Gold Standard for the Global Goals

METHODOLOGY

TWO AND THREE WHEELED PERSONAL TRANSPORTATION

SDG 13

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SUMMARY

This methodology applies to project activities that shift the mode of transport of urban passengers to mechanical bicycles, tricycles, e-bikes, e-scooters, or e-tricycles, by implementing related infrastructure in an urban area such as bicycle lanes, bicycle and e-scooter sharing programmes (through dock less bicycles or e-scooter sharing stations) and bicycle parking areas.

This is an adaptation from the CDM approved methodology AMS.III.BM - Lightweight two and three wheeled personal transportation V2.0. It is developed in association with Micromobility Research Partnership™.

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1| INTRODUCTION

The following table describes the key elements of the methodology:

Table 1 Methodology key elements

Typical projects	Construction of new and/or expansion of existing bicycle lanes, bicycle sharing programmes (through dock less bicycles or sharing stations), bicycle parking areas; introduction of e- bikes, e-scooters, or tricycles; and/or implementation of new and/or expansion of existing passenger transportation services based on tricycle
Type of GHG emissions mitigation action	Technology and/ or fuel switching: Replacement of more GHG-intensive transportation modes.

2| SCOPE, APPLICABILITY, AND ENTRY INTO FORCE

2.1 | Scope

2.1.1 | This methodology applies to project activities that shift the mode of transport of urban passengers to mechanical bicycles, tricycles, e-bikes, e-scooters, or e-tricycles, by implementing related infrastructure in an urban area such as bicycle lanes, bicycle and e-scooter sharing programmes (through dock less bicycles or e-scooter sharing stations) and bicycle parking areas. Implementation of new and/or expansion of an existing passenger transportation service based on tricycles or e-scooters is also eligible. Activities to introduce e-bikes, e-scooters, or tricycles (such as e-bikes belonging to a bicycle sharing programmes or promotion of individual ownership) are also eligible.

2.2 | Applicability

2.2.1 | The table below illustrates which types of project activities are eligible under this methodology (see also related baseline options under section 5.5).

Table 2 Types of projects eligible under this methodology

Type of project	Description	Baseline options applicable (as per para 5.5 I)		
		Option 1	Option 2	Option 3
Type 1	Construction of new bicycle lanes	✓	✓	
Type 2	Extension of existing bicycle lanes	✓	✓	
Type 3	Implementation of new bicycle sharing programme (through dock less bicycles or sharing stations)	✓		✓
Type 4	Expansion of an existing bicycle sharing programme (through increasing the number of dock less bicycles and/or through increasing the size or number of bicycle sharing stations)	✓		✓
Type 5	Construction of new bicycle parking areas. These parking areas may be connected to public transport (PT) (subway stations, bus stops, light-rail train stations, etc.) or activity hubs (office towers, shopping centers, markets, venues, etc.)	✓	✓	
Type 6	Expansion of the existing bicycle parking areas	✓	✓	
Type 7	Introduction of e-bikes	✓		✓
Type 8	Implementation of a new transportation service or expansion of an existing one based on tricycles	✓		
Type 9	Implementation of e-scooter sharing programme	✓	✓	✓
Type 10	Introduction of e-scooters through individual ownership	✓	✓	✓
Type 11	Implementation of a new transportation service or expansion of an existing one based on e-scooters	✓	✓	✓

2.2.2 | If one or more measures described in Table 2 above have already been implemented within the project boundary (e.g., within the same city as the proposed project activity), it shall be ensured that these measures are identified and taken into account when determining the baseline.

2.2.3 | Any combination of measures described in Table 2 is also eligible. If multiple measures are implemented as part of the project activity, it shall be ensured that any interactive effects between the measures are identified and taken into account to avoid double-counting. The project proponent should make an analysis of the interactive effects and account for them following the provisions from the applicable version of the "Guidelines for the consideration of interactive effects for the application of multiple CDM methodologies for a programme of activities", considering that interactive effects could occur, for example, in the following situations:

a. When there is an overlap in users between different measures of the project; or
b. When several measures rely on the same information when estimating emission reductions; or
c. When relying on default factors for setting the baseline. If the project activity involves the construction of on-road bicycle lanes, the width of any existing dedicated bus lane shall not be reduced in such a way that the traffic would be altered.

2.2.4 | If the project activity involves the deployment of shared e-Scooters and charging networks, it shall be clearly demonstrated that the charging stations are within the control of the e-Scooter project owner and that charging stations and networks are not under any existing carbon certification scheme through the life of the project activity.

2.2.5 | If the project activity involves the charging of e-Scooters from renewable energy source(s) it shall be clearly demonstrated and positively evidenced by the Project Owner that the renewable energy source(s) are not certified independently under any other carbon certification scheme on an ongoing basis through the life of the project activity.

2.2.6 | The applicability conditions included in the tools referred to below also apply.

2.2.7 | Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.

2.3 | Entry into force

2.3.1 | The date of entry into force is the date of the publication of the methodology i.e., 13 January 2023.

