2021

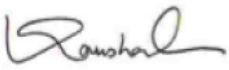
COVER PAGE

Project Verification Report Form (VR)

BASIC INFORMATION	
Name of approved UCR Project Verifier / Reference No.	KBS Certification Services Limited https://www.ucarbonregistry.io/CouRegistry/VerifierList
Type of Accreditation	☒ CDM or other GHG Accreditation ☐ ISO 14065 Accreditation Name of the entity that provided the accreditation: UNFCCC Date of validity: 08/11/2024 to 09/11/2029 Web link of the active accreditation certificate and approval: https://cdm.unfccc.int/DOE/list/DOE.html?entityCode=E-0051
Approved UCR Scopes and GHG Sectoral scopes for Project Verification	Sectoral Scope 07: Transport
Validity of UCR approval of Verifier	15/01/2022 onwards
Completion date of this VR	23/05/2025
Title of the project activity	MMMOCL (Line-2A and Line-7)
Project reference no. (as provided by UCR Program)	529

Name of Entity requesting verification service (can be Project Owners themselves or any Entity having authorization of Project Owners, example aggregator.)	Maha Mumbai Metro Operation Corporation Limited (MMMOCL)
Contact details of the representative of the Entity, requesting verification service (Focal Point assigned for all communications)	Sh. Pravin Gajare Designation: Director (Maintenance) Organisation: Maha Mumbai Metro Operation Corporation Limited (MMMOCL) Telephone: +91-9892147664 E-Mail ID: dm@mmmocl.co.in
Country where project is located	India
Applied methodologies (approved methodologies by UCR Standard used)	ACM0016 ver. 4 - Mass Rapid Transit Project
GHG Sectoral scopes linked to the applied methodologies	Sectoral scope 7: Transport
Project Verification Criteria: Mandatory requirements to be assessed	☒ UCR Standard ☒ Applicable Approved Methodology ☒ Applicable Legal requirements /rules of host country ☒ Eligibility of the Project Type ☒ Start date of the Project activity ☒ Meet applicability conditions in the applied methodology ☒ Credible Baseline ☒ Do No Harm Test ☒ Emission Reduction calculations ☒ Monitoring Report ☒ No GHG Double Counting ☐ Others (please mention below)

Project Verification Criteria: Optional requirements to be assessed	☒ Environmental Safeguards Standard and do-no-harm criteria ☒ Social Safeguards Standard do-no-harm criteria
Project Verifier's Confirmation: The *UCR Project Verifier* has verified the UCR project activity and therefore confirms the following:	The UCR Project Verifier KBS Certification Services Ltd., certifies the following with respect to the UCR Project Activity MMMOCL (Line-2A and Line-7). ☒ The Project Owner has correctly described the Project Activity in the Project Concept Note (dated 02/05/2025) including the applicability of the approved methodology ACM0016: Mass Rapid Transit Projects, version 4.0 and meets the methodology applicability conditions and has achieved the estimated GHG emission reductions, complies with the monitoring methodology and has calculated emission reductions estimates correctly and conservatively. ☒ The Project Activity is likely to generate GHG emission reductions amounting to the achieved 89,894 tCO_2eq, as indicated in the MR, which are additional to the reductions that are likely to occur in absence of the Project Activity and complies with all applicable UCR rules, including ISO 14064-2 and ISO 14064-3.

	☒ The Project Activity is not likely to cause any net-harm to the environment and/or society ☒ The Project Activity complies with all the applicable UCR rules[1] and therefore recommends UCR Program to register the Project activity with above mentioned labels.
Project Verification Report, reference number and date of approval	GHG.25.VER.022_UCR Version: 2.0 Date of Approval: 23/05/2025
Name of the authorised personnel of UCR Project Verifier and his/her signature with date	 Mr. Kaushal Goyal Managing Director

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PROJECT VERIFICATION REPORT

Executive summary

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KBS Certification Services Ltd. has been appointed to undertake the first verification and certification for the greenhouse gas (GHG) emission reductions registered under UCR, titled "MMMOCL (Line-2A and Line-7)", UCR Ref. no. 529. This verification falls under the first monitoring period from (01/01/2023 to 31/12/2024) (both dates included), with the fixed crediting period between 01/01/2023 to 31/12/2032, The UCR projects must undergo independent third-party verification and certification of emission reductions as the basis for the issuance of Carbon Offset Units (COUs).

Verification Objectives and Scope:

The objectives of this verification exercise are, by reviewing objective evidence, to establish that:

- The project activity has been implemented and operated as per the approved project concept note /01/, and all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place;
- The monitoring report and other supporting documents are complete;
- The data is recorded and stored as per the monitoring methodology and approved monitoring plan.
- To confirm that the monitoring system is implemented and fully functional to generate Carbon Offset Units (COUs) without any double counting.

The scope of the verification is the independent and objective review and ex-post determination of the monitored reductions in GHG emission by the project activity. The verification is based on the review of the monitoring report, supporting information and

a) The latest PCN /01/;
b) Monitoring report /02/ for the monitoring period under verification including COU calculations sheets and all supporting documents;
c) The applied monitoring methodology /05/;
d) Relevant decisions, clarifications, and guidance from UCR /04/;
e) All information and references relevant to the project activities resulting in emission reductions.

The verification team has assessed project activity against the requirements of the latest version of UCR verification standard, version 2.0 /04/, and employed a risk-based approach to verification, focusing on the identification of significant risks for project implementation and the generation of emission reductions.

Description of the Project:

The objective of the project activity is to register Line-2A and Line-7 of the Mumbai Metro system under the UCR activity. The project is implemented and operated by Maha Mumbai Metro Operation Corporation Limited (MMMOCL). The metro transportation system offers higher efficiency compared to traditional road-based transport and achieves greenhouse gas (GHG) emission reductions, calculated on a per passenger-kilometre basis. On average, the metro system has significantly lower GHG emissions per passenger-kilometre than the modes of transport it replaces in the absence of the project activity. This modal shift results in measurable GHG emission reductions.

The total network length of the project is 35.1 km, comprising two fully elevated corridors:

- Line-2A: Dahisar (East) to Andheri (West) – 18.6 km, 17 stations
- Line-7: Ovaripada to Gundavali – 16.5 km, 13 stations

The project was found to be implemented and operated in accordance with the information provided in the approved PCN. The project is currently undergoing verification, and the monitoring period for the registered project activity is from 01/01/2023 to 31/12/2024 (both dates inclusive). The total emission reductions claimed under the monitoring period as verified are 89,894 tCO_2eq.

Verification process:
The verification comprises a review of the monitoring report for the monitoring period from 01/01/2023 to 31/12/2024 (both days included) including monitoring parameters and monitoring plan, emission reduction calculation spread-sheet, monitoring methodology, and all related evidence provided by the project participant.

Methodology:
KBS follows a rule-based verification approach, wherein, as a first step, the contract review is undertaken as per the latest version of the UCR Standard V7.0 /04/. A desk review of the project documentation is undertaken, which is followed by a site assessment by the members of the verification team in accordance with the latest version of UCR verification standard, version 2.0 /04/. The verification protocol provides transparent means to record the observations and compliances by the verification team members and the nonconformities, if any. The verification protocol is an internal document and is available on request.

Conclusion:

Based on the verification assessment, and subject to the successful closure of all findings, KBS confirms that the project activity has been implemented and operated in accordance with the approved PCN. All physical components of the project, including technology, project equipment, and monitoring and metering systems, are in place.
The monitoring systems, procedures, and reports are found to be in compliance with the requirements of the approved monitoring plan and the applicable monitoring methodology. Based on the information reviewed and evaluated, we confirm that the implementation of the project has resulted in 89,894 tCO_2e of emission reductions during the monitoring period from 01/01/2023 to 31/12/2024 (both dates inclusive).

Project Verification team, technical reviewer and approver

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Project Verification team

No.	Role	Last name	First name	Affiliation (e.g. name of central or other office of UCR Project Verifier or outsourced entity)	Involvement in		
					Doc review	On-Site inspection	Interviews
1.	Team Leader and Technical Expert (TA 7.1)	Madan	Rishabh	Central Office	✓	✓	✓

2.	Verifier	Thomas	Alen Mariyam	Central Office	✓	✓	✓

Technical reviewer and approver of the Project Verification report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of UCR Project Verifier or outsourced entity)
1.	Technical reviewer	IR	Yadav	Ashish	Central Office
2.	ETR (TA 7.1)	IR	Prasanna	M.P.	Central Office
3.	Manager Technical & Certification	IR	Francis	Margaret	Central Office
4.	Approver	IR	Goyal	Kaushal	Central Office

Means of Project Verification

Desk/document review

A desk review is undertaken, involving, but not limited to,

- A review of the data and information presented to verify their completeness;
- A review of the monitoring plan and monitoring methodology, the quality of metering equipment, and the quality assurance and quality control procedures;
- An evaluation of data management and the quality assurance and quality control systems in the context of their influence on the generation and reporting of emission reductions.
- A complete list of documents evidence reviewed or referred in this report are included.

