Verification and certification report form for CDM project activities

(Version 01.0)

Complete this form in accordance with the "Attachment: Instructions for filling out the verification and certification report form for CDM project activities" at the end of this form.

VERICATION AND CERTIFICATION REPORT	
Title of the project activity	Lanzhou Bus Rapid Transit (BRT) Project
Reference number of the project activity	6796
Version number of the verification and certification report	Version 04
Completion date of the verification and certification report	20/02/2018
Monitoring period number and duration of this monitoring period	1st monitoring period 01/01/2013-25/10/2014
Version number of monitoring report to which this report applies	version 4.0
Crediting period of the project activity corresponding to this monitoring period	Type: Renewable Start date: 01/01/2013 Length: 7 years
Project participant(s)	Lanzhou Public Traffic Group (Project owner) Asian Development Bank, as Trustee of the Future Carbon Fund (buyer)
Host Party	People's Republic of China
Sectoral scope(s), selected methodology(ies), and where applicable, selected standardized baseline(s)	Sectoral scope 7: Transport Selected methodology: AM0031 (version 03.1.0)
Estimated GHG emission reductions or net anthropogenic GHG removals for this monitoring period in the registered PDD	5,759 tCO_2e
Certified GHG emission reductions or net anthropogenic GHG removals for this monitoring period	9,176 tCO_2e
Name of DOE	Shenzhen CTI International Certification Co., Ltd
Name, position and signature of the approver of the verification and certification report	Zhou Lu, General Manager 

SECTION A. Executive summary

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Shenzhen CTI International Certification Co., Ltd (CTI) has performed the verification of the emission reductions reported for the "Lanzhou Bus Rapid Transit (BRT) Project" in China (UNFCCC Ref. No. 6796) for the period 01/01/2013-25/10/2014. The project is a Bus Rapid Transit (BRT) type of bus-based urban passenger transportation solution, locates at Anning District, Lanzhou City, Gansu Province, People's Republic of China. The project activity was registered as a CDM project on 23/07/2012 and its first crediting period starts on 01/01/2013. The selected monitoring period 01/01/2013-25/10/2014 is the 1st monitoring period of the project, which is within the renewable first crediting period 01/01/2013-31/12/2019.

The scope of the verification is to verify that:

- The project activity has been implemented and operated in accordance with the registered PDD;
- The monitoring plan complies with the monitoring methodology and the actual monitoring complies with the monitoring plan, including compliance with any guidance provided by the Board regarding deviations from the provisions of a registered plan and/or methodology;
- The data and calculation of GHG emission reductions have been assessed to correctly support the emission reductions being claimed.

The verification team identified one CAR and two CLs in this monitoring period, no FAR was raised. The CAR and CLs were satisfactorily addressed by the project participants in the revised monitoring report (refer to Appendix 4 for further details). All changes made to the monitoring report (version 4.0 dated 15/09/2017) are as a result of the verification findings.

In CTI's opinion, the GHG emission reductions reported for the project in the monitoring report (version 4.0 dated 15/09/2017) are fairly stated. The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology AM0031 (version 03.1.0) and the monitoring plan contained in the Project Design Document (version 02 dated 17/07/2012).

CTI confirmed that the GHG emission reductions are calculated without material misstatements. Based on the evidence and information that are considered necessary to guarantee that GHG emission reductions are appropriately calculated, CTI is able to certify that emission reductions from Lanzhou Bus Rapid Transit (BRT) Project during the period 01/01/2013-25/10/2014 amount to 9,176 tCO_2e.

SECTION B. Verification team, technical reviewer and approver

B.1. Verification team member

No.	Role	Type of resource	Last name	First name	Affiliation	Involvement in			
						Desk review	On-site inspection	Interview(s)	Verification findings
1.	Team Leader	IR	Lin	Wu	N/A	√	√	√	√
2	Team Member	IR	Wang	Jun	N/A	√	√	√	√

B.2. Technical reviewer and approver of the verification and certification report

No.	Role	Type of resource	Last name	First name	Affiliation
1.	Technical Reviewer	IR	Lin	Shunrong	N/A
2	Technical Reviewer	IR	Jiang	Shu'E	N/A
3.	Approver	IR	Zhou	Lu	N/A

SECTION C. Application of materiality

C.1. Consideration of materiality in planning the verification

No.	Risk that could lead to material errors, omissions or misstatements	Assessment of the risk		Response to the risk in the verification plan and/or sampling plan
		Risk level	Justification	
1.	Human error in the quantification of emissions (which may be more likely to occur if personnel are unfamiliar with, or not well trained regarding, emissions processes or data recording);	Low	The project owner has established the CDM monitoring and management manual and appointed the CDM technical staffs, CDM accountant staffs and CDM manager which were trained to responsible for power meters reading and recording, auditing of these metered data. The installation and calibration of monitoring meters was also stipulated in the manual. The CDM monitoring and management manual has also established the QA/QC procedure to ensure the veracity and validity of the monitoring procedure and monitoring	Depending on the monitoring period being verified, conduct increased sampling during the months when there is a greater likelihood of errors and issues with data quality control due to project participants' leave schedules.
2.	Undue reliance on a poorly designed information system, which may have few effective quality controls; for example, the use of spreadsheets without adequate controls related to data changes/updates, version tracking, traceability, security, etc.	Low		Depending on the monitoring period being verified, conduct increased sampling during the months when there is a greater likelihood of errors and issues with data quality control due to project participants' leave schedules.
3.	Manual adjustment of otherwise	Low		Depending on how data is

	automatically recorded activity levels; for example, manual input may be required if a flare meter becomes overloaded.		records. So the risk level is low.	generated, processed, and reported, place greater emphasis on verifying data captured and processed manually and/or in spreadsheets versus those that are generated from an automated system.

C.2. Consideration of materiality in conducting the verification

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(1) As per the "Application of materiality in verifications (Version 02.0)" which enters into force on 01/04/2015, the project is a large-scale CDM project activity achieving total emission reductions of <300,000 tons of CO_2e per year; as such, a 2 per cent materiality threshold is applied.

(2) The parameters used for determining the project's baseline emissions and project emissions were collected. CTI confirms that all parameters stated in the monitoring plan are monitored and reported appropriately.

(3) No errors are identified in the additional data set, and the DOE proceeds with the remaining elements of the verification as defined in its verification plan.

SECTION D. Means of verification

D.1. Desk review

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The monitoring report was published on UNFCCC website on 28/11/2014. In addition to the monitoring report (version 1.0 dated 05/11/2014 and updated version 4.0 dated 15/09/2017) /1/, CTI reviewed:

- The PDD for the project activity /12/, including the monitoring plan and the corresponding validation report /13/;
- Baseline and monitoring methodology AM0031 (version 03.1.0) applied by the project /17/;
- Relevant decisions, clarifications and guidance from the CMP and the CDM Executive Board /14/ -/16//18/-/21/; and
- Other information and references relevant to the project activity /2/-/13/.

During the desk review, CTI has applied standard auditing techniques to assess the quality of information provided. The following activities were performed:

- A review of the data and information presented to verify their completeness;

- A review of the monitoring plan and monitoring methodology, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures; and
- An evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

D.2. On-site inspection

Duration of on-site inspection: 20/01/2015				
No.	**Activity performed on-site**	**Site location**	**Date**	**Team member**
1.	An assessment of the implementation and operation of the registered project activity is as per the PDD for the project activity	The project plant and the transformer station	20/01/2015	Lin Wu Wang Jun
2.	A review of information flows for generating, aggregating and reporting the monitoring parameters	The office of the project.	20/01/2015	Lin Wu Wang Jun
3.	Determine whether the operational and data collection procedures are implemented in accordance with the monitoring plan in the PDD	The office of the project.	20/01/2015	Lin Wu Wang Jun
4.	A cross-check between information provided in the monitoring report and data from other sources such as plant logbooks and electricity sale receipts	The project plant and the office of the project.	20/01/2015	Lin Wu Wang Jun
5.	A check of the monitoring equipment including calibration performance and observations of monitoring practices against the requirements of the PDD and the selected methodology	The project plant, the transformer station and the office of the project.	20/01/2015	Lin Wu Wang Jun
6.	A review of calculations and assumptions made in determining the GHG data and emission reductions	The office of the project.	20/01/2015	Lin Wu Wang Jun
7.	An identification that quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters	The project plant, the transformer station and the office of the project.	20/01/2015	Lin Wu Wang Jun

