# BIKES FOR THE PLANET - BRAZIL

## Monitoring report for the period 18-Dec-2018 to 26-Jan-2021

Document Prepared by ZSCORE S.A.

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# 1 PROJECT DETAILS

## 1.1 Summary Description of the Implementation Status of the Project

The primary objective of "*Bikes for the Planet Brazil*" project (the "Project" or "Bikes4PlanetBR") is to promote alternative mobility with the following technologies and/or measures:

> construction of new and/or expansion of existing bicycle lanes, bicycle sharing programs (through dockless bicycles or sharing stations), bicycle parking areas, introduction of e-bikes or tricycles, and/or implementation of new and/or expansion of existing passenger transportation services based on tricycles in different locations throughout Brazil.

Urban centres face many problems related to transport and traffic. Enhancing low-carbon two and three-wheeled mobility while reducing congestion and pollution has the potential to be a key solution for a cleaner and healthier urban life. In Brazil, the greenhouse gas (GHG) emissions from transportation represent 46% of emissions from the energy sector[1]. In this context, the strategic plan for Brazil's Nationally Determined Contribution (NDC) establishes 4.9 $MtCO_2e$ reduction target for transportation[2] in line with the Paris Agreement approved on September 21st, 2016, by the government. Brazil has committed to reduce emissions by 1.3 $GtCO_2e$ in 2025 and 1.2 $GtCO_2e$ by 2030, corresponding to 37% and 43% reduction based on 2005 levels[3].

The Project emerges as a contribution for pursuing the goals proposed by the government, and is developed as a grouped project within the Brazilian boundaries. Thus, the expansion of a project activity after project validation is allowed and each project activity instance shall follow the program eligibility criteria for its inclusion.

In the absence of the program, the baseline scenario is the continuation of the existing transportation modes.

The Project implementation results in avoided negative environmental impacts and may contribute to better mobility and, consequently, in better quality of life as it:

- Reduces demand on fossil fuel-based vehicles.
- Reduces traffic in rush hour and increases the offer on non-motorized options.
- Reduces GHG emissions (is GHG emission free) and improves air quality.

[1] WRI Brasil (2017). *A estratégia do Brasil na área de transportes para colocar em prática o Acordo de Paris.* Retrieved from http://bit.ly/2Dugqf7 (access on 15/Jun/2021).

[2] "… in the transportation sector, further promote efficiency measures, and improve infrastructure for transport and public transportation in urban areas" (source: Federative Republic of Brazil Intended Nationally Determined Contributions Towards Achieving the Objective of the United Nations Framework Convention on Climate Change).

[3] UNFCCC's INDCs as communicated by Parties; Brazilian INDC submitted on 28/Sep/2015; retrieved from http://bit.ly/2DuU6C0 (access on 23/Jan/2019).

Although the Project does not have alone a major impact in the Host Country in terms of GHG emission reductions given its mobility restrictions (few or non-existent cycle routes connected to public transportation, climate, physical conditioning, etc.), it is part of a greater idea. The program contributes to sustainable development since it reduces fossil fuel consumption, traffic congestion, GHG emissions and other air pollutants as well as increases well-being. Therefore, it meets the needs of the present without compromising the ability of future generations to meet their own needs, as defined by the Brundtland Commission (1987).

An annual average and total GHG emission reductions and removals depends on the number of instances added to the grouped project. The first two project instances (Grow and Tembici) occur in the metropolitan area of the city of Sao Paulo. The project instance 2 (implemented by Grow) has interrupted its operations and is no longer considered in the grouped project. The activity instance included in the grouped project is the bicycle sharing program operated in the metropolitan region of the city of Rio de Janeiro.

The emission reduction project starting date for the grouped project (also applicable to instance 1) is 30-Jan-2018, when the first bike sharing stations of instance 1 were made available to the public. For project instance 3, starting date is 16-Feb-2018, also when the first stations were made available to the public. Instances 1 and 3 were fully operational in this monitoring period.

In this monitoring period, instance 1 (in São Paulo) achieved 10,348,410 km ridden and, 488 tCO2e emission reductions, and, instance 3 (Rio de Janeiro) achieved 35,105,816 km ridden and, emissions reductions of 1,821 tCO2e.

Total grouped project generated GHG emission reductions of 2,309 tCO2e in this monitoring period.