On-site inspection

Date of on-site inspection:
15/05/2025 to 16/05/2025

No.	Activity performed On-Site	Site location	Date
1)	The project verification team conducted interviews with the project owner to confirm the information and to resolve issues identified in the document review.	Line 2A: Dahisar (East) to Andheri (West) Line 7: Ovaripada to Gundavali	15/05/2025 to 16/05/2025
2)	An assessment of the implementation and operation of the project activity as per the PCN and UCR requirements.		
3)	To validate that the project design, as documented is sound and reasonable, and meets the identified criteria UCR Standard Requirements and associated guidance		
4)	To assess conformance with the certification criteria as laid out in the UCR Standards;		
5)	To evaluate the conformance with the certification scope, including the GHG project and baseline scenarios; GHG sources, sinks, and reservoirs; and the physical infrastructure, activities, technologies and processes of the GHG project to the requirements of the GCC;		
6)	To evaluate the calculation of GHG emissions, including the correctness and transparency of formulae and factors used; assumptions related to estimating GHG emission reductions; and uncertainties; and		
7)	To determine whether the project could reasonably be expected to achieve the estimated GHG reduction/ removals.		
8)	A review of information flows for generating, aggregating and reporting of the ex-ante monitoring parameters.		
9)	Interviews with relevant personnel to confirm that the		

	operational and data collection procedures can be implemented in accordance with the Monitoring Plan		
10)	A cross-check between information provided in the submitted documents and data from other sources		
11)	A review of calculations and assumptions made in determining the GHG data and estimated ERs, and		
12)	An identification of QA/QC procedures in place to prevent, or identify and correct, any errors or omissions in the reported monitoring parameters		

Interviews

No.	Interview			Date	Subject
	Last name	First name	Affiliation		
1.	Singh	Varun Kr.	DGM/ENV (DMRC)	15/05/2025 – 16/05/2025	Project boundary, emission reduction calculations, monitoring plan (feasibility of monitoring arrangements described in PCN), QA/QC procedures, responsibility of implementation of monitoring plan, data recording & storage procedures, implementation plan
2.	Sethi	Ankit	AM/ENV (DMRC)		
3.	Meena	Laddu Lal	AM/ENV (DMRC)		
4.	Naj	Anit M	AM/PS (MMMOCL)		
5.	Gowda	Sudip Kumar	AM/PS (MMMMOCL)		
6.	Dafe	Ravindra K	JE/E&M (MMMMOCL)		
7.	Palkar	Kaushal R	Safety Supervisor II (MMMMOCL)		

Sampling approach

N/A

Clarification request (CLs), corrective action request (CARs) and forward action request (FARs) raised

Areas of Project Verification findings	No. of CL	No. of CAR	No. of FAR
Green House Gas (GHG)			
Identification and Eligibility of project type	-	-	-
General description of project activity	-	-	-
Application and selection of methodologies and standardized baselines	-	-	-
- Application of methodologies and standardized baselines	-	-	-
- Deviation from methodology and/or methodological tool	-	-	-
- Clarification on applicability of methodology, tool and/or standardized baseline	-	-	-
- Project boundary, sources and GHGs	-	-	-
- Baseline scenario	CL 04	-	-
- Estimation of emission reductions or net anthropogenic removals	-	-	-
- Monitoring Report	CL 01 CL 02 CL 03	CAR 01	-
Start date, crediting period and duration	-	-	-
Environmental impacts	-	-	-
Project Owner- Identification and communication	-	-	-
Others (please specify)	-	-	-
Total	**04**	**01**	-

Project Verification findings

Identification and eligibility of project type

Means of Project Verification	The project has been approved for verification under the UCR program with project reference number 529. (https://www.ucarbonregistry.io/Registry/Details?id=qokYdopwZV%2BZ9f0GtYMtow%3D%3D). The project has taken reference with the approved CDM methodology ACM0016 version 4.0 /05/. The monitoring report complies with the approved PCN and the UCR Verification standard, version 2.0 /04/.
Findings	No findings were raised.
Conclusion	The verification team confirms that the project is in line with the UCR standard version 7.0 /04/, UCR verification standard version 2.0 /04/, and UCR program manual version 6.1 /04/.

General description of project activity

Means of Project Verification

The objective of the project activity is to register Line-2A and Line-7 of the Mumbai Metro system under the UCR activity. Maha Mumbai Metro Operation Corporation Limited (MMMOCL) is responsible for the implementation and operation of the project. The metro transportation system offers higher energy efficiency compared to traditional road-based transport, with lower greenhouse gas (GHG) emissions per passenger-kilometre. As such, the implementation of the project activity results in measurable GHG emission reductions compared to the baseline scenario.

The project was found to be implemented and operated in line with the information provided in the PCN /01/. The project activity is currently undergoing its verification, and the monitoring period of the registered project activity is from 01/01/2023 to 31/12/2024 (both dates inclusive). The total emission reductions claimed under the monitoring period, as verified, are 89,894 tCO_2e.

The details of the Mumbai Metro along with the commissioning dates under this project are as follows:

Line	Corridor Name	Network Length (in km)	No. of Stations	Commissioning Date
Line - 2A	Dahisar (East) - Dahanukarwadi	9.8 km	9	02/04/2022
	Dahanukarwadi – Andheri West	8.8 km	8	20/01/2023
Line - 7	Ovaripada - Aarey	10.7 km	9	02/04/2022
	Aarey - Gundavali	5.8 km	4	20/01/2023

The combined total network length of the two lines is 35.1 km with the metro system being fully elevated. Trains run on standard gauge (1435 mm) and consist of 6-car stainless steel rolling stock, with a width of approximately 3.2 meters. The capacity of a 6-car train is approximately

	1,756 passengers. The trains operate at an average speed of 35 kmph and a maximum speed of 80 kmph, with frequencies ranging from 6 to 10 minutes, depending on the time of day and passenger demand. The track structure includes: • Ballast less tracks on viaducts • Ballasted tracks in depot areas The traction system is 25 kV AC, 50 Hz, single-phase, with power supplied through a 110 kV/33 kV power distribution system, connected to grid substations. Auxiliary systems are powered through a dedicated 33 kV ring main cable network along the alignment. Projected ridership based on DPR forecasts: • 2023: 10,04,722 passengers/day • 2032: 13,11,648 passengers/day During the site visit and desk review, the verification team confirms that the description of the project is consistent with the approved PCN /01/, and that all physical features, equipment, and monitoring systems are in place as per the registered design.
Findings	No findings were raised.
Conclusion	The verification team confirms that the project description contains all the relevant information required and is in line with the UCR standard version 7.0 /04/, UCR verification standard version 2.0 /04/, and UCR program manual version 6.1 /04/.

Application and selection of methodologies and standardized baselines

(.a.i) Application of methodology and standardized baselines

Means of Project Verification	The project activity applies to the approved CDM methodology ACM0016, Mass Rapid Transit Projects, version 4.0 /05/ and no standardized baseline is used. The applicability of the methodology is assessed below:

Applicability Condition under ACM0016, version 04	**Verification team assessment**
The project constructs a new rail-based infrastructure or segregated bus lanes. • For rail systems, the project needs to involve the construction of a new infrastructure (new rail lines); • For BRTs the project can be based on existing road infrastructure, but which separates physically bus lanes from mixed traffic.	The project activity is construction of a new rail-based infrastructure (Metro). The same has been checked by verification team from Detailed Project Report (DPR) /06/ during the desk review and on-site audit. The project activity does not include BRT, hence this point is not applicable. The verification team confirms that the criteria has been met.
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 under the project replaces passenger trips by the existing bus operations and result in the reduction in number of buses. The same has been confirmed by verification team during desk

		review and traffic survey report /10/ shared by PP.
	The methodology is not applicable for operational improvements (e.g. new or larger buses) of an already existing and operating bus lane or rail-based MRTS;	The project is a new rail-based system. This has been confirmed by the verification team during on-site visit and review of DPR /06/
	Fuels including (liquefied) gaseous fuels or biofuel blends, as well as electricity can be used in the baseline or project case. The following condition apply:	The project activity uses only electricity for its operations, whereas, the baseline modes of transport uses different types of fuels, including gaseous fossil fuels (gasoline and diesel) and CNG. However, as there is no other fuel consumption, except the traction energy (electricity by the project activity, the same has been verified during the on-site visit and desk review of the DPR /06/, there is no possibility of more consumption of gaseous fossil fuels by project activity. Hence, the condition, usage of more gaseous fossil fuel in the project case is not applicable.
	In the case of gaseous fossil fuels, the methodology is applicable if equal or more gaseous fossil fuels are used in the baseline scenario than in the project activity. The methodology is not applicable in its current form if more gaseous fossil fuel is used in the project activity compared to the baseline scenario.	The condition usage of more gaseous fossil fuel in the project case is not applicable.
	The methodology is applicable for urban or suburban trips. It is not applicable for inter-urban transport.	The project activity is meant for urban transport in Mumbai. The purpose of metro line is to connect the various parts of Mumbai. Metro line map clearly indicates the project operations are restricted for urban trips only. The same has been verified during the on-site visit and metro map available on the public domain.
	The methodology is applicable if the most plausible baseline scenario is the continuation of the use of current modes of transport.	The identified baseline scenario of the project is continuation of current public transport system, as described and justified in 'Establishment and description of baseline scenario under baseline section of PCN. The same has been verified during the onsite visit.
	The implementation of Air-and Water- based transport system	The project activity is a land based transport system. Hence this is not applicable.