3| NORMATIVE REFERENCES

3.1.1 | The methodology also refers to the latest approved version of the following methodological tools and standards:

a. "TOOL21: Demonstration of additionality of small-scale project activities" (hereinafter referred to as TOOL21);

b. "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (hereinafter referred to as TOOL05);

c. "TOOL11: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (hereinafter referred to as TOOL11);

d. "TOOL18: Baseline emissions for modal shift measures in urban passenger transport" (hereinafter referred to as TOOL18);

e. "TOOL23: Additionality of first-of-its-kind project activities" (hereinafter referred to as TOOL23);

f. "Standard: Sampling and surveys for CDM project activities and programme of activities".

4| DEFINITIONS

4.1.1 | The definitions contained in the Glossary of GS terms shall apply. Glossary of CDM terms may also be referred where applicable.

4.1.2 | For the purpose of this methodology, the following definitions apply:

a. **Bicycle lanes** - dedicated lanes for mobility using bicycles, e-bikes, or tricycles. These lanes may be located on-road, on sidewalks or may be dedicated lanes in other areas (such as in a park, on a river's bank, etc.). These lanes shall be clearly identifiable, signalled and shall be durable;

b. **Bicycle parking areas** - areas dedicated for parking bicycles, e-bikes, or tricycles. The parking areas may be composed of stands or racks in open or closed areas or may be dedicated and secured rooms, and the parking service may be free or may charge a fee. Parking areas may also be implemented in connection with public transportation modes (e.g., subway, rail, or bus stations) or other activity hubs;

c. **Bicycle sharing station** - sites located in urban areas where the users can check in and out bicycles. It is usually composed by docking spaces (stations with docks where bikes are parked and locked), terminals (places where users can get information about the system) and the bicycles;

d. **Dockless bicycles** - bicycles that belong to a sharing programme that doesn't make use of docking spaces, allowing users to check in and out the bicycles in any location within a geographical boundary;

e. **E-bikes** - bicycles that can utilise an electric motor to assist propulsion by pedalling. The e-bikes should comply with any national standards or regulations for e-bikes;

f. **E-scooters** – Scooters that utilise an electric motor for propulsion. The e-scooter should comply with national standards or regulations for e-scooters and be certified independently as to endurance (mileage) and operational lifespan.

g. **Infrastructure** - under this methodology, means bicycle lanes (new or extension of existing), bicycle parking areas (new or expansion of existing areas) and bicycle sharing stations (new or expansion of the existing stations);

h. **Micro mobility** in this context is defined as "Personal transportation using devices and vehicles weighing up to 350 kg and whose power supply, if any, is gradually reduced and cut off at a given speed limit which is no higher than 45 km/h. Micro mobility includes the use of exclusively human-powered vehicles, such as bicycles, skates, skateboards, and kick-scooters." (ITF 2020)

i. **Replacement** in this context is defined as "The action or process of replacing passenger trips from the alternative baseline transport modes".

j. **Tricycles** - vehicles similar to the bicycles but having three wheels. Electric tricycles that run on electric power to assist pedalling are also eligible under this methodology.

5| BASELINE AND PROJECT IMPACT METHODOLOGY

5.1 | Project boundary

5.1.1 | The project boundary is the area in which the users of the infrastructure and/or of the promoted bicycles, e-scooter, tricycles, e-bikes, or e-tricycles travel between origins and destinations.

5.1.2 | If the project involves the use of e-bikes, e-scooters or e-tricycles, the project boundary also includes the electric grid, and all physically connected power plants that supply electricity to the grid and/or captive power plants directly supplying electricity to the charging stations used to recharge the battery of e-bikes, e-scooters, or e-tricycles.

5.1.3 | If the project involves the increased public transport (PT) participation due to the solution to first and last mile barriers, (Refer para 5.3.1 |) the project boundary also extends to the radius of the average PT trip calculated as having been caused by accessibility improvement, in terms of the average PT trips reported in surveys or official statistics on household travel or similar national statistical reporting of recent and relevant nature, not older than 5 years. Project participant may opt to not claim any emission reductions due to such increase in PT attributed to project activity.

5.1.4 | The baseline emissions include CO_2 emissions from different modes of transport that the users of the bicycles, e-bikes, e-scooters, tricycles, and e-tricycles would have taken in the absence of the project activity.

5.1.5 | Project emissions include CO_2 emissions from electricity consumption (e.g., to recharge the batteries and/or in operating the related infrastructure). N_2O and CH_4 emissions are excluded from the project boundary as the amount of these emissions are considered not significant.

5.1.6 | It is possible that charging stations are fed with renewable energy (RE) either through the connected grid (in open access arrangement) or through dedicated RE power sources. For RE supplied through grid in open access arrangement, quantity of electricity used shall be verified on the basis of supplier certifications by an independent certifier. The electricity supplied through dedicated RE sources shall be covered as explained in paragraph 5.1.2 | above.

5.2 | Baseline scenarios

5.2.1 | The baseline scenario is assumed to be the continuation of the use of existing modes of transport in the absence of the Gold Standard project activity, which includes more GHG-intensive transport modes replaced by micro mobility transport options (e-bikes, e-scooters, or e-tricycles) of the project activity, as evidenced by academic studies and/or survey results.