## 1.2 Sectoral Scope and Project Type

“Bikes for the Planet Brazil” (or Bikes4PlanetBR) is a grouped project.

Sectoral scope 7: Transport as established by the Clean Development Mechanism (CDM).

Methodologies approved under CDM are applicable under the Voluntary Carbon Standard (VCS) as stated at http://verra.org/methodologies/.

## 1.3 Project Proponent

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## 1.4 Other Entities Involved in the Project

Not applicable.

Once there are no other entities involved in the preparation of the Project.

## 1.5 Project Start Date

According to the Program Definitions: VCS Standard, version 4, the project start date of a non-AFOLU project is the "date on which the project began generating GHG emission reductions or removals".

Therefore, the emission reduction project starting date for the grouped project (also applicable to instance 1) is 30-Jan-2018, when the first official[4] bike sharing stations were made available to the public and started operation under the first project activity instance (first official registered bike rental on 30-Jan-2018 at 7h13min). For project instance 3 starting date is 16-Feb-2018, also when the first stations were made available to the public.

## 1.6 Project Crediting Period

The Project will have a maximum of 10 years of crediting period as follows:

- Crediting period start, 30-Jan-2018
- Crediting period end, 29-Jan-2028

## 1.7 Project Location

Bikes4PlanetBR implementation occurs within the geographical area of Brazil (KML file as validated and registered under VERRA).

The project instances included in the grouped project occur in the metropolitan area of the cities of Sao Paulo and Rio de Janeiro (KML file valid for both project instances supplied during the validation and request for registration processes).

Geodetic coordinates will be provided individually for each additional project instance included in the grouped project.

All project activity instances will be implemented taking into consideration applicable national, regional and/or sectoral policies and regulations.

[4] Field operations started on 27 January 2018 and run-in test mode for three days, up to 29-January-2018. Official operation started on 30 January 2018, which is the project start date.

## 1.8 Title and Reference of Methodology

CDM Small-scale methodology AMS-III.BM, "lightweight two and three-wheeled personal transportation", version 01.0.

The methodology also refers to the following tools:

- CDM TOOL05 - Methodological tool - Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation, version 03.0.
- CDM TOOL11 - Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period, version 03.0.1.
- CDM TOOL18 - Methodological tool - Baseline emissions for modal shift measures in urban passenger transport, version 01.0.
- CDM TOOL19 - Methodological tool – Demonstration of additionality of microscale project activities, version 09.0.
- CDM TOOL21 - Demonstration of additionality of small-scale project activities, version 13.1.
- CDM TOOL23 - Additionality of first-of-its-kind project activities, version 03.0.

## 1.9 Participation under other GHG Programs

The project submitted on 18-Jul-2018 a "prior consideration" of the Clean Development Mechanism (CDM)[5], but by November 2019 has not been registered, or is seeking registration under the CDM or any GHG programs other than the VCS.

## 1.10 Other Forms of Credit

Not applicable as possible GHG emission from the proposed Project are not included in any emission trading program or any other mechanism that includes GHG allowance trading. Also, the Project did not and is not seeking or receiving another form of GHG-related environmental credits.

## 1.11 Sustainable Development

The program contributes to sustainable development since it reduces fossil fuel consumption, traffic congestion, GHG emissions and other air pollutants as well as increases healthier habits and well-being.

With respect to nationally stated sustainable development priorities, examples on how the project contributes to achieving nationally stated sustainable development priorities:

1. In the first Brazilian NDC submission[6] one reads, "*Brazil intends to adopt further measures that are consistent with the 2°C temperature goal, in particular… vi) in the transportation*

[5] See https://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html (access on 4-Nov-2019).

[6] Brazil, Federative Republic of (2015). Intended Nationally Determined Contribution to UNFCCC.

*sector, further promote efficiency measures, and improve infrastructure for transport and public transportation in urban areas."*

2. In 2021 the Brazilian Ministry of Regional Development presented the *Bicycle Brazil Seal*[7], created to promote more sustainable urban mobility and recognize good practices encouraging the use of bicycles, and officially released a six-publication series on "Low Carbon Urban Mobility," co-authored by the Interamerican Development Bank and the National Secretary of Mobility and Regional Urban Development[8], including one specific on Bicycle Mobility[9].