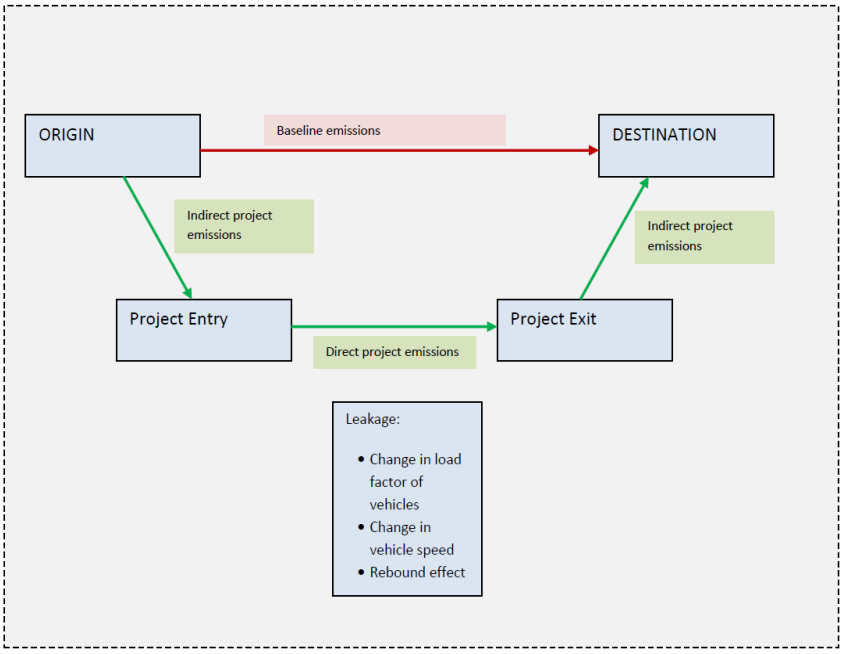
	<table><tr><td>Applicability conditions of Tool 01 “Tool for the demonstration and assessment of additionality”, Version 07.0.0</td><td>The project uses performance analysis i.e. proves for rail based MRTS projects - Electricity consumption is less than or equal to 0.1kWh/pkm. This is demonstrated in ER spreadsheet (ex-ante). Notwithstanding that additionality demonstration is not a criterion under UCR scheme</td></tr></table> <table><tr><td>Applicability conditions under Tool 05 “Tool to calculate baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”, version 03</td><td></td></tr><tr><td>This tool provides procedures to estimate the baseline, project and/or leakage emissions associated with the consumption of electricity and procedures to monitor the amount of electricity generated by the project power plant.</td><td>The project activity will consume electricity to maintain traction energy for propulsion of metro. This is evident from the DPR /06/. Thus, the tool is used to calculate direct project emissions from consumption of electricity.</td></tr><tr><td>The tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption: Scenario A: Electricity consumption from the grid. Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s).</td><td>The project activity applies to Scenario A, where electricity will be consumed from the grid to maintain traction energy for the metro line. This is evident from the DPR /06/. Hence scenario A is applicable.</td></tr></table> <table><tr><td>“Baseline measures for modal shift measures in urban passenger transport” version 01.0</td><td>The tool is applicable to project activities in urban passenger transport that implement a measure, or a group of measures aimed at a modal shift to urban public transit such as metro, bus rapid transit, light rail and trams. The project activity is a metro system aimed at modal shift thus the tool is applicable.</td></tr></table> The verification team has checked the applicability conditions with the applied methodology and tools and approved PCN and found to be correct.
Findings	No findings were raised.
Conclusion	"The verification team confirms that the applicability of the project is in line with the applied methodology, UCR Standard Version 7.0, UCR Verification Standard Version 2.0, UCR Program Manual Version 6.1,

	and the approved PCN.

(.a.ii) Clarification on applicability of methodology, tool and/or standardized baseline

Means of Project Verification	The latest available version of the approved methodology; ACM0016: "Mass Rapid Transit Projects" is Version 06; however, PP has applied Version 04, as the baseline scenario has been adopted from CDM PoA 9863, and is alike the proposed UCR project. PP has requested a deviation from the requirement to use the latest version of the methodology, and this deviation has been formally approved in the PCN. As a means of verification, the verification team has reviewed the approved CDM PoA 9863 /15/, the submitted PCN, and the justification for applying Version 04 of ACM0016. Based on this assessment, the verification team confirms that the application of ACM0016 Version 04 is appropriate and acceptable for the proposed project activity.
Findings	No findings were raised.
Conclusion	The verification team confirms that the use of ACM0016 Version 04, justified by alignment with CDM PoA 9863 and approved in the PCN, is appropriate, acceptable, and in accordance with UCR requirements for the proposed project activity.

(.a.iii) Project boundary, sources and GHGs

Means of Project Verification	The project boundary includes the physical, geographical site(s) of MMMOCL Line 2A and Line 7:  The verification team has reviewed the project boundary in accordance with the approved PCN and confirmed that it aligns with the methodology.
Findings	No findings were raised.
Conclusion	The verification team confirms that the project boundary includes all necessary information and complies with both UCR requirements and the approved PCN.

(.a.iv) Baseline scenario

Means of Project Verification	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. Baseline emissions are calculated per passenger surveyed. For each passenger surveyed, the individual baseline emissions are calculated and multiplied with the individual expansion factor thus getting the baseline emissions of all passengers of the specific week surveyed. These are then multiplied with the total of the passengers of the period to arrive at baseline emissions. The following steps would be realised: Step 1: Conduct a survey, following the procedures presented in Appendix 4 of methodology, in which for each surveyed passenger, the trip distance per transport mode that would have taken place in the baseline is determined. Step 2: Calculate the individual baseline emissions for each surveyed passenger. Step 3: Apply an individual expansion factor to each surveyed passenger in accordance with the survey sample design, and summarize these to get the total baseline emissions of the period (week) surveyed. To get the annual (or monitoring period) baseline emissions the baseline emissions of the surveyed period (week) are calculated per passenger of the period (week) and multiplied with the total passengers transported per year (or monitoring period). Step 4: Take the lower limit of the 95% confidence interval as total baseline emissions. Baseline emissions are calculated as follows: $$BE_y = \frac{P_y}{P_{SPER}} \sum_p \left(BE_{p,y} \times FEX_{p,y} \right)$$ _____ (1) Where: BE_y = Baseline emissions in the year y (gCO_2) $BE_{p,y}$ = Baseline emissions per surveyed passenger p in the year y (gCO_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 = 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 (each individual) y = Year of the crediting period The verification team confirms that the passenger survey data /09/ for 2023, conducted by a third-party agency, has been appropriately reviewed and correctly incorporated into the ER sheet. The survey methodology and data were verified during the onsite assessment and are found to be consistent with UCR requirements. The baseline emission per surveyed passenger p is calculated based on the mode used, the trip distance per mode and the emission factor per mode: $$\mathrm{BE}_{p,y} = \sum_i \mathrm{BTD}_{p,i,y} \times \mathrm{EF}_{pkm,i,y} \times 10^{-6}$$ _____ (2)

Where:
$BE_{p,y}$ = Baseline emissions per surveyed passenger p in the year y (gCO_2)
$EF_{PKM,i,y}$ = Emission factor per passenger-kilometre of mode iin the year y (gCO_2/PKM)
$BTD_{p,i,y}$ = Baseline trip distance per surveyed passenger p using mode iin the year y (PKM)
p = Surveyed passenger (each individual)
i = Relevant vehicle category
y = Year of the crediting period

1) Criteria for identifying the vehicle categories are as follows:

a) At a minimum, public transport has to be included;

b) Conditions to include categories with reliable data on fuel consumption and load factors;

c) Only include categories that are relevant for the MRTS project. If the project will only generate credits from public transport without modal shift, then passenger cars, taxis and motorcycles need not be included;

d) Differentiate relevant fuel types for each category. Diesel, gasoline and gas (CNG or LPG) are listed separately if a minimum of 10 per cent of vehicles of the respective category use such a fuel, while the threshold for zero-GHG-emission fuels is minimum 1 per cent. The 10 per cent threshold is justified, as greenhouse gas (GHG) emission differentials between diesel, gasoline and gaseous fuels are less than 20 per cent;

e) In case of a system extension, the currently operating system is not included as a vehicle category.

Identification of the relevant vehicle categories (modes of transport)

Following vehicle categories have been identified as the applicable modes of transport in the absence of the project MRTS:
1. Buses
2. Urban rail
3. Metro (non-project existing metro)
4. Taxi
5. Passenger cars;
6. Two-wheelers and Motorcycles;
7. Auto rickshaws (motorized)
8. Bicycle or per foot
9. Others

If some vehicle categories are not explicitly identified or do not fit into one of the categories above; they should be entered in the survey as “others”. Baseline emissions of this category are counted as 0. The index i is used to identify each relevant vehicle category (mode of transport) included in the analysis. In indirect project emissions, the highest emission factor of all categories is taken if the survey respondent chooses the item “others”.

The traffic survey reports /10/ were conducted by the PP and shared with the verification team. During the onsite visit, the verification team cross-checked the survey data with the records maintained by the PP and

confirms that the provided data is consistent with the data on file.

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

Passenger-kilometer (PKM) is defined as the average passenger trip distance multiplied by the number of passengers. The emission factors per PKM are determined ex ante for each vehicle category. Any change in the occupancy rate of taxis and buses influencing the corresponding emission factors is monitored as leakage. The emission factor per PKM is calculated as follows:

(2.1) Emission factor per PKM for electricity-based transport systems (Existing metro rail):

$$EF_{PKM,i,x} = \frac{TE_{EL,i,x}}{P_{EL,i,x} \cdot D_{EL,i,x}} \times 10^6 \quad \text{_____(3)}$$

Where:

$EF_{PKM,i,x}$	=	Emission factor per passenger-kilometre for electricity-based vehicle category i in year x (gCO_2/PKM)
$TE_{EL,i,x}$	=	Total emissions from the electricity-based vehicle category i in year x (tCO_2)
$P_{EL,i,x}$	=	Total passengers transported per year by the electricity-based vehicle category i in year x (passengers)
$DE_{LI,xi}$	=	Average trip distance travelled by passengers using the electricity-based vehicle category i in
X	=	year x (km) Most recent calendar year for which data is available. Data not older than three years

The total emissions from the existing metro rail category i, $TE_{EL,i,y}$, is calculated, using the 'Tool to calculate baseline, project and/or leakage emissions from electricity consumption'. When applying the tool, the parameter $EC_{BL,k,y}$ is taken as the amount of electricity used by the electricity-based vehicle category i for year y, consistent with the transportation of $PE_{L,i,y}$ passengers along the average distance $TD_{EL,i}$.