5.3 | Project Impact Scenarios (for calculating additional baseline emission reductions)

5.3.1 | A further project impact that may be applied is the increase in public transport participation when micro mobility projects can evidence an increase in such participation based on micro mobility solving first and last mile transport issues and improve accessibility to public transport.

5.3.2 | A further project impact that may be applied is the reduction in reliance on and ownership of private internal combustion engine vehicles and personal electric vehicle classes (BEV, PHEV, FCEV).

5.4 | Additionality Demonstration

5.4.1 | Activities that are automatically additional:

The following measures, referred in Table 2, alone or in combination, are considered as automatically additional:

a. Type 1 and Type 2 (i.e., construction of new bicycle lanes and extension of the existing bicycle lanes);

b. Type 3, Type 4, and Type 9 (i.e., implementation of new or expansion of existing bicycle sharing programmes), if the value paid when renting the bicycle is fully refundable upon return to the sharing station;

c. Type 5 and Type 6 (i.e., construction of new or expansion of existing bicycle parking areas), if no charges are applied to park the bicycles.

5.4.2 | Other activities:

Activities that do not satisfy the conditions under para 5.4.1 | above are considered additional if:

a. The project activity complies with the criteria for demonstrating additionality of microscale project activities; or

b. The first-of-its-kind barrier is demonstrated as per the CDM methodological tool (TOOL 23); or

c. Activities that are type 7, 9, 10, 11 (i.e., introduction of e-bikes or e-scooters) and the market (penetration) of e-bikes or e-scooters in cars in use in the city is below or equal to 1.5% based on number of annual car trips undertaken in the city or based on stock of cars; or

d. It is demonstrated, through the application of CDM TOOL 21, that at least one barrier would prevent the implementation of the project activity.[1]

5.5 | Baseline emissions

5.5.1 | Baseline emissions are the emissions resulting from transportation of passengers in the absence of the project activity. It is differentiated per baseline modes of transport (relevant travel modes) that the project activity users would have used in the absence of the project activity. One of the options below shall be applied for baseline emissions.

5.5.2 | **Option 1:** Ex-post survey of baseline travel modes:

a. This option is suitable for all types indicated in Table 2.

b. Under this option, baseline emissions cover the emissions which would have been caused by the user of the new or improved infrastructure (bicycle lanes, bicycle sharing programme, parking areas) and/or of the e-bikes, e-scooters, e-tricycles in absence of the project from origin (O) to destination (D), where the O and D points of the trip are assumed to be equal for both the baseline and the project scenarios.

c. Baseline emissions are determined by applying Steps 1 to 4 from the latest approved version of TOOL 18, using parameters estimated based on data collected during the survey in the year 1 and optionally in the year 4 of the crediting period. The survey shall be conducted with the users of the infrastructure, bicycle sharing programme or new tricycles, e-bikes, e-scooters, or e-tricycles.

d. The vehicle categories index *i* indicated in Step 1 of TOOL 18 shall be included, and "cycling" and "walking" should be considered as potential baseline "vehicle categories" with an emission factor of zero.

[1] When assessing the investment barrier, the investment analysis should be undertaken from the perspective of the operator/investor of the bike parking areas or bicycle sharing stations, reflecting the costs and revenues from the perspective of the operator/investor – meaning that the revenues from the parking fees and other sources (e.g. advertising) and the costs associated with the rent and maintenance of the parking area and/or the bicycle sharing station, security and personnel and the land cost and/or opportunity cost of land and/or fair value of the land shall be considered when conducting the investment analysis.

If some vehicle categories are not explicitly identified or do not fit into the categories from the tool, they should be included in the survey as "others" and baseline emissions of this category are counted as zero. The survey shall be undertaken at locations of the project infrastructure and origin/destination of the cycling trip shall be substituted for "entry/exit station" in TOOL18. The survey may be conducted with a sample of users in the case of the bicycle sharing programme or new tricycles, e-bikes, e-scooters or e-tricycles.

e. When applying Step 4 of TOOL18, the following provisions shall apply:

i. Parameter P_y (number of passengers travelled by the project system in year y) should be considered as number of trips on the new infrastructure / service per year as measured by counting, if necessary relying on sampling (sampling in accordance with the standard "Sampling and surveys for CDM project activities and programme of activities");

ii. Parameter D_i (average trip distance travelled by passengers) may be determined:

1. from the survey with the users in the project;

2. as an average value for bicycle, tricycle, e-tricycle, e-scooter or e-bike trips (as relevant) from recent relevant official data or studies at the city level; Relevance of data in this context and in the context of this Methodology applicable to other similar provisions related to reliance on data or studies, shall be defined as not older than five years in terms of recency, or

3. by applying the default conservative value of 2.5 km for bicycle, or tricycle trips, 2 km for e-scooter [2], and 5 km for e-bike or e-tricycle trips.[3]

5.5.3 | **Option 2:** Baseline emissions based on public transportation (excluding cars, taxis, and motorcycles) as benchmark:

[2] According to the study "Sengül, B.; Mostofi, H. Impacts of E-Micromobility on the Sustainability of Urban Transportation—A Systematic Review. Appl. Sci. 2021, 11, 5851. https://doi.org/10.3390/app11135851 "the findings in the literature were mostly between 0.72 and 2.4 km for the average e-scooter distance, and the average duration spent using e-scooters was between 8 and 12 min"