# 2 SAFEGUARDS

## 2.1 No Net Harm

The Project considers riding bikes on urban environments, an initiative with overwhelmingly positive impacts aligned with some of the UN Sustainable Development Goals, namely, good health and well-being, gender equality, reduced inequalities, sustainable cities and communities and, climate action and, no relevant negative impact, as described in the Brazilian Ministry of Regional Development publication on Bicycle Mobility[9].

## 2.2 Local Stakeholder Consultation

There are no national or regional requirements for local stakeholder consultation due to the implementation of measure types identified in section 2.2. For that reason, the global public comments carried out in the at the VCS pipeline projects database in April 2019 is also considered as the local stakeholder consultation. This project was up for public comment from 12 April - 12 May 2019 and no comments were received.

Additionally, any new activity or public infrastructure requires license and permits, including the construction or expansion of bicycle lanes and parking areas, which is under municipality management.

Considering that the third project instance was implemented in February 2018, shortly after the first project instance (in January 2018) and has the same implementation and operation characteristics and structure presented at the global stakeholder consultation, it is reasonable to assume that the held stakeholder consultation applicable to the first instance is also applicable to the third instance. Therefore, no local stakeholder consultation was held prior to validation and the installment of the third project instance.

[7] Brazilian Ministry of Regional Development (2021). Mobilidade Urbana – Ministério do Desenvolvimento Regional Apresenta o Selo Bicicleta Brasil (URL: https://www.gov.br/pt-br/noticias/transito-e-transportes/2021/09/ministerio-do-desenvolvimento-regional-apresenta-o-selo-bicicleta-brasil, accessed on 6-Feb-2022).

[8] Mobilidade Urbana de Baixo Carbono (URL: http://mobilidadebaixocarbono.com.br/, accessed on 6-Feb-2022).

[9] BID and MDR (2021). Mobilidade por Bicicleta. Banco Interamericano de Desenvolvimento e Ministério do Desenvolvimento Regional (authors). Global Environment Facility - GEF (funder).

Nevertheless, it worth mentioning that since the operation start of the project instances 1 and 3, there are mechanisms for ongoing communication and consultation with local stakeholders. Specifically for project instance 3:

- The users of the bikes have anytime access to a chat in the app used to unlock the bikes.
- Any stakeholder can communicate and interact anytime through the helpdesk (URL: https://tembicihelp.zendesk.com/hc/pt-br) and the etic channel, accessible on the homepage (https://www.tembici.com.br/) of Tembici (operator of instances 1 and 3) .
- Tembici also regularly follows and respond to any complaints at the publicly available services (e.g., "Reclame Aqui" (https://www.reclameaqui.com.br/) and social networks.

A few examples of interactions and consultations with stakeholders and general public during this monitoring period follow:

- (Oct/2019) – Complaint on 15/Oct/2019, by the profile @cadeiravoadora on Instagram, about the position of a bike station in Rio de Janeiro, supposedly too close to a handicap parking space. After analysis of the case, it was confirmed that the station did not make the parking space unusable, but the station could be moved to make the use of the parking space easier. The station was moved on 17/Oct/2019.
- (Dec/2019, Sep/2020, Sep/2021) Tembici organizes since 2019 the "Summit Tembici", a public event to discuss the future of mobility. In 2019 it happened in São Paulo on December 18[10]. In 2020 and 2021 it took place virtually[11] due to the CoViD19.

### 2.3 AFOLU-Specific Safeguards

Not applicable, once the Project is not an AFOLU project.

# 3 IMPLEMENTATION STATUS

## 3.1 Implementation Status of the Project Activity

The first two project activity instances included in Bikes4PlanetBR grouped project were Tembici and Grow, in the city of São Paulo. The project instance Grow has interrupted its operations and is no longer considered on this grouped project. The activity instance included in the grouped project is a new bicycle sharing program operated in the metropolitan region of the city of Rio de Janeiro.

GROW was a joint venture between "Grin Mobilidade Ltda." and "Yellow Soluções de Mobilidade Ltda." The purpose of the company is to provide alternative means of transport by providing bicycles and

[10] URL: Summit tembici 2019 - https://www.sympla.com.br/summit-tembici----o-futuro-da-mobilidade__701533.

[11] URL: Summit tembici 2020 - https://www.facebook.com/tembici/videos/318822875860610/. Summit tembici 2021 - http://summit.tembici.com.br/.

electric scooters in urban centers in Brazil. Grow is no longer in operation and, therefore, there will be no more credits issuance from this instance.