D.3. Interviews

No.	**Interviewee**			**Date**	**Subject**	**Team member**
	Last name	**First name**	**Affiliation**			
1	Dang	Ly	Grütter Consulting AG	20/01/2015	- Monitoring Plan - Monitoring data and Monitoring Report - GHG Calculations	Lin Wu Wang Jun
2	Tian	Ziyi	Lanzhou Public Traffic Group	20/01/2015	- Project design and implementation - Technical equipment, including calibration and operation - Monitoring Plan and management procedures - Monitoring data - Data uncertainty and residual risks (QA/QC)	Lin Wu Wang Jun
3	Ye	Changfu				
4	Jie	Guohua				

D.4. Sampling approach

NA

D.5. Clarification requests, corrective action requests and forward action requests raised

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
Compliance of the monitoring report with the monitoring report form			
Compliance of the project implementation with the registered PDD		1	
Post-registration changes			
Compliance of the monitoring plan with the monitoring methodology including applicable tool and standardized baseline			
Compliance of monitoring activities with the registered monitoring plan	2		
Compliance with the calibration frequency requirements for measuring instruments			
Assessment of data and calculation of emission reductions or net removals			
Others (please specify)			
Total	2	1	

SECTION E. Verification findings

E.1. Compliance of the monitoring report with the monitoring report form

Means of verification	Document review the monitoring report (version 4.0 dated 15/09/2017) against the monitoring report form.
Findings	The MR (Version 1.0 dated 05/11/2014) was made publicly available on the UNFCCC website. The latest available version of the CDM-MR-FORM (version 05.1) was applied in the updated MR (version 4.0 dated 15/09/2017). By checking the MR, CTI confirmed that the latest version has been applied correctly and the input is according to the instructions for filling out the monitoring report form.
Conclusion	The Verification Team confirms that the monitoring report is compliance with the valid version of the CDM-MR-FORM and the instructions therein for filling out the CDM-MR-FORM.

E.2. Remaining forward action requests from validation and/or previous verification

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This is the 1st periodic verification. By checking the validation report /13/ of the project listed in EB website, CTI confirmed that no remaining forward action requests were identified from the validation.

E.3. Compliance of the project implementation with the registered project design document

Means of verification	CTI conducted the document review and performed on-site assessment with project participants to: - An assessment of the implementation and operation of the registered project activity is as per the PDD for the project activity - A check of the monitoring equipment including calibration performance and

	observations of monitoring practices against the requirements of the PDD and the selected methodology
Findings	The monitoring period in the MR was 01/01/2013 to 25/09/2014. However, the monitoring data of the project in the MR was up to 10/2014. By interviewing with the project participants, they confirmed the ending date of monitoring period was 25/10/2014 in their original consideration and a typo error was made in the MR. **CAR 1** is raised to request the project participant to correct in the MR and ER spreadsheet. The project participant revised the monitoring report as requirement. The verification team verified the updated MR and ER spreadsheet. Hence, **CAR 1** is closed. The proposed CDM project activity is a Bus Rapid Transit (BRT) type of bus-based urban passenger transportation solution, locates at Anning District, Lanzhou City, Gansu Province, People's Republic of China. The project comprised the implementation of a new infrastructure of 12.3 kilometres of dedicated bus lanes, flexible operation making allowance for both new specialized BRT buses and existing buses, at-grade boarding and alighting, real-time bus operation information displays, pre-boarding fare collection and fare verification, free transfers between routes, automatic vehicle location technology, centralized control providing monitoring and communications to scheduling services and real-time response to contingencies. The project started construction on 20 March 2011 and is fully operational since 28 December 2012 /12/. A total of 19 BRT specific stations along with corridor was constructed, with the average spacing between stations being appropriately 600 meters. Two terminals are Renshoushan (Latitude North 36°7'38.83" and Longitude East 103°40'56.09") and Xizhan (Latitude North 36°4'12.07" and Longitude East 103°46'1.28"), respectively, which have been confirmed by the verification team through global positioning system (GPS). During the physical site visit, by interviewing with project managers and operators, the verification team confirmed that all existing conventional buses (12m CNG-fuelled buses) quitted from the BRT system in the end of year 2014, and all new buses (12-18m Euro III or Euro IV CNG-fuelled buses) are operational within the BRT system, which meets requirement of the registered PDD. The management and operation of the BRT system included the associated facilities, like bus stations, centralized bus dispatch management, electric ticketing, etc. The fare system is based on pre-board ticketing and the validation turnstiles are at the entrance of each station, which detects each electronic ticket and deducts the corresponding fare. The operational fleet centre manages bus dispatch, informs passengers, produces reports and maintains records. Trunk buses are equipped with GPS to identify their position and track distance driven. This is linked to the operation centre. The novelty of the operational fleet centre is that an efficient management of bus fleets and bus dispatch can take place optimizing load factors through coordinated scheduling of service /4/. During the on-site visit, based on

	visual inspection and interviews, CTI verified the operational process of the BRT system, and confirmed that no serious malfunction happened and the system was under a normal operation as expected in this monitoring period /6/.
Conclusion	CTI confirms that the project implementation is in accordance with the project description contained in registered PDD (version 02 of 17/07/2012) /12/. The verification team confirmed through visual inspection and document review that all physical features of the proposed CDM project activity including data collection systems and storage systems have been implemented in accordance with the registered PDD.

E.4. Post-registration changes

E.4.1. Temporary deviations from the registered monitoring plan, monitoring methodology or standardized baseline

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By interviewing with the manager from project owner and checking the operation logsheet, CTI found prior to 26/04/2014, the monitoring was not effectively conducted on the project operation. After 26/04/2014, the project was operating following the registered monitoring plan. The project owner decided to not claim emission reductions for the period 01/01/2013-26/04/2014.

Hence, the project claimed zero emission reduction for the period 01/01/2013-26/04/2014. CTI verified following reasonableness of applying zero (0) to the emission reductions for this period. Fundamental to understanding this issue is the fact that all baseline emission factors across all baseline transport modes are higher than the project emission factor. Specifically, as shown in the submitted calculation sheet, baseline emission factors are 288 gCO2e/passenger for bus, 1,008 gCO2e/passenger for taxi, 718 gCO2e/passenger for car, and 160 gCO2e/passenger for motorcycle respectively, whereas the project emission factor is in the range of 136 to 150 gCO2e/passenger for Lanzhou BRT project. Whilst this data applies directly to the monitoring period of May to Oct. 2014, it has been derived from a series of default parameters that remain unchanged during the first few years of the crediting period. Moreover, considering the continuity and stability of Lanzhou BRT project operation and the general city-wide urban transport situation in general, it can be argued with strong confidence that the baseline emission factors in year 2014 can well serve to represent the situation in year 2013 and early year 2014. In addition, as detailed in the registered PDD and also the submitted MR, leakage emissions were determined on ex-ante basis and remain fixed for the first 3 years of the crediting period. This means that the leakage emissions for the unmonitored period (01/01/2013 to 26/04/2014) were taken as zero (0), the same as those for the monitored period in year 2014. Hence, for the unmonitored period of 01/01/2013 to 26/04/2014, the baseline emissions were bound to have been higher than the project emissions. This inference holds true even in the unrealistic extreme scenario that all passengers transported by Lanzhou BRT project (emission factor 136-150 gCO2e/passenger) over this period would have taken motorcycles (emission factor 160 gCO2e/passenger).

As far as paragraph 232(b)(i) of the Project Standard (version 01.0, for project activities) is concerned, it is our understanding that it is not applicable to the specific context of Lanzhou BRT project. Applying zero (0) to baseline emissions implies that, in the absence of BRT, none of the BRT passengers (over 0.1 million people per day, over 30 million people per year) would have taken conventional bus, taxi, car, or motorcycles. Apparently, this is against the common sense. As for paragraph 232(b)(ii), the relatively special methodological approach of Lanzhou BRT Project makes it unsuitable to be subjected to the treatment described in paragraph 232(b)(ii). That being said, fundamentally, the purpose of both 232(b)(i) and 232(b)(ii) is to ensure reasonable conservativeness. To this end, the proposed approach of taking emission reduction as zero (0), as rationalized by the above explanation on baseline emissions, is believed to be fully compliant with such a fundamental principle.

Hence, as per CDM VVS and CDM PS, CTI considered such post-registration change is a temporary deviations from the registered monitoring plan. It is clear that in this particular case the

deviation from the registered monitoring plan was temporary, rather than permanent. Otherwise the monitoring activities for the period of May to Dec. 2014 would not have been conducted strictly according to the registered monitoring plan. The temporary deviation was caused by the practical constraints of available financial resources to make possible the resource-consuming monitoring activities during the period concerned. And the approach of taking the emission reduction as zero (0) for the concerned non-conforming monitoring period is reasonably conservative. Therefore, it is our understanding that the nature of the temporary deviation from registered monitoring plan in the context of Lanzhou BRT Project is well aligned with the Paragraph 232 (b) of the Project Standard and Paragraph 1(b) of Appendix "Indicative list of post-registration changes that may be suitable for approval under the issuance track" of the Project Standard (version 01.0, for project activities):
Paragraph 232(b): Apply the following most conservative values approach when alternative monitoring arrangements are not proposed. This does not require approval by the Board.