[3] According to the study "A Global High Shift Cycling Scenario", prepared by the Institute for Transportation and Development Policy (ITDP) and by the Institute of Transportation Services (ITS) from UC Davis, a typical cycling trip distance is of 3 – 5 km and can be covered in 20 minutes using a bicycle; e-bikes can cover 10 km in 20 minutes.

a. This option is suitable for Type 1 and Type 2 (i.e., construction of new or extension of existing bicycle lanes), Type 5 and Type 6 (i.e., construction of new or expansion of existing bicycle parking areas) and Type 7, 9, 10, 11 (i.e., Introduction of e-bikes or e-scooters).

b. Under this option, the modal shares of the public transportation in the city (excluding travels using passenger cars, motorcycles, and taxis) and the corresponding CO_2 emissions are determined before the implementation of the project, using statistics from the transport authority or other credible studies. Steps 1 to 3 of the methodological tool TOOL18 may be applied to complement existing data, if necessary. Also, the number of cycling trips prior to installation of the new infrastructure ($N_{bicycles,BL}$) shall be determined ex ante.

c. The baseline emissions are calculated considering the number of cycling, e-bike, or e-scooter trips after installation of the new infrastructure or the introduction of e-bikes or e-scooters and the distance travelled by the users of the infra- structure or micro mobility services.

$$BEy = 0.9\times (N_{bicycles,y} - N_{bicycles,BL}) \times ADT_{u,y} \times EF_{BL,PT} \quad \text{Equation (1)}$$

Where:

BE_y	=	Baseline emissions in year y (tCO_2)
0.9	=	Net-to-gross adjustment factor to account for 'walking' in the baseline
$N_{bicycles,y}$	=	Number of bicycles trips travelling through the bicycle infrastructure in year y
$N_{bicycles,BL}$	=	Number of bicycle trips travelling through the location of the new bicycle infrastructure prior to implementation of the project activity
$ADT_{u,y}$	=	Average distance travelled per trip by the user *u* of the infrastructure in year y (km)
$EF_{BL,PT}$	=	Weighted average CO_2 emission factor per passenger-kilometer corresponding to public transportation-mix in the city (excluding travels by using passenger cars, motorcycles, and taxis) (tCO_2/pkm), before the implementation of the project, using statistics from the transport authority or credible studies

5.5.4 | **Option 3:** Based on a survey of users of e-bikes, e-scooters and users of bicycle sharing programmes.

a. This option is applicable to Type 3, Type 4, and Type 7, 9, 10, 11 (i.e., introduction of e-bikes or e-scooters).

b. Under this option, the baseline emission factor is determined through a survey of users of e-bike or e-scooter promotion programmes or bicycle sharing programmes ($EF_{BL,CO2,survey}$) and the distance travelled will be monitored for each user of the programmes ($DT_{u,y}$).

c. Baseline emissions are determined through the equation below:

$$BE_y = EF_{BL,CO2} \times \sum DT_{u,y} \qquad \text{Equation (2)}$$

Where,

BE_y	=	Baseline emissions in year y (tCO2)
DTu,y	=	Total distance travelled by the individual user *u* of the bicycle sharing programme and/or of the promoted e-bikes or e-scooters in year y (pkm)
$EF_{BL,CO2}$	=	Weighted average CO2 emission factor per passenger-kilometer (all modes private and public) based on survey conducted with users of e-bike or e-scooter promotion programmes or bicycle sharing programmes (tCO2/pkm)

5.5.5 | **Option 4:** Based on recent national household travel surveys of not more than three years predating the date of calculations matched to operator GPS results

a. This option is applicable to Type 7, 9, 10, 11 projects (i.e., introduction of e-bikes or e-scooters).

b. Under this option, a baseline emission factor is determined through direct data analysis of an operator trip databases reflecting trips and distances recorded via GPS for any period of calculation, resulting in the total mileage travelled by the users of e-bike or e-scooter promotion programmes or bicycle sharing programmes ($DT_{u,y}$).

c. An Emission Factor will be established for all modes of transport replaced by trips made by users of e-bike or e scooter, or bicycle sharing programmes, based on publicly available emissions statistics, defining the make-up of baseline fleets, for all Other Modes of Transport replaced ($EF_{BLOMT,CO2}$)

d. The Mode Switch factor for each Other Mode of Transport replaced (MS) will be established based on academic literature reviews and user surveys conducted in the year of calculating the emission reductions in percentage (%) terms for each Mode of Transport replaced as *MS%.*

e. Baseline emissions are determined through the equation below for each Mode of Transport replaced, as Addends individually and in aggregate:

$$BE_y = \sum (\mathrm{DT_{u,y}\ x\ MS\%})\ (\mathrm{EF_{BLOMT,CO2}}) \qquad \text{Equation (3)}$$

Where:

BE_y	=	Baseline emissions in year y for all replaced Modes of Transport (tCO_2)

$DT_{u,y}$ = Total distance travelled by the individual user u of the bicycle sharing programme and/or of the promoted e-bikes or e-scooters in year y (pkm)

$EF_{BLOMT,CO2}$ = CO_2 emission factor per passenger-kilometer (for each Other Mode of Transport, private and public) based on official statistics.