(2.2) For fuel-based vehicle categories identified above (bus/taxi/passenger car/Auto rickshaw/motorcycle), the emission factor per PKM is calculated as follows:

$$EF_{PKM,i,x} = \frac{EF_{KM,i,x}}{OC_{i,x}} \quad \text{_____ (4)}$$

Where:

$EF_{PKM,i,x}$	=	Emission factor per passenger-kilometre of vehicle category i in year x (gCO_2/PKM)
$EF_{KM,i,x}$	=	Emission factor per kilometre of vehicle category i in year x (gCO_2/km)
$OC_{i,x}$	=	Average occupancy rate of vehicle category i in year x (passengers)
I	=	Road based vehicle categories (such as passenger car (C) bus (B), Motorcycle (M)
X	=	Most recent calendar year for which data is available. Data not older than three years

(2.2.1) Determination of the average occupancy rate (OC_i)

	The average occupancy rate (OCi) of vehicle category i is determined based on visual occupancy studies for all vehicle categories i. For buses, besides the visual occupancy studies, the occupancy rate can also be based on boarding-alighting studies or electronic smart tickets, with expansion factors for routes served to determine the average occupancy rate along the entire route. For taxis, the driver should not be included. **Occupancy rate of taxis/motorcycles or passenger cars:** Load factor studies for taxis/motorcycles or passenger cars is carried out through visual occupancy as per Appendix 3 of ACM0016. The actual number of passengers excluding the driver of taxis is counted in a given point within a given time period. The procedures to establish visual occupancy: a. Locations, days and times for field study were defined, avoiding days immediately after or before a holiday. b. Field data is collected. Coverage of the occupancy counts should be higher than 95% of the number of taxis that cross the checkpoint. One hundred per cent coverage is desired. To control this outcome, a separate vehicle count is advised. Data can be adjusted with the actual count c. Occupancy is the number of passengers using the vehicle. The driver is not counted for taxis. Taxis without passengers were counted as no (zero) occupancy; d. The total number of vehicles and the total number of passengers was reported. The average occupancy rate of vehicles is the total number of passengers divided by the total number of vehicles in which counts were performed; e. The study is realized in different locations of the larger urban zone of the city **In the case of taxis and auto rickshaws, the driver is not included in the study.** The occupancy studies would be conducted as per the guidance provided under Appendices 1, 2 and 3 of the methodology. Baseline emission estimated as per the above formulas, would determine the total emissions that would have occurred in the absence of the project activity, as a result of baseline trips made by the project passengers. Baseline emissions cover the entire emissions which would have been caused by the project passenger in absence of the project from his trip origin to his trip destination: a) The origin and destination of the trip are assumed to be equal for the baseline as for the project case with an exception of induced traffic included only as project but not as baseline trips; b) The trip distance and the modes used between O (origin) and D (destination) are however different in the baseline than in the project case; c) The trip distance may vary as some passengers using the project MRTS may be willing to make detours due to the higher speed of the MRTS versus conventional bus transport.

To fully capture all the potential changes, the methodology compares emissions per O-D trip of the baseline with emissions per O-D trip of the project. The data to determine O-D mode(s) and distances per mode are derived from a representative survey of project passengers realized annually. Total baseline emissions are calculated thereafter annually based on these parameters, the emissions per pkm and the amount of passengers transported by the project.

(2.2.2) Determination of the emission factors per kilometre ($EF_{KM,i,x}$)

Differentiate relevant fuel types for each of the relevant road-based vehicle categories identified in Step 1. Vehicles in a vehicle category using diesel, gasoline, biofuel, biofuel blend, electricity or gas (compressed natural gas (CNG) or liquefied petroleum gas (LPG)) should be listed separately.

Estimating emission factor per kilometre based on the fraction of vehicles using a specific fuel type, the consumption of each fuel type and CO_2eq emissions per unit of fuel consumed:

$$EF_{KM,i,x} = \frac{\sum_{n} \left(SFC_{i,n,x} \cdot NCV_{i,n} \cdot EF_{CO2,n} + SECi, x.EFCO2, X \right)}{} .Ni, nx / Ni, x$$

_____(5)

Where,

$EF_{KM,i,x}$	=	Emission factor per kilometre of vehicle category i in year x (g CO_2/km)
$SFC_{i,n,x}$	=	Specific fuel consumption of vehicle category i using fuel type n in year x (mass or volume units of fuel/km)
$NCV_{x,n}$	=	Net calorific value of fuel n used in vehicle category i (J/mass or volume units of fuel)
$EF_{CO2,n}$	=	Emission factor for fuel type n(g CO_2/MJ)
$SEC_{i,x}$	=	Specific electricity consumption of vehicle category I using electricity in year x (Kwh/ Km)
$EF_{CO2,x}$	=	Emission factor for electricity in year x (g CO_2/KWh)
$N_{i,x}$		Number of vehicles – Kilometres of category i driven in year x (VKM) or number of vehicles of category i in year x (units)
$N_{i,n,x}$	=	Number of vehicle – kilometres vehicle category i using fuel type n driven in year x (VKM) or number of vehicles in vehicle category i using fuel type n in year x (units)
N	=	Fuel types used in vehicle category i in year x
I	=	Road- based vehicle categories (passenger car (C), bus (B), motorcycle (M) etc.
X	=	Most recent calendar year for which data is available, Data not older than three years.

The technology improvement factors provided in the tool is listed in the following table are applied:

Vehicle Category	**Technology improvement factor (IR)**
Buses	0.99
Passenger cars	0.99
Taxis	0.99

	Motorcycles (inc. Tricycles) | 0.99 For the baseline scenario, the PP has correctly identified the parameters and provided the MMRCL DPR /06/, survey reports /09/, and ridership and traction energy details /07/. These have been used and correctly calculated in the ER sheet. During the onsite visit and desk review, the verification team cross-checked all available data maintained by the PP on a random basis.
Findings	CL 04 was raised and closed successfully. Refer to "Clarification request, corrective action request and forward action request" below for further details.
Conclusion	The verification team confirms that the baseline scenario has been correctly identified and is consistent with the approved methodology, UCR requirements, and the approved PCN.

(.a.v) Estimation of emission reductions or net anthropogenic removal

Means of Project Verification

In accordance with the applied methodology, the project owner has calculated emission reductions in the following manner:

$$ER_y = BE_y - PE_y + LE_y$$

Baseline emission calculations

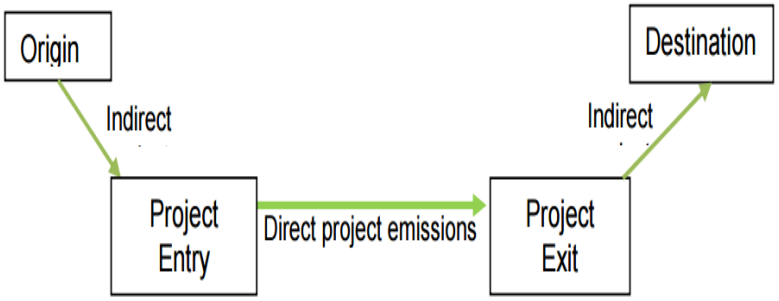
Baseline emission, estimated as per the above formulas, would determine the total emissions that would have occurred in the absence of the project activity, as a result of baseline trips made by the project passengers. Baseline trips emissions are calculated based on the distance travelled by the passengers from their trip origin to trip destination and the mode of transport used to make the respective trip. The survey carried out for the purpose of determining the baseline trip distance and modes used, also covers the passenger those would not have made the trip in the absence of the project activity.

Total baseline emissions are calculated thereafter annually based on these parameters, the emissions per PKM and the amount of passengers transported by the project.

Year	Annual Passenger Flow	PSPER	Expanded baseline emission (gCO_2e)	Baseline Emission (tCO_2e)
2023	6,19,09,985	1,39,032	18,20,31,856	81,058
2024	7,91,47,302	1,39,092	18,06,71,219	1,02,807

Project emission calculations

Project emissions are based on the fuel and/or electricity consumed by the MRTS (direct project emissions) plus emissions caused by project passengers from their trip origin to the entry station of the project and from the exit station of the project to their final destination (indirect project emissions), as illustrated in Figure below.



Project emissions are calculated as follows:

$$PE_y = DPE_y + IPE_y \quad \text{_____ (6)}$$

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

Determination of direct project emissions (DPE_y)

Case 1: Use of fossil fuels in the project activity transport system (Not Applicable since Fuel consumption is not involved in the project activity).

Case 2: Use of electricity in the project activity transport system (Applicable). If the project activity involves electricity-based transport systems (e.g. electrical railway systems), the emissions from electricity consumption will be based on the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". The parameter $PE_{EC,y}$ in the tool corresponds to the direct project emissions from the project transport system in year y (DPE_y). Only electricity consumed for train propulsion should be included in rail-based MRTS.

For calculation of direct project emissions which in this case is from the use of electricity in the project activity transport system, "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" is to be used. The parameter $PE_{EC,y}$ in the tool corresponds to the direct project emissions from the project transport system in year y (DPE_y). Only electricity consumed for train propulsion should be included in rail-based MRTS.

$$PE_{EC,y} = \sum_j EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y}) \quad \text{_____ (7)}$$

Where,

$PE_{EC,y}$ = Project emissions from electricity consumption in year y (tCO_2/yr)
$EC_{PJ,j,y}$ = Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$ = Emission factor for electricity generation for source j in year y (tCO_2/MWh)
$TDL_{j,y}$ = Average technical transmission and distribution losses

for providing electricity to source j in year y

j = Sources of electricity consumption in the project

Since electricity for train propulsion will be imported from grid, hence the baseline emission factor has been chosen in accordance with UCR guideline.