Paragraph 1(b) of Appendix: Temporary deviations from the registered monitoring plan for which alternative monitoring arrangements are proposed, if the proposed alternative monitoring arrangements product a conservative estimate of greenhouse gas (GHG) emission reductions or net anthropogenic GHG removals.
Hence, CTI considers that no approval is required by the Board.

E.4.2. Corrections

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N/A

E.4.3. Changes to the start date of the crediting period

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N/A

E.4.4. Inclusion of a monitoring plan to a registered project activity

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N/A

E.4.5. Permanent changes from registered monitoring plan, monitoring methodology or standardized baseline

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N/A

E.4.6. Changes to the project design of a registered project activity

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N/A

E.4.7. Types of changes specific to afforestation and reforestation project activities

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N/A

E.5. Compliance of monitoring plan with the monitoring methodology including applicable tool and standardized baseline

Means of verification	CTI conducted the document review and performed on-site assessment with the compliance check of the monitoring plan with the applied methodology including applicable tools
Findings	All parameters stated in the monitoring plan are in compliance with the applied methodology, i.e. AM0031 (version 03.1.0), and monitored and reported appropriately. The monitoring report lists each parameter required by the monitoring plan and the information flow (i.e. from data generation, aggregation, recording,

	calculation and reporting) for these parameters is provided.
Conclusion	CTI confirmed that the monitoring plan is in accordance with the approved methodology applied by the project activity, i.e. AM0031 (version 03.1.0).

E.6. Compliance of monitoring activities with the registered monitoring plan

E.6.1. Data and parameters fixed ex ante or at renewal of crediting period

Means of verification	"Data and parameters fixed ex ante" in the MR are checked against the registration PDD and monitoring plan
Findings	In the D.1 of MR, the CO_2 emission factor of CNG buses, taxis and passenger cars ($EF_{CO2,CNG,Z/T/C}$) was indicated as data and parameter fixed ex-ante. However, this parameter was not included in the registered PDD. And, in the registered PDD, the parameter "Total distance driven by all buses in the baseline" was ex-ante, which was not put in the MR. Further, in the registered PDD, the parameter "the number of vehicles in the vehicle category i using fuel type x" ($N_{i,x}$) and "Net calorific value of the natural gas used by the project during the year y ($NCV_{NG,y}$)" were the monitoring parameters, which were not included in the MR. **CL 1** is raised to clarify such inconsistencies. The project participant revised the monitoring report. The verification team confirmed the ex-ante parameters $EF_{CO2,CNG,Z/T/C}$ and DD_Z, ex-post parameter $NCV_{NG,y}$, have been added in the updated MR. Further, since the parameter $N_{i,x}$ is used as no BRT existed and thus no survey could be made, it is not required. The verification team verified the updated MR. Hence, **CL 1** is closed. Thus, all reported factors determined *ex-ante* by the monitoring methodology AM0031 (version 03.1.0) and indicated in the PDD (version 02 dated 17/07/2012) were assessed as follows:

Parameter	Description	Value	Source
$SEC_{CNG,T}$	Specific energy consumption of CNG by taxis	New vehicles: 8.0 m^3/100km Vehicles older than 1 year: 9.0 m^3/100km	Lanzhou Traffic Bureau
$SEC_{G,C}$	Specific energy consumption passenger cars	7.84 l/100km	Harvard Kennedy School: China's Fuel Economy Standards for Passenger Vehicles", 2009 Baseline Traffic Survey for CDM Development of Lanzhou BRT Project
$SEC_{G,M}$	Specific energy consumption of gasoline by motorcycles	2.2 l/100km	Baseline Traffic Survey for CDM Development of Lanzhou BRT Project; Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual
$SEC_{CNG,Z}$	Specific energy	31.41 l/100km	Lanzhou Public Traffic

	consumption of CNG by buses		Group
$EF_{CO2,CNG}$	CO_2 emission factor of CNG	1,970.8 gCO_2/m^3	IPCC, 2006 Lanzhou Public Traffic Group
$EF_{CH4,CNG,Z}$	CH_4 emission factor of CNG for buses	515.8 gCO_{2e}/m^3	
$EF_{N2O,CNG,Z}$	N_2O emission factor of CNG for buses	99.7 gCO_{2e}/m^3	
$EF_{CH4,CNG,T}$	CH_4 emission factor of CNG for taxis	123.4 gCO_{2e}/m^3	
$EF_{N2O,CNG,T}$	N_2O emission factor of CNG for taxis	187.9 gCO_{2e}/m^3	
$EF_{CO2,G,C/M}$	CO_2 emission factors of gasoline for passenger cars and motorcycles	Passenger cars = 2,313 Motorcycles = 2,313	Default factor of methodology AM0031, Appendix A
$EF_{CH4,G,C/M}$	CH_4 emission factor of gasoline for passenger cars and motorcycles	Passenger cars = 11 Motorcycles = 29	
$EF_{N2O,G,C/M}$	N_2O emission factor of gasoline for passenger cars and motorcycles	Passenger cars = 14 Motorcycles = 7	
OC_T	Average occupation rate of taxis	1.08 Passengers	Baseline Traffic Survey for CDM Development of Lanzhou BRT Project
OC_C	Average occupation rate of motorcycles	1.51 Passengers	
OC_M	Average occupation rate of passenger cars	1.71 Passengers	
P_Z	Passengers-trips realized with buses in the baseline	402,319,193 Passenger trips	Lanzhou Public Traffic Group Baseline Traffic Survey for CDM Development of Lanzhou BRT Project
$TD_{C,T,M}$	Average trip distance of passenger cars, taxis and motorcycles in baseline	Passenger cars = 10.3km Taxis = 6.8 km Motorcycles = 6.0 km	Baseline Traffic Survey for CDM Development of Lanzhou BRT Project
N_Z	Total number of buses in Lanzhou	2,135 Buses	Lanzhou Public Traffic Group
N_T	Total number of taxis in Lanzhou	6,738 Taxis	Traffic Division of Lanzhou Public Security Bureau
N_C	Total number of passenger cars in baseline	142,341 Passenger cars	
VD_T	Annual distance driven per taxi on average before start of project	110,000 km	Lanzhou Traffic Bureau
VD_Z	Annual distance driven per bus before start of project	66,985 km	Lanzhou Public Traffic Group
$ROC_{Z,0}$	Average occupancy rate relative to capacity of buses before start of	34.69%	Baseline Traffic Survey for CDM Development of Lanzhou BRT Project

	project		
TR_C	Number of daily trips realized by passenger cars in baseline	382,897 Trips	Baseline Traffic Survey for CDM Development of Lanzhou BRT Project Traffic Division of Lanzhou Public Security Bureau
SRS	Share of road space used by public transport in the baseline	6.15%	Lanzhou Public Traffic Group Lanzhou Traffic Bureau; Traffic Division of Lanzhou Public Security Bureau Baseline Traffic Survey for CDM Development of Lanzhou BRT Project
RSB/RSP	Total road space available in the baseline / Total available road space in the project	RSB = 446.62 km RSP = RSB – Road space dedicated to BRT lanes = 446.62 – 12.3 = 434.32km	Lanzhou Municipal Engineering Administration Department Lanzhou BRT Project Feasibility Study Report
$BSCR_w$	Bus units scrapped by project in year w	2013: 354 Buses 2014: 612 Buses 2015: 887 Buses 2016: 1,002 Buses 2017: 1,265 Buses 2018: 1,502 Buses 2019: 1,730 Buses	Lanzhou Public Traffic Group
V_B/V_p	Vehicle speed of passenger cars in baseline / project scenario	V_B = 39.45; V_P = N/A (no data is available as BRT is yet to be operational)	Baseline Traffic Survey for CDM Development of Lanzhou BRT Project
DD_Z	Total distance driven by all buses in the baseline	143,013,462 km	Lanzhou Public Traffic Group

Other ex-ante parameters are not mentioned in B.6.2 of the PDD, but the default values from AM0031 (version 03.1.0), are used to calculate the emission reductions applied by the project, and were assessed as follows:

Parameter	Description	Value	Source
$IR_{Z,\ T,C}$	Technology improvement factor buses (Z), taxis (T) and cars (C)	0.99	Default value of methodology AM0031, Appendix A
IR_M	Technology improvement factor of motorcycles	0.997	Default value of methodology AM0031, Appendix A
$EF_{CO2,G,C/M}$	CO_2 emission factors of gasoline for passenger cars and motorcycles	2,313 gCO_2/l	Default factor of methodology AM0031, Appendix A
$EF_{CH4,G,C}$	CH_4 emission factor of gasoline for passenger	11 gCO_2/l	Default factor of methodology AM0031, Appendix A

		cars		
	$EF_{N2O,G,C}$	N_2O emission factor of gasoline for passenger cars	14 gCO_2/l	Default factor of methodology AM0031, Appendix A
	$EF_{CH4,G,M}$	CH_4 emission factor of gasoline for motorcycles	29 gCO_2/l	Default factor of methodology AM0031, Appendix A
	$EF_{N2O,G,M}$	N_2O emission factor of gasoline for motorcycles	7 gCO_2/l	Default factor of methodology AM0031, Appendix A
	X_C	Share of fuel type "x" used by passenger cars baseline	Gasoline: 100%	Methodology AM0031, Appendix A
	GWP	Global warming potential	CH_4: 25 tCO_2/tCH_4 N_2O: 298 tCO_2/tN_2O	Annex 3 of EB69, "Standard for application of the global warming potential to clean development mechanism project activities and programmes of activities for the second commitment period of the Kyoto Protocol".
Conclusion	CTI verified and confirmed that the ex-ante parameters used in the monitoring report is in compliance with the registered PDD.			

E.6.2. Data and parameters monitored

Means of verification	CTI conducted document review and performed on-site assessment with project participants to: - A review of information flows for generating, aggregating and reporting the monitoring parameters; - Determine whether the operational and data collection procedures are implemented in accordance with the monitoring plan in the PDD; - A cross-check between information provided in the monitoring report and data from other sources such as plant logbooks and electricity sale receipts; - An identification that quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.
Findings	According to the methodology, the occupancy rate of taxis and the remaining bus fleet is monitored through representative samples, and the recommended interval for occupancy rate of vehicle category i relative to capacity and occupancy of vehicle category i is 3 and 7 for 7 year crediting period, which is applicable to the proposed project. Since the proposed monitoring period only included 1st and 2nd year, the following monitoring parameters in the registered PDD are not monitored in this monitoring period: Numbers of taxi and conventional buses still operating in year y: $N_{T,y}/N_{Z,y}$ Average occupancy rate of taxis in year y: $OC_{T,y}$ Average occupancy rate relative to capacity of buses in year y: $ROC_{Z,y}$ In the PDD, the number of vehicle in vehicle category i using fuel type x ($N_{i,x}$) was used as no

BRT existed and thus no survey could be made. In the monitoring period, however, this parameter is monitored through S_i. Hence, the parameter $N_{i,x}$ is not required as the share per fuel of taxis, motorcycles and cars is adjusted to the baseline value based on the survey question of the fuel type used for passengers using cars, motorcycles or taxis in accordance with the methodology and the PDD.

Hence, the below tables describe for each parameter, which is to be measured according to the monitoring plan, how CTI has verified that i) the actual monitoring complies with the monitoring plan and that ii) data have been assessed to correctly support the emission reductions being claimed.

(1) Parameters used to calculate baseline emissions

Item	Assessment/ Observation
Data / Parameter:	Total passengers transported by project (P)
Value	21,949,168 Passengers
Measuring frequency:	Continuous
Recording frequency:	Monthly
Assessment of measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology.	The measuring and recording frequency are accordance with the monitoring plan and monitoring methodology.
Assessment of monitoring equipment in accordance with the monitoring plan and monitoring methodology.	Non-contact IC card technology is used in public transport. All card readers are powered by electricity. In case of malfunction the buses are immediately taken out of service until the problem is fixed. Extra card readers are available in case of need. Malfunctions are addressed immediately and considering the nature of the malfunction, proper operation is restored in general after two days.
Assessment of how to verify the reported values in the monitoring report.	Data on passenger number is generated from card users and cash payment. Passenger numbers is based on entry statistics, on income from ticket sales through cash at stations and buses plus electronic tickets /9/. Data from the card readers is transferred in two ways according to its location: on the bus or at the bus station. Card readers are inside the bus for support lines as well as for feeder lines. In that case, daily data gathering is done at the bus depot after service hours /6/. Data from passengers is gathered daily and transferred directly to the central Database /6/. Passengers from trunk and support lines can change freely and no double counting occurs as the passenger is only counted once when entering the station. A special survey of feeder line passengers is made to check for passengers using feeder plus supporting/trunk lines /7/. Non-paying passengers (mainly those senior passengers with entitlement of ticket exemption) will not be counted and therefore actual passengers are greater than recorded. This contributes to data conservativeness and reliability.
Assessment of how to cross-check the reported values with other available data.	CTI cross checked the data included in the spreadsheet for emission reduction calculation /2/ with the records stored in the Net Center located at Lanzhou Public Traffic Group headquarter. The verification was done based on random sampling. Data were found consistent.
Assessment of the data management (from monitoring	The QA / QC activities performed by the company for the parameters are consistent with the provisions of the Methodology.

equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes.	CTI verified the assessment of consistency of the survey realized and confirmed that the surveys were made in accordance with the principles as established in AM0031 and the registered PDD.

Item	Assessment/ Observation
Data / Parameter:	Passengers transported by the project who in the absence of the project would have taken transport mode "i" where Z = bus, T = taxi, C = car, M = motorcycle, NMT = Non-Motorized transit, IT = Induced traffic (P_i)
Value	P_Z: 10,465,802 P_T: 6,238,619 P_C: 4,143,113 P_M: 667,185 P_{NMT}: 434,448 P_{IT}: 0
Measuring frequency:	For monitoring period
Recording frequency:	For monitoring period
Assessment of measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology.	The measuring and recording frequency are accordance with the monitoring plan and monitoring methodology.
Assessment of monitoring equipment in accordance with the monitoring plan and monitoring methodology.	NA
Assessment of how to verify the reported values in the monitoring report.	Data from Lanzhou Public Traffic Group and Grütter Consulting for surveys.
Assessment of how to cross-check the reported values with other available data.	NA
Assessment of the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes.	NA.

	Assessment/ Observation
Data / Parameter:	Average trip distance of BRT passengers who in the absence of the BRT would have used passenger cars, taxis or motorcycles ($TD_{C/T/M}$)
	Fuel type used from BRT passengers who in the absence of the BRT would have used passenger cars (X_C)

		Share of passengers who in the absence of the project would have taken transport mode "i" (S_i)
	Value	**$TD_{C/T/M}$:** Distance of passengers which would have used passenger cars: 7.0 km Distance of passengers which would have used taxis: 6.2 km Distance of passengers which would have used motorcycles: 4.7 km
		X_C: Cars using gasoline: 100% Cars using diesel: 0% Cars using gaseous fuels: 0% Cars using alternative fuels: 0%
		S_i : Passengers which would have used a car: 19% Passengers which would have used a taxi: 28% Passengers which would have used a motorcycle: 3% Passengers which would have used a conventional bus: 48% Passengers which would have used NMT:2% Passengers which would not have made the trip: 0%
	Measuring frequency:	Bimonthly surveys
	Recording frequency:	Bimonthly surveys
	Assessment of measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology.	The measuring and recording frequency are accordance with the monitoring plan and monitoring methodology.
	Assessment of monitoring equipment in accordance with the monitoring plan and monitoring methodology.	No monitoring equipment. Based on bimonthly survey: June, August and October 2014
	Assessment of how to verify the reported values in the monitoring report.	The survey of passengers is same as used for distance and for mode share. The reliability of the survey is tested for the proportions to determine the sample size in accordance with the "Standard for sampling and surveys for CDM project activities and programmes of activities" /19/. The required number of surveys is calculated for the share of mode users buses which represent nearly 50% of respondents and thus the largest share. The required sample size is thereby 1,686 whilst the actual sample size is 2,224. CTI considered the sample number is sufficient to comply with the required 95% confidence interval and a 5% relative precision level /11/. For parameters $TD_{C/M/T,y}$, it required to meet the statistical requirements of a 95% confidence interval and a 10% relative precision level can be determined using the following formula[1]: $n = \frac{1.96^2 \times (\frac{SD}{AV})^2}{0.1^2}$ Where: n sample size SD Standard deviation AV Average (mean) 1.96 95% confidence interval

[1] CDM-EB67-A06-GUID Guidelines for sampling and surveys for CDM project activities and programme of activities