$MS\%$ = Percentage of mileage of replaced Modes of Transport by the bicycle sharing programme and/or the promoted e-bikes or e-scooters, per Other Mode of Transport.

5.6 | Additional baseline emission reduction (project impact emission reductions)

5.6.1 | Project impact emission reductions are the reduced emissions resulting from transportation of passengers by Project Activity modes, including bicycles, e-Bikes, and e Scooters, as compared to transport modes that were used prior to the implementation of the Project Activity. It is based on a variation of travel taken by baseline modes of transport (relevant travel modes) that the project activity users would have used in the absence of the project activity. One or both options below shall be applied for calculating the additional baseline emission reductions.

5.6.2 | **Option 5:** (additional baseline emission reduction): Based on the project impact noted under para 5.3.1 |, where an increase in public transport participation results from improved access provided by micro mobility transport options.

a. This option is applicable to Type 7, 9, 10, 11 projects (i.e., introduction of e-bikes or e-scooters).

b. Under this option, additional Baseline Emission Reduction (BE_{ya}) is determined as follows:

i. The trip distance travelled by PT in the area of deployment will be identified from recent public statistics, such as national Household Travel Surveys, to define the total PT trip distance for PT users during the year. ($PT_{u,y}$)

ii. The Mode Switch factor for increased PT trips and participation replacing Other Modes of Transport (MS) will be established based on academic literature reviews and user surveys conducted in the year of calculating the emission reductions in percentage (%) terms for each Other Mode of Transport replaced by PT trips as (MS%)

iii. An adjustment will be made for the number of micromobility vehicles actually deployed in the area calculated under any licensing limitations (VD_{act}), if applicable, as compared to the optimal sustainable Deployable number of micro mobility Vehicles. (VD_{opt}) which is established on the basis of academic

research and modelling, using the most conservative figure as confirmed by the Subject Matter Expert.

iv. An Emission Factor will be established for the measurable increase in Public Transport participation due to the availability of shared micro mobility programmes, to provide first and last mile options to and from public transport (PT) hubs, ($EF_{PT,CO2}$) and replacing Other Modes of Transport emissions ($EF_{BLOMT,CO2}$), based on recent emission statistics produced by national statistics agencies.

c. Additional baseline emission reduction (project impact emissions) is determined through the equation below for each Mode of Transport replaced by PT, as individual Addends, in aggregate:

$$BE_{ya} = (PT_{u,y} \times MS\%) (VD_{act} / VD_{opt}) \times \sum ((EF_{BLOTM,CO2} - EF_{PT,CO2})) \quad \text{Equation(4)}$$

Where:

BE_{ya}	=	Additional baseline emission reduction (project impact emissions) in year y for all replaced modes of transport (tCO_2) caused by the project impact of increased PT participation
$PT_{u,y}$	=	Total distance travelled by PT users in year y (pkm)
$EF_{BLOMT,CO2}$	=	CO_2 emission factor per passenger-kilometer (by each Other mode of Transport, private and public) based on official statistics.
EF_{PT},CO_2	=	Percentage of increase in PT trips compared to Other Modes of Transport
$MS\%$	=	Percentage of increase in PT trips compared to Other Modes of Transport
VD_{act}	=	Actual number of micro mobility vehicles deployed
VD_{opt}	=	Optimal number of micro mobility vehicles deployed

5.6.3 | **Option 6** (additional baseline emission reduction): Based on the project impact noted under section 5.3.2, where a decrease in car ownership results from improved access provided by micro mobility transport options.

a. This option is applicable to Type 7, 9, 10, 11 projects (i.e., introduction of e-bikes or e-scooters).

b. Under this option, additional Baseline Emission factor (BE_{yb}) is determined as follows:

i. The total Internal Combustion Engine (ICE) fleet number is sourced from government statistics and industry associations. ($VICE_{u,y}$)

ii. The total annual ICE fleet increase is sourced from government statistics and industry associations, in percentage terms. ($VICE\%$)

iii. Total ICE fleet ($VICE_{u,y}$) and percentage increase ($VICE\%$) are calculated for the area of the project deployment based on national population statistics, including personal light vehicle/ ICE per population basis.

iv. The percentage of car ownership reduction ($ICERED\%$) and avoided ICE procurement ($ICEAV\%$) are established on the basis of user surveys and academic literature findings, and these percentages are verified by an independent Subject Matter Expert to determine the most conservative percentages and the average between upper and lower bounds.

v. An average lifespan LCA based emission is calculated for both ICE (ICE_{lca}) and micro mobility vehicles (DV_{lca}), using LCA results reported in academic literature with adjustments for local conditions including fleet age, engine sizes, vehicle mass, travel behaviors and trip distributions, among others. LCA results are verified by an independent Subject Matter Expert.

vi. The difference between the Minuend (ICE_{lca}) and the Subtrahend (DV_{lca}) is calculated for the total number of ICE vehicles reduced and ICE avoided, reduced to an annual basis from the total lifespan assumed age of 15 years.