The combined emission factor for electricity consumption is as follows:

Grid	Unit	Value
Indian	tCO_2/MWh	2022-23: 0.919 2023-24: 0.757

Traction Energy	Emission factor	TDL_y	DPE_y
x	y	z	x*y*(1+z)

The traction energy will vary and depend on the estimated value from DPR or project feasibility report. Energy at high voltage will be received at Receiving Substation (RSS), internal transmission and distribution loss from RSS to Rolling stock would be recorded and measured.

In MRTS system, the Receiving Substation (RSS) supplies electricity to various lines of the MRTS system (both project and non-project lines). In the event, the RSS supplies dedicatedly to the project line, then the total reading of the meter for traction energy will be monitored and used for the calculation of direct project emissions.

In case the RSS supplies electricity to other lines of the MRTS system along with the project line, then the following formula will be used to calculate traction energy used by project line during the monitoring period:

$$TE_{CPA,y} = TE_{Total-RSS,y} * \frac{Car-km_{CPA-MRTS,y}}{Car-km_{RSS-Total,y}} \quad \text{(8)}$$

Where,

$TE_{CPA,y}$ = Traction energy consumed by project MRTS line in year y
$TE_{Total-RSS,y}$ = Total traction energy supplied by RSS in year y
$Car\text{-}km_{CPA-MRTS,y}$ = Total car-km of project MRTS line in year y
$Car\text{-}km_{RSS-Total,y}$ = Total car-km supplied traction energy by the RSS in year y

Year	Traction Energy	Emission factor in tCO_2/Mwh	TDL	DPE_y (Calculated)
2023	51,550	0.919	3.27%	48,924
2024	52,616	0.757	3.30%	41,144

During the onsite visit to the Charkop RSS, DN Nagar RSS and Nancy Nagar RSS, the verification team noted that the electricity provided by DISCOM at 110 kV level is metered. There is also a check meter at each RSS at 110 kV level. The Charkop RSS and DN Nagar RSS are responsible for supply of electricity in line 2A of MMMOCL and Nancy Nagar RSS is responsible for supply electricity in line 7 of MMMOCL.

	The received electricity is passed through 2 transformer lines in parallel. One line steps down the electricity to 33 kV and the other line steps down the electricity to 25 kV. The 33 kV line is used for stations and the 25 kV line is used for traction. The RSS meters the energy in the 25 kV line. This 25 kV line is used for main line traction and traction at depots. The electricity consumption at depots is metered. The net energy used for main line traction is thus the difference of energy recorded at 25 kV line meter and the electricity consumed by the depot meters. This is the procedure adopted at all the RSS involved in the project activity. This derived value of main line traction energy is directly utilized for estimation of emission reductions. The data maintained at the RSS on hourly basis and the data provided to the verification team are monthly basis, the traction energy has been cross verified by the verification team and found to be consistent and to be in line with the applied methodology /05/ and approved PCN /01/. **Determination of indirect project emissions (IPE_y)** 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: The survey realized identifies the origin, the project entry station, the project exit station and the final destination of the passenger and the modes used between the different points, e.g. bicycle from origin to project entry station and taxi from project exit station to final destination. The distances between origin and entry and between exit and destination are calculated based, e.g. on public transit routes, electronic maps and GPS (identical to baseline trip determination); The emission factors per passenger-kilometre used for indirect project emissions are identical to the baseline passenger-kilometre factors ($EF_{PKM,i,y}$). The following steps would be followed to determine the indirect project emissions: **Step 1:** A survey conducted, as per Appendix 4 of the Methodology ACM0016, to determine the trip distance per transport mode used to/from the project metro stations. **Step 2:** Indirect project emissions for each surveyed passenger are calculated as per equation 10. **Step 3:** Apply to each surveyed passenger an individual expansion factor in accordance with the survey sample design (as defined in Appendix 4 of the Methodology ACM0016) and summarize these to get the total indirect project emissions for the survey period (week). To get the annual (or monitoring period) indirect project emissions the indirect project emissions of the surveyed period (week) are calculated per passenger of the survey period (week) and multiplied with the total passengers transported per year (or period), as per equation 9 below. **Step 4:** Apply the upper 95% confidence interval to the total indirect project emissions. $$IPE_y = \frac{P_y}{P_{SPER}} \sum_P (IPE_{p,y} \times FEX_{p,y}) \times 10^{-6} \quad \text{(9)}$$ 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.

$$IPE_{p,y} = \sum_i IPTD_{p,i,y} \times EF_{pkm,i,y} \quad \text{(10)}$$

Where:

$IPE_{p,y}$ = Indirect project emissions per surveyed passenger p in the year y (g CO_2)
$IPTD_{,p,i,y}$ = 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 (gCO_2/PKM)
i = Relevant vehicle category
p = Surveyed passenger
y = Year of the crediting period

Year	**Annual Passenger Flow**	**PSPER**	**Expanded Project emission (gCO_2e)**	**Indirect project emission (tCO_2e)**
2023	6,19,09,985	1,39,032	38,62,123	1,719
2024	7,91,47,302	1,39,092	38,38,126	2,184

Based on the surveyed passenger and the survey design the corresponding expansion factors are applied to calculate total indirect project emissions. Total indirect project emissions are determined based on the upper limit of the 95% confidence interval as results are based on a sample/survey.

Leakage emission calculations:
The same 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; ($LE_{LFB,y}$ and $LE_{LFT,y}$)

Emissions due to reduced congestion on affected roads, provoking higher average vehicle speed, plus a rebound effect; ($LE_{CON,y}$)

Upstream emissions of gaseous fuels ($LE_{UP,y}$)

	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. The indirect project emissions is based on the Origin to Destination trip of the passenger. A third party survey analysis authority Probe Research & Social Development Pvt. Ltd. was appointed to do the passenger analysis survey, the survey sheet /11/, the survey was done as per the methodology requirements and sample filled survey questionnaire has been checked by the verification team and found to be in line with the applied methodology and approved PCN. Leakage emissions are calculated as follows: $$LE_y = LE_{LFB,y} + LE_{LFT,y} + LE_{Con,y} + LE_{UP,y}$$ _____ (11) Where, LE_y = Leakage emissions in the year y (tCO_2) $LE_{LFB,y}$ = Leakage emissions due to change of load factor of buses in the year y (tCO_2) $LE_{LFT,y}$ = Leakage emissions due to change of load factor of taxis in the year y (tCO_2) $LE_{CON,y}$ = Leakage emissions due to change in congestion in the year y (tCO2) $LE_{UP,y}$ = Leakage emissions due to upstream emissions of gaseous fuels in year y (tCO_2) As a conservative approach, it is assumed that for each component viz. $LE_{LFB,y}$, $LE_{LFT,y}$, $LE_{CON,y}$, $LE_{UP,y}$ and $LE_{UP,y}$ only the positive value (leading to net emissions) is considered. For ex ante calculation leakage is considered to be zero. **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, 4, 7 and 10 of the crediting period, if fixed crediting period is chosen. 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: $$LE_{LFB,y} = max\left\{\frac{1}{10^6} \times N_{B,y} \times AD_B \times EF_{km,B,y} \times \left(1 - \frac{OC_{B,y}}{OC_B}\right); 0\right\}$$ _____ (12) 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 (gCO_2/km)

	$OC_{B,y}$ = Average occupancy rate of baseline buses in the year y (passengers) OC_B = Average occupancy rate of baseline buses prior project start (passengers) For the purpose of determining the occupancy rate of buses, the study method of visual occupancy is chosen. The monitoring method will be used for the entire project monitoring period. **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, 4, 7 and 10 of the crediting period, as the fixed crediting period is chosen. This leakage is calculated as: $$LE_{LFT,y} = max\left\{N_{T,y} \times AD_T \times EF_{km,T,y} \times \left(1 - \frac{OC_{T,y}}{OC_T}\right) \times \frac{1}{10^6}; 0\right\} \quad \text{(13)}$$ 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 baseline 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 = Average baseline occupancy rate of taxis prior project start (passengers) 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 who in absence of latter would have taken a taxi. For the purpose of determining the occupancy rate of taxis, the study method of visual occupancy would be chosen. The monitoring method will be used for the entire project monitoring period. The parameter emission factor per kilometre of baseline taxis in the year y ($EF_{KM,T,y}$) is calculated using the equation for $EF_{KM,i,y}$ presented in the tool “Baseline emissions for modal shift measures in urban passenger transport” section, substituting i for T (taxis). Since, load factor of buses and taxis have increased, hence as per

methodology ACM0016 version 04, leakage emission due to change in load factor of buses and taxis are not considered and is taken as zero.

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

The project activity may reduce the number of remaining buses and potentially other vehicles on roads used by mixed traffic and thus also congestion. It is not possible however to determine ex ante if this effect will result in positive leakage emissions (i.e. emissions increase) or negative leakage emissions (i.e. emissions reductions). Two effects resulting from reduced congestion are considered:

1) Induced traffic effect (or rebound effect), i.e. more trips of passenger cars on the affected roads.
2) Changes in vehicle speed effect, i.e. change of emissions due to reduced or increased speed of cars on affected roads.

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. This change in road capacity available for individual motorised transport modes may result from the reduction of road space due to the implementation of MRTS and/or a potential reduction of traffic flow due to the withdrawal of conventional public transport units as a result of the project activity.