0.1 Relative precision level

For passenger cars, the required minimum sample size calculated based on actual SD and AV from the sampling data is 201 whereas the actual sample size was 416, thereby substantiating the statement that the confidence level and precision level requirements have been satisfied.
For taxis, the required minimum sample size calculated based on actual SD and AV from the sampling data is 122 whereas the actual sample size was 636, thereby substantiating the statement that the confidence level and precision level requirements have been satisfied.
For motorcycles, the required minimum sample size calculated based on actual SD and AV from the sampling data is 244 whereas the actual sample size was 66. Further discussions on its reliability check and the corrective measures taken are given in the following section.
The reliability check has been undertaken as follows:
The standard error of the mean values, i.e. $TD_{C/M/T,y}$, are calculated using the following formula:

$$\text{Standard error of mean} = \sqrt{(1-f) \times \frac{s^2}{n}}$$

Where:
f sampling fraction (the proportion of the population that is sampled)
s sample standard deviation
n sample size
Note that the multiplier (1-f) can be replaced with 1 as the sampling fraction f is small. The resultant equation for standard error of mean, i.e. $\sqrt{\frac{s^2}{n}}$, is conservative in the context of undertaking the reliability check.
Then, dividing the precision by the mean leads to the relative precision, i.e. the reliability.
Calculation results show that the relative precision (reliability) for passenger cars and taxis is 6.9% and 4.4%, respectively, both of which are well below 10%, thereby substantiating the reliability of the sampling.
As for motorcycles, the deficiency in sample size, i.e. 244 required vs 66 actually sampled, results in the reliability being 19.2% and therefore failing to achieve the required minimum level of precision (95/10). Objectively this is because motorcycles registered in Lanzhou were not many and were already in the processing of being gradually displaced by other transport modes and therefore undergoing scrap page over time. During the surveys in 2014, motorcycles running on roads that were successfully spotted by the survey team were indeed limited, despite the team made efforts to the extent possible to cover as many roads as realistically possible.
In line with “Sampling and surveys for CDM project activities and programmes of activities”, a corrective measure is applied to address this issue. Whilst discounting the emission reduction estimates by either taking lower or upper bound or by 3 times the percentage precision points missed is allowed, the approach taken here is to set baseline emissions on account of motorcycles to be zero (0). By doing so, the total emission reduction claimed by this monitoring period is reduced by approximately 100 tCO_2e. This is the most conservative approach.

	Mode passengers would have used in the baseline, trip distances and type of fuel is based on the survey asking the modes of transit used and the trip distances in absence of the project. The survey was carried out by a local independent 3rd Party company. Data aggregation, recording, calculation and reporting is made by the 3rd Party company. The survey quality control is made by the CDM consultant /11/. Related to the training of field data collectors, CTI could confirm that the consultant's staff involved in the study was trained by the CDM consultant /5/. During the site visit CTI reviewed the original copies of the training attendance list and the contents of the training.
Assessment of how to cross-check the reported values with other available data.	CTI could verify that the survey is in line with the methodology and the monitoring plan in the registered PDD. During the site visit, all original copies of the survey were verified and CTI confirmed that the survey was carried out in the entire BRT system. The sample was distributed for each day according to the passenger flow in a typical week of operation of the system. Thereby the amount of passengers interviewed per station, hour and per day of the week was determined and was found to be according to the data of passenger distribution. This is consistent with the PDD and the methodology.
Assessment of the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes.	The QA/QC activities performed by the company for the parameters are consistent with the provisions of the Methodology. CTI verified the assessment of consistency of the survey realized and confirmed that the surveys were made in accordance with the principles as established in AM0031 and the registered PDD. The analysis of collected data is made to see if the required 95% confidence interval of the survey and the 5% error level of the survey corresponds and the survey is thus reliable. CTI verified that the assessment was made in accordance with the "Best Practices Examples Focusing on Sample Size and Reliability Calculations" (EB 67 Annex 6). Summarized the survey complies with all monitored parameters with the requirements set forth by the methodology and the relevant EB guidelines.

	Assessment/ Observation
Data / Parameter:	Policies that may affect baseline parameters (Polices)
Value	NA
Measuring frequency:	Annual
Recording frequency:	Annual
Assessment of measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology.	The measuring and recording frequency are accordance with the monitoring plan and monitoring methodology.
Assessment of monitoring equipment in accordance with the monitoring plan and monitoring methodology.	No monitoring equipment.
Assessment of how to verify the reported values in the monitoring report.	Annually new relevant transport and fuel policies are listed and their potential influence or impact on the project is assessed.

Assessment of how to cross-check the reported values with other available data.	CTI verified that there are no new relevant policies for the years 2013 and 2014. Sources reviewed include: Ministry of Transportation (http://www.moc.gov.cn/); Energy Foundation (http://www.efchina.org/); China Sustainable Transportation Centre (http://www.chinastc.org/home).
Assessment of the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes.	There is no QA/QC procedure defined in the PDD and methodology.

(2) Parameters used to calculate project emissions

	Assessment/ Observation
Data / Parameter:	Total fuel (CNG) consumption by the project ($TC_{PJ,C}$)
Value	1,157,009 m^3
Measuring frequency:	Daily
Recording frequency:	Monthly
Assessment of measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology.	The measuring and recording frequency are accordance with the monitoring plan and monitoring methodology.
Assessment of monitoring equipment in accordance with the monitoring plan and monitoring methodology.	Fuel dispensers at the filling stations. The filling stations are not managed by the project but by independent companies. The calibration of the fuel meters is responsible by the filling station, and their reports are not available to be provided to the verification team for check. By interviewing with the manager of filling station, CTI confirmed the above information. Since the filling station operates publicly and commercially, it is considered the accuracy and operation of fuel meters are complied with the national standard. The data is thus based on reports as also indicated in the approved methodology as well as the registered PDD and is not a measurement of the project owner.
Assessment of how to verify the reported values in the monitoring report.	CNG consumption is obtained from filling stations. Every time a bus is refilled the driver and the fuel station operator have to fill out a form stating date, hour, bus ID, distance driven and amount of fuel charged. Fuel consumption data is registered manually. Data is from the reports per bus filling made per day at the filling stations. Data aggregation is made by each filling station and verified by the Lanzhou Public Traffic Group, which pays the fuel to the station.
Assessment of how to cross-check the reported values with other available data.	CTI cross checked the data included in the spreadsheet "Monitoring sheet" with manual records taken by each filling station and with the fuel invoices issued by each filling station to the Lanzhou Public Traffic Group. CTI also verified the monthly report of fuel consumption per bus per line. The verification was done based on random sampling. Data were found consistent. Fuel consumption of CNG (SEC) and total distance driven (DD) by BRT buses are to be cross-checked against the total fuel consumption. The fuel consumption was registered as well as

	the project passenger numbers as the project was operating. However the project did not realize the passenger surveys. Therefore the monitoring was not complete and the project did not claim credits prior to 26/04/2014. However fuel consumption data was available. CTI verified the fuel consumption and distance driven, and confirmed the average specific fuel consumption from January to October was 55.7 m^3/100km, and the variations of SEC from May to October are in the order of maximum 5% to the average, which was considered as minor.
Assessment of the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes.	Data plausibility control is carried out through specific consumption of fuel (m^3 per 100km).

	Assessment/ Observation
Data / Parameter:	Net calorific value of the natural gas used by the project during the year "y" ($NCV_{NG,y}$)
Value	50.4 TJ/Gg
Measuring frequency:	Source from IPCC2006
Recording frequency:	Annual
Assessment of measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology.	The measuring and recording frequency are accordance with the monitoring plan and monitoring methodology.
Assessment of monitoring equipment in accordance with the monitoring plan and monitoring methodology.	No monitoring equipment.
Assessment of how to verify the reported values in the monitoring report.	The upper limit of the uncertainty at a 95% confidence interval is taken.
Assessment of how to cross-check the reported values with other available data.	NA.
Assessment of the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes.	NA

All necessary documentations are collected, referenced and aggregated. The quality assurance and quality control procedures have been addressed in the CDM monitoring

	manual, including the organization structure with the responsibilities, personnel competencies, monitoring procedures and monitoring management. By interview with the staff and check records during on-site visit, it can be confirmed that the monitoring management system is in place. The survey in the MR showed passengers which would have used a conventional bus occupied 48%, however it is 77.49% in the PDD. **CL 2** is raised to request to clarify for such big different percentage of passengers used a conventional bus. The project participant explained: the operational start of the project was end 2012 and the PDD was delivered mid-2012; therefore no passenger survey could be realized at time of PDD as the BRT was not yet operational; no other BRT line was operating in the city which could have been used as comparison base; the PDD relied on an estimation based on hypothetical questioning of passengers which don't even know what a BRT is as no such existed; two surveys (PDD and MR one) are thus obviously not comparable and the PDD data relies on estimates and assumptions which are very difficult to make ex-ante and which often prove to be widely wrong. The verification team confirmed the correction has been made in the updated MR and ER spreadsheet. **CL 2** is closed.
Conclusion	Monitoring of data and parameters related to the GHG emission reductions in the project activity has been carried out in accordance with the registered monitoring plan.