vii. An adjustment will be made for the number of micro mobility Vehicles actually deployed in the area calculated under any licensing limitations (VD_{act}), if applicable, as compared to the optimal sustainable Deployable number of micro mobility vehicles. (VD_{opt}), which is established on the basis of academic research and modelling, using the most conservative figure as confirmed by the Subject Matter Expert.

viii. A further adjustment is made for the total number of switchable trips possible from ICE. The number of switchable trips is delimited by the average distance for each class of micro mobility vehicles calculated against recent public travel statistics for the area of deployment being calculated ($MS\%$)

ix. A further adjustment is made for the total number of ICE trips sourced from public recent travel statistics for the area of deployment being calculated ($ICE\%$)

c. Additional baseline emission reduction (Project Impact emissions) is determined through the equation below:

$$BE_{yb} = [(VICE_{u,y}) \times (ICERED\%) \times \{(ICE_{lca})\text{-}(DV_{lca})\}] + \{(VICE_{u,y}) \times (VICE\%) \times (ICEAV\%)\} \times \{(ICE_{lca})\text{-}(DV_{lca})\} \times \{(VD_{act})/ (VD_{opt})\} \times (MS\%) \times (ICE\%)$$

Equation (5)

Where:

BE_{yb}	=	Additional baseline emission reduction (Project Impact emissions) in year y for all replaced Modes of Transport (tCO_2) caused by the Project Impact of reduced car (ICE) ownership.
$VICE_{u,y}$	=	Total number of ICE in area of calculation.
$ICERED\%$	=	Average ICE ownership reduction factor.
ICE_{lca}	=	Lifespan GHG emissions footprint for ICE
DV_{lca}	=	Lifespan GHG emissions footprint for micro mobility vehicle
$VICE\%$	=	Annual rate of increase in ICE purchases
$ICEAV\%$	=	Average ICE purchase avoidance factor
VD_{act}	=	Actual number of Micro mobility vehicles deployed
VD_{opt}	=	Optimal number of Micro mobility vehicles deployable
$MS\%$	=	Switchable trips population for particular micro mobility vehicles class
$ICE\%$	=	Number of ICE trips as a percentage of total household trips

5.7 | Project emissions

5.7.1 | Project emissions are determined based on the amount of electricity consumed to recharge the batteries of e-bikes e-scooters or e-tricycles ($EC_{PJ,y}$) and associated infrastructure to capture both direct and indirect fuel emission components, using Equation (1) from TOOL 05, unless recharging by renewable energy is certified and ascertained at any confirmed percentage of the energy mix used.

5.7.2 | The electricity consumed to recharge the batteries ($EC_{PJ,y}$) may be determined:[4]

[4] Project proponents are encouraged to submit additional proposals through a request for revision of the methodology.

a) By directly measuring the electricity consumed by all e-bikes, e-scooters or e-tricycles included in the project; or

b) Alternatively, at a zero-rate based on renewable energy certification in the manner prescribed in para 5.1.1 – 5.1.4.

c) Alternatively, assuming a default consumption of 0.015 kWh/km[5] travelled. In this situation, the electricity consumed is determined according to the equation below:[6]

$$EC_{PJ,y} = 0.015 \times \sum DT_{u,y} \qquad \text{Equation (6)}$$

Where:

$EC_{PJ,y}$	=	Quantity of electricity consumed to recharge the batteries of e-bikes, e-scooters, or e-tricycles in year y (kWh)
$DT_{u,y}$	=	Total distance travelled by the individual user u of the bicycle sharing programme and/or of the promoted e-bikes e-scooters or e-tricycles in year y (km)

5.8 | Leakage

5.8.1 | Leakage does not have to be taken into account.

5.9 | Emission Reductions

5.9.1 | Emission reductions are calculated as follows:

$$BE_{y(\text{total})} = \text{BE}_{\text{Y}} + \text{BE}_{\text{YA}} + \text{BE}_{\text{YB}} \qquad \text{Equation (7)}$$

$$ER_{y(\text{total})} = \text{BE}_{\text{Y(total)}} + \text{PE}_{\text{Y}} \qquad \text{Equation (8)}$$

Where:

$BE_{y(\text{total})}$	=	Total baseline emissions in year y (tCO_2)
BE_y	=	Baseline emissions in year y (tCO_2)
$ER_{y(\text{total})}$	=	Emission reductions in year y (tCO_2)
PE_y	=	Project Emissions in year y (tCO_2)

[5] This parameter depends on a number of factors, such as terrain, level of assistance from batteries to offset pedaling set by the cyclist, weight of the cyclist, weight of the bicycle, outside temperature, direction and speed of the wind, type of battery, efficiency of the motor. Typically, a standard 36V and 10Ah e- bike consumes between 7.5 – 15 Wh/km.
[6] For projects developed under Option 1, DTu,y is determined following the provisions from 5.5.2(e).

BE_{YA}	=	Additional baseline emission reduction (project impact emissions) in year y for all replaced Modes of Transport (tCO_2) caused by the Project Impact of increased PT participation.
BE_{YB}	=	Additional baseline emission reduction (Project Impact emissions) in year y for all replaced Modes of Transport (tCO_2) caused by the Project Impact of reduced car (ICE) ownership.