To determine whether road capacity is reduced, the following procedure shall be applied:

Determination of the additional road capacity available to motorised transport modes

The following equation determines the additional road capacity, available to the transport modes remaining in operation, as a result of the implementation of project activity in the year when the project MRTS is intended to reach its planned capacity:

$$ARS_y = \sum_y \frac{BSCR_y}{N_B} \times SRS - \frac{RS_{BL} - RS_{PJ}}{RS_{BL}} \quad \text{(14)}$$

Where,

ARS_y	=	Additional road capacity available to individual motorised transport modes in year y when the project MRTS is intended to reach its planned capacity (in percentage)
$BSCR_y$	=	Bus units retired as a result of the project in year y
N_B	=	Number of buses in use in year x
SRS	=	Share of road space used by public transport in the year x (in percentage)
RS_{BL}	=	Total road space available in year x (lane-kilometres)
RS_{PJ}	=	Total available road space in the project (= RSB minus kilometre of lanes that where reduced due to dedicating bus lanes to the project activity) (lane-kilometres)
x	=	Most recent calendar year for which data is available.

Data not older than three years.

The following equation shall be used to determine SRS if no recent and good quality study is available which has calculated this parameter:

$$SRS = \frac{TD_B \times 2.5}{TD_B \times 2.5 + TD_T + TD_C} \quad \text{(15)}$$

Where:

SRS	=	Share of road space used by public transport in year x (in percentage)
TD_B	=	Total distance driven by public transport buses in year x (kilometres)
TD_T	=	Total distance driven in kilometres by taxis in year x (kilometres)
TD_C	=	Total distance driven in by passenger cars in year x (kilometres)
x	=	Most recent calendar year for which data is available. Data not older than three years.

It is assumed that one bus occupies 2.5 times more road space than a personal car or a taxi. For all distance variables, the same vintage of data, the same spatial scope and the same time-span (e.g., one month or one year) is required.

If ARS_y is negative, leakage emissions due to increased congestion, as a result of the reduced road capacity due to the project activity, shall be quantified as per the calculation of $LE_{CON,Y}$. If ARS_y is positive, $LE_{CON,y}$ is assumed to be zero.

The project activity is applicable to rail-based MRTS, the implementation of which has no effect on the road capacity of the urban zone. Apart from that as a result of implementation of the MRTS, few number of bus units are to be retired in the route of the MRTS. Thus, $BSCR_y$ is positive, hence ARS_y is positive. Thus $LE_{CON,y}$ is assumed to be zero.

The leakage calculation has been accepted by the verification team and found to be in line with the applied methodology /05/

Emission Reductions:

Emissions reductions are calculated as:

$ER_y = BE_y – PE_y + LE_y$ _____ (16)

Where:

ER_y = Emissions reductions in year y (tCO_2)

BE_y = Baseline emissions in year y (tCO_2)

PE_y = Project emissions in year y (tCO_2)

LE_y = Leakage emissions in year y (tCO_2)

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
2023	81,058	50,643	0	30,415

	2024	1,02,807	43,328	0	59,479
	Total number of crediting years	02			
	Total	1,83,865	93,971	0	89,894
Findings	No findings were raised.				
Conclusion	The verification team confirms that the estimation of emission reductions has been carried out correctly in accordance with the approved methodology, UCR requirements, and the approved PCN.				

(.a.vi) Monitoring Report

Means of Project Verification

The monitoring contains the following parameters as required:

Sl. No:	Parameter	Description
1.	**$TE_{EL,i,y}$** Total emissions from the electricity based rail system in year y	The emissions from the electricity-based rail system for the years 2023 and 2024 have been calculated based on approved CDM tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption," resulting in 858 tCO_2eq and 707 tCO_2eq respectively. The values for electricity consumption due to electricity based rail system has been taken from the recent train electricity consumption data from Rail Operator. The verification team confirms that the parameter $TE_{EL,i,y}$ has been correctly calculated in accordance with the applicable methodology, and that the calculation process and data archiving practices are consistent with UCR requirements
2.	**$EC_{pj,y}$** Electricity consumed by project activity vehicles	Electricity consumption by project activity vehicles is measured at the RSS level using high-accuracy meters and monitored monthly by MMMOCL's O&M Traction wing. **Year** / **Traction Energy** 2023 / 51,550 2024 / 52,616 The verification team cross-checked the data during the onsite visit at the RSS and confirms that the values have been correctly recorded and used to calculate project emissions ($TE_{EL,i,y}$). Calibration certificates /14/, were reviewed and confirm that the meters are properly calibrated in accordance with technical requirements. The calibration details of meters for traction energy are provided: S. No. of Energy Meter / Make of Energy Meter / Date of Calibration / Due Date of Calibration X1233400 / Secure / 14/08/2024 / 13/08/2026 X1233399 / Secure / 14/08/2024 / 13/08/2026
3.	**TDL_y**	The transmission and distribution loss data for

<table>
<tr><td></td><td></td><td>Average technical transmission and distribution losses for Maharashtra</td><td>MMMOCL was sourced from Maharashtra State Electricity Transmission Co. Ltd. /12/ and is publicly available.
<table><tr><th>Year</th><th>TDL</th></tr><tr><td>2023</td><td>3.27%</td></tr><tr><td>2024</td><td>3.30%</td></tr></table>The verification team confirms that the data has been appropriately sourced, reviewed, and correctly applied in the ER sheet for project emission calculations.</td></tr>
<tr><td></td><td>4.</td><td>$TE_{Total\text{-}RSS,\ y}$

Total traction energy recorded at RSS level</td><td>Traction energy consumption is measured using high-accuracy meters installed at RSS and monitored monthly by MMMOCL’s O&M Traction wing.
<table><tr><th>Year</th><th>Traction Energy</th></tr><tr><td>2023</td><td>51,550</td></tr><tr><td>2024</td><td>52,616</td></tr></table>The verification team cross-checked the data with logbooks during the onsite visit and confirm its accuracy for calculating direct project emissions and traction energy consumed by the MRTS line (TE_{CPA}). The verification team also reviewed the calibration certificates /14/ and confirm that the meters are properly calibrated.

The calibration details of meters for traction energy are provided:
<table><tr><th>S. No. of Energy Meter</th><th>Make of Energy Meter</th><th>Date of Calibration</th><th>Due Date of Calibration</th></tr><tr><td>X1233400</td><td>Secure</td><td>14/08/2024</td><td>13/08/2026</td></tr><tr><td>X1233399</td><td>Secure</td><td>14/08/2024</td><td>13/08/2026</td></tr></table></td></tr>
<tr><td></td><td>5.</td><td>$Car\text{-}km_{CPA\text{-}MRTS,y}$

Car-km of CPA (Line 2A and 7) MRTS lie in year y</td><td>The Car-km data for Line 2A and Line 7 are maintained by the Operations Control Center (OCC) and sourced from the MMMOCL Operations Control Center’s morning position report.

Values applied: 3,58,44,564 km

The verification team cross-checked the data provided by the PP during the onsite visit and confirms they are accurate and acceptable. The fixed distances between stations and the scheduled timetable, with minimal changes, ensure accurate annual recording of Car-km for calculating direct project emissions and traction energy consumption (TE_{CPA}) and the data for Car-km /08/ has been provided by the PP.</td></tr>
<tr><td></td><td>6.</td><td>$Car\text{-}km_{RSS\text{-}Total,y}$

Total car-km supplied traction energy by the RSS</td><td>The total Car-km data /08/ for traction energy supplied by the RSS is maintained by MMMOCL’s Operations Control Center (OCC) and sourced from the MMMOCL’s OCC morning position report.

Values applied: 3,58,44,564 km

The verification team cross-checked the data during the onsite visit and confirm its accuracy</td></tr>
</table>

			and correct application in ER sheet /03/ for calculating direct project emissions and traction energy consumed by the MRTS line (TE_{CPA}).
	7.	**$NCV_{g,d,y}$** Net calorific value of gasoline and diesel in year y	The calorific value for Diesel and gasoline has been taken from Table 1.2, Chapter 1, Volume 2 of the 2006 IPCC Guidelines for National GHG Inventories /16/. **Values applied:** **Diesel - 43** **Gasoline (petrol) - 44.3** The verification team confirms that the values have been correctly applied for calculating baseline and project emissions.
	8.	**$NCV_{cng,y}$** Net calorific value of CNG in year y	The calorific value of CNG has been sourced from PPAC reports. **Values applied: 40.2 MJ/kg** The verification team confirms that this parameter has been correctly applied in the ER calculations in line with the applicable methodology.
	9.	**$EF_{CO2,g,d,cng,y}$** CO_2 emission factor for gasoline, diesel and CNG in year y	The CO_2 emission factors for gasoline, diesel, and CNG have been sourced from Table 1.4, Chapter 1, Volume 2 of the 2006 IPCC Guidelines for National GHG Inventories /16/. For conservativeness, the lower limit values were applied for baseline emissions, and the upper limit values for project emissions. **Values applied:** **For baseline estimations:** **Gasoline: 67.5** **Diesel: 72.6** **CNG: 54.3** **For project estimations:** **Gasoline: 73** **Diesel: 74.80** **CNG: 58.30** The verification team confirms that the values have been correctly applied in the ER calculations and are consistent with IPCC guidance and UCR requirements.
	10.	**$OC_{B,y}$/$OC_{T,y}$ /$OC_{MR,y}$** Average occupation rate of vehicle category *i* in year *y*. In particular, B stands for buses, and T for taxis	The average occupation rates were derived from survey reports /13/ conducted by the project participant, with appropriate methodologies applied, including expansion factors for bus routes. **Values applied:** **Buses: 40.1** **Taxis: 2.03** **Motorized Auto-Rickshaw: 1.79** Source of data includes survey reports, conducted in years 1 and 4 of the crediting period. The verification team reviewed the survey reports and questionnaires and confirms that the