"Tembici Participações S.A." (Tembici) is a company focused on shared bicycles and e-bicycles with sharing stations throughout the country. However, no e-bicycles were included in this monitoring period. Tembici named its projects based on the name of each municipality where it operates. In the Municipality of São Paulo, Tembici operation is called "Bike Sampa" and the Municipality of Rio de Janeiro, "Bike Rio".

Tembici implements projects like "Bike Sampa" and "Bike Rio" aiming to encourage the bicycle modal in public spaces.

**Table 1 - Instance Summary**

| Project activity instance | Description | Current status | Issuance | |
|---|---|---|---|---|
| | | | Monitoring period | VCUs ($tCO_2e$) |
| 1 | Tembici, Bike Sampa | Operational | 30-Jan-2018 to 17-Dec-2018 | 120 (issued) |
| | | | 18-Dec-2018 to 26-Jan-2021 | 488 (requesting) |
| 2 | Grow, SP | Not Operational | 30-Jan-2018 to 17-Dec-2018 | 120 (issued) |
| 3 | Tembici, Bike Rio | Operational | 18-Dec-2018 to 26-Jan-2021 | 1,821 (requesting) |

## 3.2 Deviations

### 3.2.1 Methodology Deviations

The same deviation already disclosed at project validation is applied, also for the new added instance.

Deviation 1. Option 1 (ex-post survey of baseline travel modes) of AMS-III.BM for the determination of baseline emission. Nevertheless, data from the origin-destination survey carried out by Metrô (in São Paulo) and by the State of Rio de Janeiro Secretary of Transport (in Rio de Janeiro) on transport modes are used.

Project Proponents are aware that the use of the surveys carried out in São Paulo and in Rio de Janeiro is a deviation of the methodology because of three reasons:

1. it is not an ex-post survey (it was carried from 2017 to 2018 in São Paulo and, carried out in 2012 and published in 2014 in Rio de Janeiro),
2. It was not conducted with the users of the infrastructure (it was conducted with all inhabitants of the São Paulo and Rio de Janeiro metropolitan areas), and

3. It does not follow exactly the standard “Sampling and surveys for CDM project activities and programme of activities”.

With respect to methodology deviations, according to the VCS Standard, version 4.0, item 3.17:

> *Projects may deviate from the procedures set out in methodologies in certain cases, where alternative methods may be more efficient for project-specific circumstances, and where the deviation will achieve the same level of accuracy or is more conservative than what is set out in the methodology.*
>
> *Requirements*
>
> *3.17.1 - Deviations from the applied methodology are permitted where they represent a deviation from the criteria and procedures relating to monitoring or measurement set out in the methodology (i.e., deviations are permitted where they relate to data and parameters available at validation, data and parameters monitored, or the monitoring plan).*
>
> *3.17.2 - Methodology deviations shall not negatively impact the conservativeness of the quantification of GHG emission reductions or removals, except where they result in increased accuracy of such quantification. Deviations relating to any other part of the methodology shall not be permitted.*
>
> *3.17.3 - Methodology deviations shall be permitted at validation or verification and their consequences shall be reported in the validation or verification report, as applicable, and all subsequent verification reports. Methodology deviations are not considered to be precedent setting.*

In the project proponent’s opinion, the proposed deviation is more efficient for the project-specific circumstances and will not only achieve at least the same level of accuracy set out in the methodology, but will be likely more conservative because of the following reasons:

- **Project activity instance 1 – Tembici, São Paulo**

1. Metrô carried out the survey (nicknamed OD2017, from the Portuguese “Origem-Destino 2017”) from July 2017 to October 2018, published preliminary results in December 2018 and detailed analysis and data in July 2019. Therefore, considering the project activity instances start date in January - 2018, the project proponents consider the vintage reasonably applicable, because it does not negatively affect the conservativeness of the quantification of GHG emission reductions.
2. The survey OD2017 was conducted with all inhabitants of the RMSP, but the project activity instances concentrate their operation in the city of São Paulo (Center Region of the Metropolitan Area in the survey), in areas with better transportation infrastructure. The results of the survey show that the users of the bicycle-sharing infrastructure - located in the city of São Paulo, will use less zero-emission modes (see table 2, with the share of trips by mode “walking”, “bicycles” and “others” are all below the RMSP average). For that reason, using the population of the RMSP is clearly more conservative than using only the users of the bicycle-share infrastructure and, therefore, the deviation

does not negatively affect the conservativeness of the quantification of GHG emission reductions.