E.6.3. Implementation of sampling plan

Means of verification	CTI conducted document review and performed on-site assessment to review the appropriateness of sampling plan and sampling result.
Findings	Surveys or visual occupation rates based on samples are required for following parameters: 1. Mode passengers would have used in the baseline; 2. Trip distance on the project system of passengers which respond with passenger cars, motorcycles and taxis; 3. Type of fuel used by cars for respondents of passenger cars. CTI verified the sampling designs of passenger survey, bus usage, taxi, cars and motorcycles occupation rate in the monitoring report.
Conclusion	CTI confirmed that the designs of survey principles, sampling sizes, reliability/relative precision level are in line with the requirements of CDM guideline "Best practices examples focusing on sample size and reliability calculations" (EB 67 Annex 6) and "Standard for sampling and survey for CDM project activities and Programme of activities" (EB 65 Annex 2).

E.7. Compliance with the calibration frequency requirements for measuring instruments

Means of verification	The documents review was carried out. By checking the registered PDD, CTI found only one monitoring parameter referring to the monitoring equipment, i.e. total fuel (CNG) consumption by the project ($TC_{PJ,C}$), the fuel meters used in the filling station.

Findings	Fuel dispensers at the filling stations. The filling stations are not managed by the project but by independent companies. The calibration of the fuel meters is responsible by the filling station, and their reports are not available to be provided to the verification team for check. By interviewing with the manager of filling station, CTI confirmed the above information. Since the filling station operates publicly and commercially, it is considered the accuracy and operation of fuel meters are complied with the national standard.
Conclusion	CTI considered the calibration requirements for measuring instruments are complied with the registered PDD and methodology.

E.8. Assessment of data and calculation of emission reductions or net removals

E.8.1. Calculation of baseline GHG emissions or baseline net GHG removals by sinks

Means of verification	Cross-checking the baseline GHG emissions calculation in the MR against that in the ER spreadsheet and the registered PDD.
Findings	As established by AM0031 (version 03.1.0), baseline emissions (BE_y) are determined as the product of (i) ex-ante determined (and ex-post eventually adjusted) transport emission factor per passenger for the considered vehicle category ($EF_{P,I,y}$); and (ii) ex-post monitored number of passengers actually transported by the project ($P_{i,y}$):

$$BE_y = \sum_i \left(EF_{P,i,y} \times P_{i,y} \right)$$

The mode passengers would have used in absence of the project is determined through the mode survey:

$$P_{i,y} = P_y \times S_{i,y}$$

P_y Total number of passengers actually transported by the project monitored

$S_{i,y}$ Share of passengers transported by the project which would have used the considered vehicle category i in the absence of the project.

CTI verified that the survey was made following the procedures presented in Annex 4 of monitoring plan and Appendix A of the methodology. By document review all original copies of the survey, the verification team found the correction of survey information based on random sampling.

The verification team checked the calculation of baseline emissions and found that is correct. CTI confirmed the adaptation of baseline emission factor for cars and taxis due to changing trip distance is realized as the monitored values are lower than the baseline. No adaptation of the baseline emission factor of cars is made due to fuel type used as the monitored fuel types used are idem to the baseline fuel types.

As data in section 3.5.1 and 3.5.2, the detail data was given for ex-ante parameters and ex-post parameters to calculate the baseline emissions, and verified by CTI:

Parameter	Unit	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Total
Passengers	Passengers	3,761,903	3,778,660	3,557,222	3,270,087	3,825,639	3,755,657	21,949,168
Emission motorcycles	tCO_2e	18	18	17	16	19	18	107
Emissions cars	tCO_2e	510	512	482	443	518	509	2,975
Emissions taxis	tCO_2e	1,078	1,083	1,019	937	1,096	1,076	6,289
Emissions buses	tCO_2e	517	519	488	449	525	516	3,014
Baseline Emissions	tCO_2e	**2,104**	**2,114**	**1,990**	**1,829**	**2,140**	**2,101**	**12,277**

	The project only claims emission reductions for the period 26/04/2014 to 25/10/2014 as no monitoring of the project was realized prior to 26/04/2014. Therefore, the total baseline emissions reported in this monitoring period are 12,277 tCO_2e.
Conclusion	The verification team confirmed that the calculation of the baseline emissions is correct.

E.8.2. Calculation of project GHG emissions or actual net GHG removals by sinks

Means of verification	Cross-checking the project GHG emissions calculation in the MR against that in the ER spreadsheet and the registered PDD.
Findings	The project emissions correspond to the emissions from all trips undertaken by the new BRT system. As all buses of the Lanzhou BRT system are all CNG-fuelled, no electricity using, the emissions are the fuel consumption from trunk buses and buses using supporting trunk bus routes. The Alternative A of AM0031 (version 03.1.0), in which the total fuel consumption by trunk buses and buses using supporting trunk bus routes ($TC_{x,y}$) were monitored. Hence, the CO_2 emission factor for all fuels (and CH_4/N_2O emission factors for gaseous fuels) are determined ex-ante: $$PE_y = \sum_x \left[TC_{x,y} \times \left(EF_{CO2,x} + EF_{CH4,x} + EF_{N2O,x} \right) \right]$$ Data plausibility control is carried out through specific consumption of fuel (liter or m^3 per 100km). The average distance driven per bus per month is checked for plausibility comparing distances over months. Distance driven is also separated in the fuel type used as CNG buses in general have a lower reliability factor and thus in general lower distances driven per month. As data in section 3.5.1 and 3.5.2, the detail data was given for ex-ante parameters and ex-post parameters to calculate the project emissions, and verified by CTI. **Parameter** / **Unit** / **Total** CNG consumption / m^3 / 1,157,009 Passengers / Passengers / 21,949,168 Project Emissions / tCO_2e / 3,102 Therefore, the total project emissions reported in this monitoring period are calculated and verified to be 3,102 tCO_2e.
Conclusion	The verification team has confirmed that the calculation of the project emissions is correct.

E.8.3. Calculation of leakage GHG emissions

Means of verification	According to the applied methodology AM0031 (version 03.1.0), the leakage of the project is not considered for the crediting period.
Findings	As stated in Section 1.4.3, the leakage sources are calculated as follows: $$LE_y = LE_{LF,Z,y} + LE_{LF,Y,y} + LE_{CONG,y}$$ For the sake of a conservative approach, leakage is only considered if the total annual effect is to reduce estimated emission reductions. The leakage load factors are monitored in year 3 and year 7, which means they are not monitored in this monitoring period. Therefore no leakage of Change of load

	factor taxis and buses has been included. The reduced congestion leakage is negative due to a negative rebound leakage with a 0 speed leakage. Therefore, leakage emissions are 0 for the crediting period.
Conclusion	According to the applied methodology AM0031 (version 03.1.0), the leakage of the project is not considered for the crediting period.

E.8.4. Summary of calculation of GHG emission reductions or net anthropogenic GHG removals by sinks

Means of verification	Cross-checking the data applied for ER calculation with all the relevant documents as listed in Appendix 3, and the ER calculation in the MR against that in the ER spreadsheet and the registered PDD.
Findings	The emission reductions (ER_y) by the project activity are the difference between the baseline emissions, project emissions (PE_y) and emissions (L_y) due to leakage: $ER_y = BE_y - PE_y - L_y$ From above sections, the following information has been achieved: <table><tr><th>Item</th><th>Total</th></tr><tr><td>Baseline emissions (tCO_2e)</td><td>12,277</td></tr><tr><td>Project emissions (tCO_2e)</td><td>3,102</td></tr><tr><td>Leakage (tCO_2e)</td><td>0</td></tr><tr><td>Emission reductions (tCO_2e)</td><td>9,176</td></tr></table> Hence, the emission reductions by the project activity during this monitoring period are calculated and rounded-down to be 9,176 tCO_2e. The emission reduction calculations have been based on actual monitored data of the plant and the estimation or default values in this monitoring period, from 01/01/2013-25/10/2014 which have been verified by CTI. Emission reduction calculations were presented in a worksheet and CTI has assessed the calculations to be complete and transparent.
Conclusion	All necessary documentations are collected, referenced and aggregated, which is easily accessible in hard-copy or electronic format. Measurements are performed by calibrated equipment, and the key data can also be cross-checked via other sources, such as records, receipts and inventory data. No assumptions are used that have any material influence on reported emission reductions. CTI concludes that during this monitoring period, the evidences for determination of emission reductions are sufficient and reasonable, and the calculation of emission reductions is reliable.