			values have been correctly applied for estimating emissions.
	11.	**P_y** Total passengers transported by the project activity transport system	Passenger data is recorded daily through the Automatic Fare Collection (AFC) System, which tracks entries at MMMOCL stations within the project boundary using smart media unique IDs and generates an OD matrix report at the end of each day at the Operations Control Centre (OCC). **Value applied:** **2023 — 6,19,09,985** **2024 — 7,91,47,302** This data is used to calculate baseline and indirect project emissions. The verification team reviewed the AFC system and OD matrix reports during the onsite visit and confirms that the parameter has been correctly applied in the ER sheet for emission reduction calculations.
	12.	**$N_{i,y}$/ $N_{B,y}$/$N_{T,y}$/$N_{MR,Y}$** Number of vehicles of vehicle category i circulating in the larger urban zone of the city. In particular B stands for buses, and T for taxis, MR for motorised auto-rickshaw, etc.	The number of vehicles in the city has been sourced from the publicly available VAHAAN Sewa Dashboard maintained by the RTO. **Values applied:** **For the year 2023:** **NB,y : 933** **NT,y : 9,245** **NMR,y: 4,095** **For the year 2024:** **NB,y : 1,054** **NT,y : 13,704** **NMR,y: 5,356** This data is used to calculate baseline emissions based on official vehicle registration statistics. The verification team reviewed the source and confirm that the parameter has been correctly applied in the ER calculations.
	13.	**$P_{EL,i,,y}$** Total passengers transported by baseline rail- system per year in the year y	The total number of passengers transported by the baseline suburban rail system has been taken from the Indian Railways Annual Statistical Statement 2023–24. **Values applied: FY 2023-24** **Sub-urban rail: 2,69,92,96,200** This data is used to calculate baseline emissions. The verification team confirms that the value has been correctly reported and appropriately applied in the ER calculations.
	The verification team confirms that the monitoring report and monitored parameters are in line with the approved PCN and the applied methodology.		
Findings	CL 01, CL 02, CL 03 and CAR 01 were raised and closed successfully. Refer to “Clarification request, corrective action request and forward action request” below for further details.		
Conclusion	The verification team confirms that the data and parameters have been		

	monitored and reported in accordance with the approved methodology and PCN, and that the emission reduction calculations are accurate and consistent with UCR requirements.

Start date, crediting period and duration

Means of Project Verification	The verification team confirms that the project has a fixed crediting period of 10 years, starting from 01/01/2023 to 31/12/2032, both dates inclusive. This has been verified through a detailed desk review of the project documentation. During the onsite verification, operational and ridership data were reviewed and found to be consistent with the declared start date. Additionally, the verification team cross-checked the operational timeline using publicly available information from the official website of Maha Mumbai Metro Operation Corporation Limited (MMMOCL- Maha Mumbai Metro), which indicates that Lines 2A and 7 commenced partial operations on 02/04/2022 and became fully operational on 20/01/2023. Based on these sources, the verification team confirms that the crediting period start date of 01/01/2023 is accurate and appropriate.
Findings	No findings were raised.
Conclusion	The verification team confirms that the crediting period of 10 years, from 01/01/2023 to 31/12/2032 (inclusive), is valid, and that the start date of 01/01/2023 accurately reflects the commencement of project operations. Furthermore, the project start date is in compliance with UCR requirements and is consistent with the approved Project Concept Note (PCN).

Positive Environmental impacts

Means of Project Verification	The verification team confirms that the project demonstrates multiple positive environmental impacts, primarily through the partial replacement of grid electricity, thereby avoiding associated greenhouse gas emissions from fossil-fuel-based power generation. The project facilitates a modal shift from conventional road transport to an electricity-powered metro system, contributing to a measurable reduction in urban air pollution and overall improvement in air quality. Furthermore, as a more energy-efficient mode of mass transit, the metro system reduces the consumption of fossil fuels, aiding in the conservation of natural resources. These environmental benefits have been verified by the team through a review of electricity consumption records, ridership data, etc.
Findings	No findings were raised.
Conclusion	The verification team confirms that the project is in technical conformance with UCR requirements and demonstrates verifiable environmental benefits, meeting the criteria for environmental impact validation under the UCR framework.

Project Owner- Identification and communication

Means of Project Verification	Maha Mumbai Metro Operation Corporation Limited (MMMOCL) has been identified as the project owner/participant, and all communication with the UCR has been conducted by MMMOCL. This has been verified through email correspondence with UCR.
Findings	No findings were raised.
Conclusion	The verification team confirms that the project owner is in compliance with the requirements of the UCR program manual, version 6.1 /04/.

Positive Social Impact

Means of Project Verification	The project has demonstrated positive social impacts by providing a safe, efficient, and reliable mode of transportation through the MMMOCL metro system. It significantly reduces travel time for commuters and helps

	decongest road traffic through a modal shift from private and road-based transport. The use of electric traction in place of fossil fuel-powered vehicles contributes to improved air quality and lowers commuters' exposure to harmful gaseous and particulate pollutants. Additionally, the metro system enhances public safety by reducing the number of traffic-related accidents per passenger transported.
Findings	No findings were raised.
Conclusion	The verification team confirms that the project activity has delivered positive social impacts by providing a safe and efficient transport system, reducing travel time, easing road congestion, improving commuter safety, and lowering exposure to air pollutants.

Sustainable development aspects (if any)

Means of Project Verification	Not applicable
Findings	Not applicable
Conclusion	Not applicable

Internal quality control

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The draft and final verification reports prepared by the Team Leader are reviewed by an Independent Technical Reviewer, who is external to the verification team and possesses the necessary competence in the relevant technical area. This review is conducted to ensure that the internal procedures established by KBS have been duly followed, and that the verification report and opinion have been reached objectively and in compliance with applicable UCR requirements.

The Independent Technical Reviewer may approve or reject the draft verification report. Findings may be identified during this stage, which must be satisfactorily resolved before the Request for Issuance is submitted to UCR. The final decision on the verification report is taken by the Manager – Technical & Certification. Once approved by the Manager – Technical & Certification, the final authorization is granted by the Managing Director, KBS.

Project Verification opinion

KBS Certification Services Ltd. has been appointed to undertake the first independent verification and certification of greenhouse gas (GHG) emission reductions registered under UCR, titled “MMMOCL (Line-2A and Line-7)”, UCR Ref. No. 529. This verification covers the first monitoring period from 01/01/2023 to 31/12/2024 (both dates inclusive), within the overall crediting period from 01/01/2023 to 31/12/2032. Under UCR requirements, all registered projects must undergo independent third-party verification and certification of emission reductions as the basis for the issuance of Carbon Offset Units (COUs).

The verification has been conducted based on the approved Project Concept Note (PCN) and the Monitoring Report submitted for the project. Our verification approach follows the requirements set forth in the UCR Project Verification Standard.

The management of MMMOCL is responsible for preparing the GHG emissions data and the reported GHG emission reductions, as outlined in the Final Monitoring Report. The calculation and determination of GHG emission reductions, as well as the development and maintenance of records and reporting procedures, are the responsibility of MMMOCL in accordance with the Monitoring Report.

It is the responsibility of KBS Certification Services Ltd. to express an independent verification opinion on the reported GHG emissions and the calculation of GHG emission reductions for the monitoring period 01/01/2023 to 31/12/2024 (both dates inclusive), based on the data provided in Final Monitoring Report – Version 2.2 dt. 23/05/2025.

Based on our understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate those risks, KBS planned and performed the verification to obtain sufficient information and explanations necessary to provide reasonable assurance that the reported GHG emission reductions for the period are fairly stated.

Verified and certified emission reductions reporting period: 01/01/2023 – 31/12/2024 (both dates inclusive).

	Amount	Unit
Baseline emissions (BEy)	1,83,865	tCO_2e
Project emissions (PEy)	93,971	tCO_2e
Leakage emissions (LEy)	0	tCO_2e
Emission reductions (ERs)	89,894	tCO_2e

Abbreviations

Abbreviations	Full texts
AFC	Automatic Fare Collection
CDM	Clean Development Mechanism
CERs	Certified Emission Reductions
CNG	Compressed Natural Gas
COUs	Carbon Offset Units
DMRC	Delhi Metro Rail Corporation Limited
GHG	Green House Gases
LPG	Liquefied Petroleum Gas
MMMOCL	Maha Mumbai Metro Operation Corporation Limited
MMRCL	Mumbai Metro Rail Corporation Limited
OCC	Operation Control Center
PCN	Project Concept Note
PoA	Programme of Activities
RSS	Receiving Substation
tCO_2e	Tonnes of Carbon dioxide equivalent
UCR	Universal Carbon Registry
UNFCCC	United Nation Framework for Climate Change Convection

Competence of team members and technical reviewers

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Personnel Name	Mr. Rishabh Madan					
Schemes	☒ CDM	☒ GCC	☐ GS	☒VCS	☒A6.4	☒Other GHG Schemes (Cercarbono, UCR, ISO 14064, ISO 14067, SDVista, JCM)

Qualified to work as			
Team Leader	☒	Technical Expert	☒
Validator/Verifier	☒	Financial Expert	☐
Technical Reviewer	☐	Local Expert (India)	☒

Area(s) of Technical Expertise	
Sectoral Scope	**Technical Area**
SS 1: Energy industries (renewable/non-renewable sources	TA 1.2. Renewables
SS 7: Transport	TA 7.1. Transport
SS 10: Fugitive emissions from fuels (solid, oil and gas)	TA 10.1. Fugitive emissions from oil and gas
Approved by (Manager C &T)	Mr. Dushyant Parashar
Approval date	27/12/2024