**Table 2 – Daily trips by mode (source: Metrô, 2019[12])**

| Region of origin | subway | railway | bus 1 | bus 2 | minibus | car | taxi | motorcycle | bicycle | walk | other | TOTAL | (%) of the total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Southwest | 65 | 4 | 246 | 9 | 102 | 356 | 3 | 79 | 15 | 510 | 4 | 1,393 | 3.3% |
| | 4.67% | 0.29% | 17.66% | 0.65% | 7.32% | 25.56% | 0.22% | 5.67% | 1.08% | 36.61% | 0.29% | 100.0% | |
| West | 91 | 178 | 645 | 37 | 227 | 1,164 | 22 | 153 | 15 | 1,196 | 10 | 3,738 | 8.9% |
| | 2.43% | 4.76% | 17.26% | 0.99% | 6.07% | 31.14% | 0.59% | 4.09% | 0.40% | 32.00% | 0.27% | 100.0% | |
| North | 27 | 51 | 111 | 4 | 82 | 185 | 2 | 15 | 9 | 329 | 2 | 817 | 1.9% |
| | 3.30% | 6.24% | 13.59% | 0.49% | 10.04% | 22.64% | 0.24% | 1.84% | 1.10% | 40.27% | 0.24% | 100.0% | |
| Northeast | 61 | 21 | 579 | 23 | 170 | 786 | 28 | 62 | 34 | 979 | 14 | 2,757 | 6.6% |
| | 2.21% | 0.76% | 21.00% | 0.83% | 6.17% | 28.51% | 1.02% | 2.25% | 1.23% | 35.51% | 0.51% | 100.0% | |
| East | 74 | 121 | 346 | 32 | 118 | 645 | 19 | 52 | 55 | 996 | 6 | 2,464 | 5.9% |
| | 3.00% | 4.91% | 14.04% | 1.30% | 4.79% | 26.18% | 0.77% | 2.11% | 2.23% | 40.42% | 0.24% | 100.0% | |
| Southeast | 127 | 148 | 875 | 81 | 257 | 1,652 | 48 | 156 | 37 | 1,606 | 10 | 4,997 | 11.9% |
| | 2.54% | 2.96% | 17.51% | 1.62% | 5.14% | 33.06% | 0.96% | 3.12% | 0.74% | 32.14% | 0.20% | 100.0% | |
| Center | 2,955 | 722 | 5,502 | 66 | 1,138 | 6,553 | 346 | 547 | 212 | 7,734 | 66 | 25,841 | 61.5% |
| (City of São Paulo) | 11.44% | 2.79% | 21.29% | 0.26% | 4.40% | 25.36% | 1.34% | 2.12% | 0.82% | 29.93% | 0.26% | 100.0% | |
| TOTAL | 3,400 | 1,245 | 8,304 | 252 | 2,094 | 11,341 | 468 | 1,064 | 377 | 13,350 | 112 | 42,007 | 100.0% |
| TOTAL (%) | 8.09% | 2.96% | 19.77% | 0.60% | 4.98% | 27.00% | 1.11% | 2.53% | 0.90% | 31.78% | 0.27% | 100.0% | |

3. The sampling did not follow exactly the prescription of the standard "Sampling and surveys for CDM project activities and programme of activities". But there is no doubt about the seriousness, quality and accuracy of the surveys regularly carried out by Metrô[13] since 1967[14] and used by the governments of the City and State of Sao Paulo to plan and develop transport sector policies in the RMSP. The most recent edition of the survey, financed by the World Bank, compiled over 150,000 samples and is the most complete diagnosis of transport mode use in a metropolitan area in Brazil. For that reason, the project proponents are confident to state that the deviation does not negatively affect the conservativeness of the quantification of GHG emission reductions.

- **Project activity instance 3 – Tembici, Rio de Janeiro**

1. The State of Rio de Janeiro Secretary of Transport carried out the survey (STRJ, 2014)[15] in the metropolitan area of the City of Rio de Janeiro (RMRio). It is the most recent available survey (carried out in 2012 and published in 2014) for planning purposes published by the Rio de Janeiro public authorities. Considering that the survey was carried out almost 10 years ago, the project proponents used a recent estimation of the transport modals use in the city of Rio de Janeiro (ANTP, 2020; published in 2020, using data from 2018)[16] to confirm the applicability of PDTU2014 in the monitoring period. As it can be seen in Table 3, the figures are not exactly the same, but data from 2012 reasonably and conservatively express the transport modes use estimated in 2018.