E.8.5. Comparison of actual GHG emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Means of verification	The section E.5 of MR (version 4.0) is cross-checked against the registered PDD.
Findings	The emission reductions claimed are 9,176 tCO_2e in this monitoring period (i.e. 663 days). Since the project only claims emission reductions for the period 26/04/2014 to 25/10/2014 as no monitoring of the project was realized prior to 26/04/2014, only

	the emission reductions claimed in the period 26/04/2014 to 25/10/2014 (i.e. 183 days) were compared with estimates in the registered PDD as follows:

Item	Baseline emissions	Project emissions	Emisison reductions
Values estimated ex-ante (tCO_2e)	15,089	9,330	5,759
Actual values achieved (tCO_2e)	12,277	3,102	9,176
Deviation	19%	67%	-59%

Conclusion	CTI verified the input data for calculating emission reductions and the calculating process, and confirmed the result were complete and transparent.

E.8.6. Remarks on difference from estimated value in registered PDD

Means of verification	The section E.6 of MR (version 4.0) is cross-checked against the registered PDD
Findings	For this monitoring period, the reported emission reductions are 59% higher than the expected. The main reason for the higher emission reduction is due to the larger modal shift than expected, i.e. the number of passengers from taxis was expected to be only 8% and is now 28% and from cars 13% and is now 19%. Passengers from high emitting modes lead to higher emission reductions than passengers which would have come from traditional bus service. At the time of PDD writing, the BRT was not operating. Therefore, approximate figures from other cities had to be taken considering mode shift. However, figures of mode shift are very city and system dependent i.e. depend on local congestion, relative prices, attractiveness of the system etc. which cannot be projected well upfront, especially in new systems like a BRT. The passenger number projected for the same period in the PDD is 67 million passengers for entire year 2014 which is equivalent to 34 million for 6 months (see PDD table 12). The MR has 22 million for 6 months. This is 65% of 34 million. The fuel usage projected for the same period in the PDD is 7.2 million m^3 for entire year 2014 which is equivalent to 3.6 million m^3 for 6 months (see PDD table 13). The MR has 1.2 million m^3 for 6 months which is 65% less. The fuel usage is 65% less whilst passenger is only 40% less as all buses used are articulated units which use per passenger less fuel.
Conclusion	CTI considered the actual emission reductions reported reflects to the operational practice of the BRT system, and are reasonable and appropriate. CTI verified the input data for calculating emission reductions and the calculating process, and confirmed the result were complete and transparent.

E.8.7. Actual GHG emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Means of verification	The section E.4 of MR (version 4.0) is cross-checked against the registered PDD.
Findings	As verified in section E.8.4, the emission reductions achieved during the first commitment period and the period from **01/01/2013** onwards are broken-down and verified by the verification team as:

Item	Actual values achieved up to 31/12/2012	Actual values achieved from 01/01/2013 onwards

			(01/01/2013-25/10/2014)
	ER_y (tCO_2)	N/A	9,176
Conclusion	CTI verified the input data for calculating emission reductions and the calculating process, and confirmed the result were complete and transparent.		

SECTION F. Internal quality control

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This final verification report including the initial findings underwent a technical review before being submitted to project participants and requesting issuance of CERs of the project activity according to CTI internal procedure. The technical reviewers were not part of the verification team, and the technical review was independently of the verification team.

SECTION G. Verification opinion

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In CTI's opinion, the GHG emission reductions reported for the project in the monitoring report (version 4.0 dated 15/09/2017) are fairly stated. The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology AM0031 (version 03.1.0) and the monitoring plan contained in the Project Design Document (version 02 dated 17/07/2012).

CTI confirmed that the GHG emission reductions are calculated without material misstatements. Based on the evidence and information that are considered necessary to guarantee that GHG emission reductions are appropriately calculated, CTI is able to certify that emission reductions from Lanzhou Bus Rapid Transit (BRT) Project during the period 01/01/2013-25/10/2014 amount as follows:

Baseline emissions: 12,277 tCO_2e

Project emissions: 3,102 tCO_2e

Leakage: 0 tCO_2e

Emission reductions: 9,176 tCO_2e

SECTION H. Certification statement

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Shenzhen CTI International Certification Co., Ltd (CTI) has performed the verification of the emission reductions that have been reported for the CDM project activity 6796 "Lanzhou Bus Rapid Transit (BRT) Project" in China for the period 01/01/2013-25/10/2014.

The verification is based on the baseline and monitoring methodology AM0031 (version 03.1.0), the validated and registered PDD (version 02 dated 17/07/2012) and the monitoring report (version 4.0 dated 15/09/2017). The verification consisted of the following three phases: i) desk review of the project design and the baseline and monitoring plan; ii) follow-up interviews with project participants; iii) resolution of outstanding issues and the issuance of the final verification and certification report.

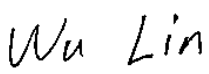
The project participants are responsible for the collection, calculation and determination of the GHG data in accordance with the monitoring plan and the reporting of GHG emission reductions on the basis set out within the project monitoring report.

It is CTI's responsibility to provide an independent verification statement on the reported GHG emission reductions for the project. Based on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these, CTI planned and performed our work to obtain the information and explanations that we considered necessary to provide reasonable assurance that reported GHG emission reductions are fairly stated.

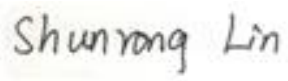
CTI confirmed that the GHG emission reductions are calculated without material misstatements. Based on the evidence and information that are considered necessary to guarantee that GHG emission reductions are appropriately calculated, CTI confirms the following statement:

Item	Reporting period (01/01/2013-25/10/2014)	Period up to 31/12/2012	Period from 01/01/2013 onwards (01/01/2013-25/10/2014)
Emission reductions (tCO_2e)	9,176	0	9,176

The finally achieved emission reduction credits are 9,176 tCO_2e in the monitoring period 01/01/2013-25/10/2014.



Mr. Lin Wu
Team Leader
20/02/2018



Ms. Lin Shunrong
Technical Reviewer
20/02/2018

Appendix 1. Abbreviations

Abbreviations	Full texts
BRT	Bus Rapid Transit
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction(s)
CH_4	Methane
CL	Clarification request
CNG	Compressed Natural Gas
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CTI	Shenzhen CTI International Certification Co., Ltd
DOE	Designated Operational Entity
EF	Emission Factor
ER	Emission Reduction
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GPS	Global Positioning System
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MR	Monitoring Report
N_2O	Nitrous oxide
PDD	Project Design Document
PS	Project Standard
tCO_2e	Tonnes of CO_2 equivalents
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Clean Development Mechanism Validation and Verification Standard

Appendix 2. Competence of team members and technical reviewers

Mr. Lin Wu

Satisfies the requirements of the Certification Body of CTI and is hereby appointed as:

Qualification as						
Status	GHG Auditor	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date	01/01/2015	01/01/2015	01/01/2015	01/01/2015	01/01/2015	01/01/2015

Qualification in the scope and technical area		
Scope	Technical area	Date
SS 1: Energy industries (renewable/nonrenewable sources)	TA 1.1: Thermal energy generation	01/01/2015
	TA 1.2: Renewables	01/01/2015
SS 2: Energy distribution	TA 2.1: Energy distribution	01/01/2015
SS 3: Energy demand	TA 3.1: Energy demand	01/01/2015
SS 4: Manufacturingindustries	TA 4.1: Cement and lime production	01/01/2015
SS 13: Waste handling and disposal	TA 13.1: Waste handling and disposal	01/01/2015
	TA 13.2: Animal waste management	01/01/2015

This appointment is valid for 3 years from its date of approval below and is bound by internal requirements of management system of the Certification Body of CTI.

Approved by:

Zhou Lu 

Director
Shenzhen, 01/01/2015

Ms. Wang Jun

Satisfies the requirements of the Certification Body of CTI and is hereby appointed as:

Qualification as						
Status	GHG Auditor	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date	01/01/2015	-	-	-	-	01/01/2015

Qualification in the scope and technical area		
Scope	Technical area	Date
SS 1: Energy industries (renewable/non-renewable sources)	TA 1.2: Renewables	01/01/2015
SS 2: Energy distribution	TA 2.1: Energy distribution	01/01/2015
SS 3: Energy demand	TA 3.1: Energy demand	01/01/2015
SS 6: Construction	TA 6.1: Construction	01/01/2015
SS 7: Transport	TA 7.1: Transport	01/01/2015

This appointment is valid for 3 years from its date of approval below and is bound by internal requirements of management system of the Certification Body of CTI.