Personnel Name	Ms. Alen Mariyam Thomas				
Schemes	☒ CDM	☒ GCC	☐ GS	☒ VCS	☒Other GHG Schemes (SDvista)

Qualified to work as			
Team Leader	☐	Technical Expert	☐
Validator/Verifier	☒	Financial Expert	☐
Technical Reviewer	☐	Local Expert (India)	☒

Area(s) of Technical Expertise	
Sectoral Scope	**Technical Area**
-	-
Approved by (Manager Competence & Training)	Mr. Dushyant Parashar
Approval date	29/11/2024

Personnel Name	Mr. Ashish Yadav					
Schemes	☒ CDM	☒ GCC	☒ GS	☒ VCS	☒A6.4	☒Other GHG Schemes (Cercarbono, SDvista, VCS CCB)

Qualified to work as			
Team Leader	☒	Technical Expert	☒
Validator/Verifier	☒	Financial Expert	☐
Technical Reviewer	☒	Local Expert (India)	☒

Area(s) of Technical Expertise	
Sectoral Scope	**Technical Area**
SS: 1 Energy Industries (Renewable/non-renewable)	TA 1.2. Renewables
SS: 3 Energy demand	TA 3.1 Energy demand
SS 13: Waste handling and disposal	TA 13.1. Solid waste and wastewater
Approved by (Manager C&T)	Mr. Dushyant Parashar
Approval date	28-10-2024

Personnel Name	Mr. M.P. Prasanna					
Schemes	☒ CDM	☒ GCC	☒ GS	☒ VCS	☒A6.4	☒Other GHG Schemes (VCS CCB, Cercarbono, SDVista, ISO 14064, JCM)

Qualified to work as			
Team Leader	☒	Technical Expert	☒
Validator/Verifier	☒	Financial Expert	☐
Technical Reviewer	☒	Local Expert (India)	☒

Area(s) of Technical Expertise	
Sectoral Scope	**Technical Area**
SS 1 – Energy Industries (renewable/non-renewable sources)	TA 1.2: Energy generation from renewable energy sources
SS 3 – Energy Demand	TA 3.1 – Energy Demand
SS 7 - Transport	TA 7.1 - Transport
Approved by (Manager Competence and Training)	Mr. Dushyant Parashar
Approval date	28/10/2024

Document reviewed or referenced

No.	Author	Title	References to the document	Provider
1.	Project Proponent	Project Concept Note V1.0	Project Concept Note v1.0 dt. 02/05/2025	PP
2.	Project Proponent	Monitoring report version 2.2	Monitoring report v2.2 dt. 23/05/2025	PP
3.	Project Proponent	ER spreadsheet v1.0	ER sheet dt. 10/05/2025	PP
4.	UCR	UCR CoU Standard Ver 7.0 UCR Verification Standard Ver2.0 UCR Program manual Version 6.1	https://www.ucarbonregistry.io/Document?projectCategoryId=1	UCR
5.	UNFCCC	CDM methodology ACM0016 “Mass Rapid Transit Projects”, Version 04	https://cdm.unfccc.int/methodologies/DB/FXQBDV16UML49NJN03U1QQTEY9J90E	UNFCCC
6.	Delhi Metro Rail Corporation Ltd.	Detailed Project report for Line 2A and Line 7	Detailed Project Report Line 2A and Line 7 MMMOCL dt. 09/2015 and 08/2015 respectively	PP
7.	Project Proponent	Ridership and Traction excel sheet	-	PP
8.	Project Proponent	Car km excel sheet	-	PP
9.	Project Proponent	Passenger Survey sheet 2023	-	PP
10.	Project Proponent	Traffic Survey sheet 2023	-	PP
11.	Probe Research & Social Development Pvt. Ltd.	Filled Survey Questionnaire 2023	-	PRSD
12.	Maharashtra State Electricity Transmission Co. Ltd. (FY 2023-24) Maharashtra State Electricity Transmission Co. Ltd. (FY 2024-25)	Transmission & Distribution Loss statement	-	MSETCL
13.	Project Proponent	OC sheet	-	PP
14.	Secure	Calibration Certificates	Meter calibration certificates dt. 14/08/2024	PP
15.	UNFCCC	CDM PoA 9863 CPA 3: Inclusion of Mumbai Metro Rail Corporation Limited Colaba-Bandra-Seepz corridor under MRTS POA	https://cdm.unfccc.int/ProgrammeOfActivities/cpa_db/LUG7W2MP9CFDZOT56B8HXN10VA4RSI/view	UNFCCC
16.	IPCC	2006 IPCC Guidelines for National GHG Inventories Chapter 1, Volume 2		IPCC

Clarification request, corrective action request and forward action request

Table 1. CLs from this Project Verification

CL ID	01	**Section no.**	***Section B.8 of PCN / Section C.10 of MR***	**Date:** 17/05/2025
Description of CL				

During the desk review of the MR and PCN provided, the verification team found that the value of parameter $SFC_{B,CNG}$ is taken from Delhi Transport Corporation (DTC), 2012 in both PCN and MR, however, the project location of the project activity is Mumbai.

PP to clarify the source of data.

Project Owner's response	**Date:** 20/05/2025

It is clarified that $SFC_{B,CNG}$ has been taken from the data available with Delhi Transport Corporation 2012. This has been done considering the following fact:

1. CNG buses has been in operation in Delhi region for a considerable time and data provided by the state transport agency viz. DTC can be considered as a reliable source.
2. Both cities viz, Delhi and Mumbai being mega cities of India have similar travel characteristics such as availability of various modes of travel, congestion during peak hour, occupancy of buses, etc.
3. Any secondary source providing the data for CNG buses for Mumbai was not available.

Hence, considering the above, it was seen relevant to take the data of $SFC_{B,CNG}$ and use the same for Mumbai region.

Documentation provided by Project Owner

NA

UCR Project Verifier assessment	**Date:** 20/05/2025

The verification team has reviewed the responses provided by the PO and found that there is no source of data available for the Mumbai. Also, the DTC data is based on study of CNG buses, which is reliable in the host country i.e. India.
Hence, it is accepted by verification team.
CL 01 is closed.

CL ID	02	**Section no.**	C.10 of MR	**Date:** 17/05/2025

Description of CL

In PCN, for the parameter $EC_{pj,y}$ it is mentioned that the calibration of meters to be done every 2 years, however, in MR, for the same parameter, it is mentioned that the calibration of meters will be done by project proponent.

PP to clarify the calibration frequency of the metering equipment in the MR.

Also, include the calibration details of metering equipment in the MR.

Project Owner's response	**Date:** 20/05/2025

Calibration of meters will be done once in 2 years. The same has been updated in the revised MR dated 20.05.2025.

Documentation provided by Project Owner

Revised MR dated 20.05.2025.

UCR Project Verifier assessment	**Date:** 20/05/2025

The verification team has reviewed the revised MR dt 20/05/2025 and found that the calibration of meters has been updated. Hence it is accepted by the verification team.
CL 02 is Closed.

CL ID	03	**Section no.**	Electricity consumption	**Date:** 17/05/2025

Description of CL

During the site-visit, the verification team found that there has been change in electricity suppliers during the current monitoring period.

PP to clarify that transition of suppliers with supporting evidences. Also, confirm whether it has made any impact on the supply of electricity.

Project Owner's response	**Date:** 20/05/2025

Transition of suppliers has been done at DISCOM level and the documentary evidence regarding the same is attached herewith as "Supplier Transition Documents".
This is to confirm that there is no impact on the supply of electricity due to transition of suppliers.

Documentation provided by Project Owner

Supplier Transition Documents

UCR Project Verifier assessment	**Date:** 20/05/2025

The verification team has reviewed the Supplier Transition documents and found that the electricity supplier has been changed 2 times (during 11/2023 and 03/2024) in the current monitoring period. Verification team also reviewed the electricity invoices and found that there is no impact on the supply of electricity and it has been taken correctly. Hence, it is accepted by verification team CL 03 is Closed.

CL ID	04	**Section no.**	C.10 of MR	**Date:** 17/05/2025
Description of CL				
PP to provide supporting evidence for the Bifurcation of traction and non-traction electricity consumption used in the project activity.				
Project Owner's response				**Date:** 20/05/2025
Bifurcation Sheet of Charkop RSS for the period Oct'24 – Dec'24 having the traction and non-traction electricity consumption is attached herewith as "Bifurcation Sheet" on sample basis.				
Documentation provided by Project Owner				
Bifurcation Sheet				
UCR Project Verifier assessment				**Date:** 20/05/2025
The verification team has reviewed the Bifurcation sheet and found that the traction electricity consumption has been calculated correctly based on total supplied electricity to RSS and differentiating the Non-traction and deport electricity consumption. Hence, it is accepted by verification team. CL 04 is Closed.				

Table 2. CARs from this Project Verification

CAR ID	01	**Section no.**	C.10 of MR	**Date:** 17/05/2025
Description of CAR				
In the MR, "Description of Monitoring plan" is not included. PP to include the same in the MR.				
Project Owner's response				**Date:** 20/05/2025
Description of Monitoring Plan has been included in the revised MR dated 20.05.2025.				
Documentation provided by Project Owner				
revised MR dated 20.05.2025.				
UCR Project Verifier assessment				**Date:** 20/05/2025
The verification has reviewed the revised MR dt. 20/05/2025 and found that Monitoring plan has been included. Hence, CAR 01 is closed.				

Table 3. FARs from this Project Verification

FAR ID	xx	**Section no.**		**Date:** DD/MM/YYYY
Description of FAR				
No FAR raised.				
Project Owner's response				**Date:** DD/MM/YYYY
Documentation provided by Project Owner				
UCR Project Verifier assessment				**Date:** DD/MM/YYYY