[12] Prepared using data from table 48 of Metrô (2019).

[13] Relevant to mention that Metrô as a public company owned by the State of São Paulo.

[14] Surveys carried out in 1967, 1977, 1987, 1997, 2002, 2007, 2012 and the most recent one initiated in 2017 and published in 2019.

[15] STRJ (2014). Plano Diretor de Transporte Urbano da Região Metropolitana do Rio de Janeiro – PDTU2014. Secretaria de Transportes, Governo do Estado do Rio de Janeiro.

[16] ANTP (2020). *Sistema de Informações da Mobilidade Urbana da Associação Nacional de Transportes Público (SIMOB/ANTP) – Relatório Geral 2018.* Maio de 2020.

**Table 3 – Total trips by mode (source: STRJ, 2014)**

| | STRJ (2014) | STRJ (2014) | ANTP (2020) |
|---|---|---|---|
| | trips | % | % |
| Bus | 8,593,000 | 38.21% | 30.86% |
| Minibus | 1,086,000 | 4.83% | |
| Subway (Metro) | 665,000 | 2.96% | 5.14% |
| Rail (CPTM) | 568,000 | 2.53% | |
| Car (private+taxi) | 4,021,000 | 17.88% | 24.18% |
| Motorcycle | 209,000 | 0.93% | 3.72% |
| Bicycle | 546,000 | 2.43% | 2.58% |
| Walking | 6,803,000 | 30.25% | 33.52% |
| total | 22,491,000 | **100.00%** | **100.00%** |

2. The sampling did not follow exactly the prescription of the standard "Sampling and surveys for CDM project activities and programme of activities". But there is no doubt about the seriousness, quality and accuracy of the surveys carried out by the Rio de Janeiro public authorities.

During the verification the following deviation was recognized and, although already applied in the first issuance request, it was not explicitly explained.

Deviation 2. Parameter $D_i$ (average trip distance travelled by passengers who shifted from electricity-based or road-based vehicle category i) should be determined at the survey in year 1 and optionally in the year 4 when applying option 1 or continuous when applying option 3. For all instances added up to the present monitoring report, deviation 1 (survey carried out by public authorities instead of ex-post survey of baseline travel modes in year 1 and optionally in year 4 of the first crediting period) is applied. Project proponents could use the average trip travelled passengers who shifted from electricity-base or road-based vehicles in the first project year, but as all included project instances monitor the distances travelled by each and all passengers, the actual annual monitored average trip distance is used.

### 3.2.2 Project Description Deviations

The project instance 2 (implemented by Grow) has interrupted its operations due to financial issues[17]. The deviation does not impact the applicability of the methodology, additionality, or the appropriateness of the baseline scenario, but instance 2 will no longer be considered in the grouped project anymore.

[17] Isto É Dinheiro, 30/07/2020. Pandemia leva startups Grin e Yellow à recuperação judicial (URL: https://www.istoedinheiro.com.br/pandemia-leva-startups-yellow-e-grin-a-recuperacao-judicial/).

## 3.3 Grouped Projects

The new activity instance included in the grouped project is an "AMS-III.BM, type 3" project, a new bicycle sharing program operated in the metropolitan region of the city of Rio de Janeiro.

According to the applicability section of the methodology (AMS-III.BM, version 01.0, Small-scale methodology: Lightweight two and three wheeled personal transportation):