Approved by:

Lin Wu Wu Lin

Technical competent manager
Shenzhen, 01/01/2015

Ms. Lin Shunrong

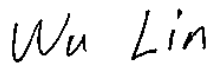
Satisfies the requirements of the Certification Body of CTI and is hereby appointed as:

Qualification as						
Status	GHG Auditor	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date	01/01/2015	01/01/2015	01/01/2015	01/01/2015	01/01/2015	01/01/2015

Qualification in the scope and technical area		
Scope	Technical area	Date
SS 1: Energy industries (renewable/non-renewable sources)	TA 1.2: Energy generation from renewable energy sources	01/01/2015

This appointment is valid for 3 years from its date of approval below and is bound by internal requirements of management system of the Certification Body of CTI.

Approved by:

Lin Wu 

Technical competent manager
Shenzhen, 01/01/2015

Ms. Jiang Shu'E

Satisfies the requirements of the Certification Body of CTI and is hereby appointed as:

Qualification as						
Status	GHG Auditor	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date	01/01/2015	-	-	-	-	01/01/2015

Qualification in the scope and technical area		
Scope	Technical area	Date
SS 6: Construction	TA 6.1: Construction	01/01/2015
SS 7: Transport	TA 7.1: Transport	01/01/2015

This appointment is valid for 3 years from its date of approval below and is bound by internal requirements of management system of the Certification Body of CTI.

Approved by:

Lin Wu Wu Lin

Technical competent manager
Shenzhen, 01/01/2015

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
/1/	Grütter Consulting AG	Monitoring Report for Lanzhou Bus Rapid Transit (BRT) Project	Version 1.0 dated 05/11/2014 and version 4.0 dated 15/09/2017	Project participant
/2/	Grütter Consulting AG	Emission reduction calculation spreadsheet for Lanzhou Bus Rapid Transit (BRT) Project	Version 1.0 dated 05/11/2014 and version 4.0 dated 15/09/2017	Project participant
/3/	Lanzhou Industrial and Commercial Administration	Business licence for Lanzhou Public Traffic Group	-	Project participant
/4/	Grütter Consulting AG	Monitoring Manual	17/04/2014	Project participant
/5/	Grütter Consulting AG	Planning and records of training for on-site staff	04/2014	Project participant
/6/	Lanzhou Public Traffic Group	Operation log sheets	01/01/2013-25/10/2014	Project participant
/7/	Lanzhou Public Traffic Group	Operational trunk and support lines	-	Project participant
/8/	Grütter Consulting AG	Lanzhou BRT Modal Split Survey Instruction Report	-	Project participant
/9/	Lanzhou Public Traffic Group	IC card reader technical data	01/01/2013-25/10/2014	Project participant
/10/	Zhengzhou Tiamaes Technology Co., Ltd.	GPS Manual	-	Project participant
/11/	Grütter Consulting AG	BRT surveys report	-	Project participant
/12/	Grütter Consulting AG	CDM-PDD for project activity	version 02 dated 17/07/2012	Project participant
/13/	RINA	Validation report for project activity	version 1.2 dated 23/07/2012	Project participant
/14/	EB	CDM VVS for project activities	Version 01.0	EB
/15/	EB	CDM Project Standard for project activities	Version 01.0	EB
/16/	EB	CDM Project Cycle Procedure for project activities	Version 01.0	EB
/17/	EB	Baseline Methodology for Bus Rapid Transit Projects-AM0031	version 03.1.0	EB
/18/	EB	Best practices examples focusing on sample size and reliability calculations	EB 67 Annex 6	EB
/19/	EB	Standard for sampling and survey for CDM project activities and Programme of activities	EB 65 Annex 2	EB
/20/	EB	Guideline-Completing the monitoring report form	Version 05.1	EB
/21/	EB	Guideline- Completing the verification and certification report form for CDM project activities	Version 01.0	EB

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

Table 1. Remaining FAR from validation and/or previous verification

FAR ID	NA	**Section no.**	NA	**Date:** NA
Description of FAR				
NA				
Project participant response				**Date:** NA
NA				
Documentation provided by project participant				
NA				
DOE assessment				**Date:** NA
NA				

Table 2. CL from this verification

CL ID	1	**Section no.**	E.6.1	**Date:** 20/01/2015
Description of CL				
In the D.1 of MR, the CO_2 emission factor of CNG buses, taxis and passenger cars ($EF_{CO2,CNG,Z/T/C}$) was indicated as data and parameter fixed ex-ante. However, this parameter was not included in the registered PDD. And, in the registered PDD, the parameter "Total distance driven by all buses in the baseline" was ex-ante, which was not put in the MR. Further, in the registered PDD, the parameter "the number of vehicles in the vehicle category i using fuel type x" ($N_{i,x}$) and "Net calorific value of the natural gas used by the project during the year y ($NCV_{NG,y}$)" were the monitoring parameters, which were not included in the MR. CL 1 is raised to clarify such inconsistencies.				
Project participant response				**Date:** 26/02/2015
1. The parameter $EF_{CO2,CNG,Z/T/C}$ has been eliminated from the MR. 2. DD_Z has been included in the MR. 3. The parameter $N_{i,x}$ is not required as the share per fuel of taxis, motorcycles and cars is adjusted to the baseline value based on the survey question of the fuel type used for passengers using cars, motorcycles or taxis in accordance with the methodology and also the PDD formulae. For the PDD the actual vehicle share i.e. $N_{i,x}$ was used as no BRT existed and thus no survey could be made. Therefore this parameter was listed in the PDD. During monitoring however this parameter is monitored through S_i. 4. The parameter $NCV_{NG,y}$ has been included in the MR.				
Documentation provided by project participant				
MR (version 4.0 dated 15/09/2017).				
DOE assessment				**Date:** 15/09/2017
The verification team confirmed the ex-ante parameters $EF_{CO2,CNG,Z/T/C}$ and DD_Z, ex-post parameter $NCV_{NG,y}$, have been added in the updated MR. Further, since the parameter $N_{i,x}$ is used as no BRT existed and thus no survey could be made, it is not required. CL 1 is closed.				

CL ID	2	**Section no.**	E.6.2	**Date:** 20/01/2015
Description of CL				

The survey in the MR showed passengers which would have used a conventional bus occupied 48%, however it is 77.49% in the PDD. **CL 2** is raised to request to clarify for such big different percentage of passengers used a conventional bus.
Project participant response **Date:** 26/02/2015
The operational start of the project was end 2012 and the PDD was delivered mid-2012. Therefore no passenger survey could be realized at time of PDD as the BRT was not yet operational. No other BRT line was operating in the city which could have been used as comparison base. Therefore the PDD relied on an estimation based on hypothetical questioning of passengers which don't even know what a BRT is as no such existed. The two surveys (PDD and MR one) are thus obviously not comparable and the PDD data relies on estimates and assumptions which are very difficult to make ex-ante and which often prove to be widely wrong.
Documentation provided by project participant
MR (version 4.0 dated 15/09/2017) and ER spreadsheet (version 4.0 dated 15/09/2017).
DOE assessment **Date:** 15/09/2017
The verification team confirmed the correction has been made in the updated MR and ER spreadsheet. CL 2 is closed.

Table 3. CAR from this verification

CAR ID	1	**Section no.**	E.3	**Date:** 20/01/2015
Description of CAR				
The monitoring period in the MR was 01/01/ 2013 to 25/09/2014. However, the monitoring data of the project in the MR was up to 10/2014. By interviewing with the project participants, they confirmed the ending date of monitoring period was 25/10/2014 in their original consideration and a typo error was made in the MR. CAR 1 is raised to request the project participant to correct in the MR and ER spreadsheet.				
Project participant response				**Date:** 26/02/2015
Has been corrected in the version 2.0 of the ER spreadsheet and the version 2.0 of the MR.				
Documentation provided by project participant				
MR (version 4.0 dated 15/09/2017) and ER spreadsheet (version 4.0 dated 15/09/2017).				
DOE assessment				**Date:** 15/09/2017
It is typo error in the MR. CTI informed the CDM Secretariat to correct the ending date of monitoring period, and approved by CDM Secretariat. The corrections have been addressed in the updated MR and verified by CTI. CAR 1 is closed.				

Table 4. FAR from this verification

FAR ID	NA	**Section No.**	NA	**Date:** NA
Description of FAR				
NA				
Project participant response				**Date:** NA
NA				
Documentation provided by project participant				
NA				
DOE assessment				**Date:** NA
NA				

Document information

Version	*Date*	*Description*
01.0	23 March 2015	Initial publication.

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Business Function: Issuance
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