5.10 | Changes required for methodology implementation in 2nd and 3rd crediting periods

5.10.1 | Project participants shall apply the latest approved version of the methodological tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (TOOL 11).

5.11 | Data and parameters not monitored

5.11.1 | In addition to the parameters listed in the tables below, the provisions on data and parameters not monitored in the tools referred to in this methodology apply.

Data/parameter ID	TWPT 1
Data / Parameter:	$EF_{BL,PT}$
Data unit:	tCO_2 /pkm
Description:	Weighted average CO_2 emission factor per passenger-kilometer corresponding to public transportation-mix in the city (excluding travels using passenger cars, motorcycles, and taxis)
Source of data:	Official statistics from the transport authority or published studies conducted by a third party
Measurement procedures(if any):	-
Any comment:	Steps 1 to 3 of the methodological tool TOOL18 may be applied to complement existing data. If the data from the statistics or from the studies only allow the determination of the activity levels in terms of pkm (passenger- kilometer), a conservative default value of 50 gCO_2/pkm for buses and 0.1 kWh/pkm for metro can be used (both values based on the performance analysis benchmarks from ACM0016).

	If the average CO_2 emission factor per passenger-kilometer determined is significantly higher than 50 gCO_2/pkm for buses and 0.1 kWh/pkm for metro, these values shall be further justified in accordance with the guidance in section 4.7 "Data and parameters" of the "General guidelines for SSC CDM methodologies"

Data/parameter ID	TWPT 2
Data / Parameter:	$N_{bicycles,BL}$
Data unit:	Number of bicycle trips
Description:	Number of bicycle trips travelling through the location of the new bicycle infrastructure (Type 1 or Type 2) or parked in the area of influence e.g., surroundings of new bicycle parking area within a defined radius of 10 km for bicycles the (Type 5 or Type 6) prior to implementation of the project activity in a year
Source of data:	Measured directly and/or based on a sample basis
Measurement procedures(if any):	In direct measurement method, this parameter is determined through sensors installed in the location that counts the number of bicycles riding in the lane or the number of bicycles parked in the parking area. In a sampling-based method, visual counting methods or camera- based methods may also be applied. Any sampling-based methods shall be in accordance with the standard "Sampling and surveys for CDM project activities and programme of activities"
Any comment:	-

Data/parameter ID	TWPT 3
Data / Parameter:	$EF_{BL,CO2}$
Data unit:	tCO_2/pkm
Description:	Weighted average CO_2 emission factor per passenger-kilometer in the baseline
Source of data:	Survey with users of e-bike or e-scooter promotion programmes and bicycle sharing programmes
Measurement procedures(if any):	The survey's questionnaire shall be designed to determine the users travel modes (all modes private and public) and trip length prior to the project activity in terms of average emissions per passenger-kilometer (gCO_2/pkm). Sampling shall be in accordance with the standard "Sampling and surveys for CDM project activities and programme of activities".

	The survey shall be conducted in the year 1 and optionally in the year 4 of the crediting period
Any comment:	The emission factor is determined by applying Steps 1 to 3 from the latest approved version of the methodological tool TOOL18, using parameters estimated based on data collected during the survey. The vehicle categories index i indicated in Step 1 of the tool shall be included, and "cycling" and "walking" should be considered as a potential baseline mode. If some vehicle categories are not explicitly identified or do not fit into the categories from the tool, they should be included in the survey as "others" and baseline emissions of this category are counted as zero. Average CO_2 emission factor per passenger-kilometer in the baseline determined through the survey as above shall be cross checked with values of typical share of travel modes and trip length reported in literature (e.g., published reports, studies pertaining to the project region). If local studies are not available, values reported in Appendix 5 of the "Manual for Calculating Greenhouse Gas Benefits of Global Environment Facility Transportation Projects" prepared by the ITDP and available at Manual for Calculating GHG Benefits of GEF Transportation Projects | GEF (thegef.org) may be used for cross-checking.[7] If the mode shares and trip length determined through the survey is conservative or comparable to literature values, no further action is required, otherwise project proponent shall demonstrate that the outcomes of the survey are representative and reliable, explaining the factors that lead to differences (e.g. based on sample based checks of evidences such as fuel receipts of cars, or travel tickets for bus or metro)

6| MONITORING METHODOLOGY

6.1 | Data and parameters monitored

6.1.1 | The monitoring methodology will require the monitoring of different parameters depending on the approach selected to calculate the baseline emissions:

[7] Literature values are not a substitute for surveys and are only used for cross check purposes.

a) If the project participants decide to calculate baseline emissions based on section 5.5.2, the relevant parameters indicated in TOOL18 shall be measured for years 1 and optionally on year 4 of the crediting period. In doing so, the guideline "Sampling and surveys for CDM project activities and programmes of activities" shall be followed;

b) For the other options, the monitored parameters are indicated in the tables below.

6.1.2 | In addition to the parameters listed in the tables below, the provisions on data and parameters monitored in the tools referred to in this methodology apply.

Data/parameter ID	TWPT 4
Data / Parameter:	$ADT_{u,y}$
Data unit:	Km
Description:	Average distance travelled per trip by the user u of the infrastructure that would not have used the bicycle or e-bike or e-scooter in the absence of the project in year y
Source of data:	Estimated via survey of the users of the infrastructure; or Directly measured via GPS; or As a conservative approach, the average trip distance can be assumed as 2.5 km for bicycles and 5 km for e-bikes or e-scooters
Measurement procedures(if any):	The survey shall be conducted with a representative sample of users of the bicycle lanes or bicycles/e-scooter parking areas, following the standard "Sampling and surveys for CDM project activities and programme of activities"
Monitoring Frequency:	The survey shall be conducted in the year 1 and optionally in the year 4 of the crediting period
QA/QC procedures:	Average distance travelled per trip by the user u when determined through a survey shall be cross checked with values of travel modes and trip length reported in literature (e.g., published reports, studies pertaining to the project region). If local studies are not available, values reported in Appendix 5 of the "Manual for Calculating Greenhouse Gas Benefits of Global Environment Facility Transportation Projects" prepared by the ITDP and available at Manual for Calculating GHG Benefits of GEF Transportation Projects | GEF (thegef.org) may be used for cross-

	checking.[8] If the other comparative transport mode shares and trip lengths measuring theoretical replacement of distances as a basis for calculating the emissions reductions determined through the survey are conservative or comparable to literature values no further action is required, otherwise project proponent shall demonstrate that the outcome of the survey is representative and reliable explaining the factors that lead to differences (e.g. based on sample based checks of evidences such as fuel receipts of cars or travel tickets for bus or metro)
Any comment:	-

Data/parameter ID	TWPT 5
Data / Parameter:	$N_{bicycles,y}$
Data unit:	Number of bicycles trips
Description:	Number of bicycles trips travelling through the bicycle infrastructure in year y or parked in the bicycle parking area
Source of data:	Measured and recorded directly and/or based on a sample basis
Measurement procedures(if any):	In direct recording method, this parameter is determined through sensors installed in the location that counts the number of bicycles riding in the lane or the number of bicycles parked in the parking area. In a sampling-based method, visual counting methods or camera- based methods may also be applied. Any sampling-based methods shall be in accordance with the standard "Sampling and surveys for CDM project activities and programme of activities"
Monitoring Frequency:	Measured continuously and consolidated daily if direct measurement methods are used
QA/QC procedures:	-
Any comment:	-

[8] Literature values are not a substitute for surveys and are only used for cross check purposes.

Data/parameter ID	TWPT 6
Data / Parameter:	$DT_{u,y}$
Data unit:	Km
Description:	Total distance travelled by the individual user u of the e-bike promotion programme, e-scooters or bicycle sharing programme in year y
Source of data:	For programmes that promoted e-bikes or e-scooters, data shall be sourced from mobile apps that record the distance travelled based on GPS. For bicycle sharing programmes, data shall be sourced from mobile apps that record the distance travelled based on GPS or from sensors installed in bicycles. For bicycle sharing programmes using docking spaces, if the data for (b) are not available, then trip distance may be conservatively assumed as the straight distance between the check-out and check-in docking spaces of the trip
Measurement procedures(if any):	a) When using mobile apps, the user shall turn on the app when starting the travel and turn off when the travel finishes; b) When using sensors, the distance travelled shall be continuously measured
Monitoring Frequency:	The parameter shall be measured while travelling. The values shall be aggregated monthly for each individual user *u*
QA/QC procedures:	A unique identification number shall be assigned to each user at the time of registering with the e-bike, e-scooter or bicycle sharing programme. The manager of the programme shall implement measures to link the distance travelled by each of the users to its unique identification number. The records shall be made in a centralised database that allows the project proponent to have access to the information related to the users' travels
Any comment:	Data shall be controlled for outliers, e.g., trips with travel distances longer than three standard deviations above the mean shall be excluded

Data/Parameter ID	TWPT 7
Data/parameter ID	$EC_{PJ,y}$
Data unit:	kWh

Description:	Quantity of electricity consumed to recharge the batteries of e-bikes, e-scooters or e-tricycles in year y
Source of data:	Continuous measurements
Measurement procedures(if any):	As per the latest version of the methodological tool TOOL05. When applying the tool, requirements for $EG_{PJ,grid,y}$ and/or $EG_{PJ,j,y}$ specified in the tool should apply to electricity consumed from the grid and electricity consumed from the captive power plant, or alternatively certified as rated zero emissions and fully renewably sourced, whichever applicable
Monitoring Frequency:	As per the methodological tool TOOL05
QA/QC procedures:	As per the methodological tool TOOL05
Any comment:	If this parameter is determined through section 5.7.2(c) above, only the parameter "Total distance travelled by the individual user *u* of the infrastructure and/or of the promoted e-bikes or e-scooters in year y" ($DT_{u,y}$) needs to be monitored.[9]

7| SAFEGUARDS

7.1.1 | The project shall not undermine or conflict with any national, sub-national or local regulations or guidance for e-mobility. The project shall document the national, regional, and local regulatory framework for provision of the type of mobility the project provides in the project boundary.

[9] For projects developed under Option 1, DTu,y is determined following the provisions from paragraph 5.5.2(e).

DOCUMENT HISTORY

Version	Date	Description
1.0	13 January 2023	Initial adoption