- item 2.1 (scope), paragraph 2, the "methodology applies to project activities the shift the mode of transport of urban passengers to mechanical bikes, tricycles, e-bikes or e-tricycles, by implementing related infrastructure in an urban area such as bicycle lanes, bicycle sharing programs and bicycle parking areas". Therefore, the methodology is applicable to the planned new bicycle sharing program in the metropolitan area of Rio de Janeiro.
- Item 2.2 (applicability), paragraph 3, "implementation of new bicycle sharing program (through dockless bicycles of sharing stations)" is one of the eligible types of project activities (type 3), with applicable baseline calculation "option 1" (ex-post survey of baseline travel modes) or "option 3" (based on a survey of users of e-bikes and users of bicycle sharing programs). Therefore, the methodology is applicable to new bicycle sharing programs in the Metropolitan area of Rio de Janeiro. With respect to the baseline determination, "option 1" will be applied.
- Item 2.2 (applicability), paragraph 4, all lightweight two and three wheeled personal transportation measures implemented in project boundary are considered when determining the baseline. The determination of the baseline is made using a survey carried out in Metropolitan area of Rio de Janeiro, which considered all existing infrastructure and available transportation modes, confirming that all measures lightweight two and three wheeled personal transportation measures implemented in the city of Rio de Janeiro are considered. Therefore, the methodology is applicable to new bicycle sharing programs in the Metropolitan area of Rio de Janeiro.
- Item 2.2 (applicability), paragraph 5, "combination of measures... are also eligible. If multiple measures are implemented, it shall be ensured that any interactive effects between the measures are identified and considered to avoid double-counting." The planned project instances to be included in the grouped project are all "Type 3" measures. Therefore, the methodology is applicable to the new bicycle sharing Project in the Metropolitan area of Rio de Janeiro.
- Item 2.2 (applicability), paragraph 6, "if the project activity involves the construction of on-road bicycle lanes..." The planned project instances to be included in the grouped project are all "type 3" measures (no project activity instance involving construction of on-road bicycle lanes forecasted). Therefore, the methodology is applicable to the new bicycle sharing program in the Metropolitan area of Rio de Janeiro.
- Item 2.2 (applicability), paragraph 7, applicability conditions included in the tools mentioned in AMS-III.BM... also apply".
  - TOOL5 – not used (no emissions are calculated for electricity).
  - TOOL11 – there is no condition for the applicability of the tool.

- TOOL18 – applicable to project activities in urban passenger transport that implement a measure, or a group of measures aimed at a modal shift to urban public transit. The project activity instance aims at a modal shift to bicycle use, and, therefore, it is applicable to the new bicycle sharing program in the metropolitan area of Rio de Janeiro.
- TOOL19 – not used as TOOL21 will be used to demonstrate additionality.
- TOOL21 - Measures are limited to those that result in emission reductions of less than or equal to 60 kt $CO_2$ equivalent annually. Estimated annual net GHG emissions are below 1,000 $tCO_2e$ and, therefore, it is applicable to the new bicycle sharing program in the metropolitan area of Rio de Janeiro.
- TOOL23 – not used as the planned measures are not "first-of-its-kind".
- Standard "Sampling and surveys…" – not used, as Metro's survey is used.

- Item 2.2 (applicability), paragraph 8, "measures are limited to those that result in emission reductions of less than or equal to 60 kt CO2 equivalent annually. Estimated annual net GHG emissions are below 1,000 tCO2e. Therefore, the methodology is applicable to the new bicycle sharing Project in the Metropolitan area of Rio de Janeiro.

Therefore, the methodology is applicable to the planned instance to be included in the grouped project.

According to the registered joint Project Description and Monitoring Report, the eligibility criteria for the inclusion of a new project activity instance is defined using a 5-step procedure, detailed below for project activity instance 3:

1. Meet the applicability conditions set out in the methodology applied to the project

| | |
|---|---|
| The proposed project activity instance follows all applicable requirements described in the registered project description:<br><br>The measure is the implementation of new bicycle sharing program (through dockless bicycles or sharing stations)<br><br>The measure will result in emission reductions of less than or equal to 60 kt $CO_2$ equivalent annually.<br><br>The measure applies the applicability conditions set in the methodological TOOL21 "demonstration of additionality of small-scale project activities", version 13 (see applicability condition 5 below) | ✔ |

2. Use the technologies or measures specified in the project description

| | |
|---|---|
| The proposed project activity instance applies type 3 of as described in the registered project description. (Construction of a new bicycle share program through dockless bicycles or docking stations). | ✔ |

3. Apply the technologies or measures in the same manner as specified in the project description

| | |
|---|---|
| The proposed project activity instance applies type 3 of as described in the registered project description (Construction of new bicycle share program through dockless bicycles or docking stations). | ✔ |

4. Are subject to the baseline scenario determined in the project description for the specified project activity and geographic area

| | |
|---|---|
| The baseline scenario of the proposed project activity instance is the ones presented in the registered project description, i.e., the continuation of the use of the existing modes of transport. | ✔ |

5. Have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area.

| | |
|---|---|
| The proposed project activity instance complies with the criteria set in the methodological TOOL21 "demonstration of additionality of small-scale project activities", version 13: According to paragraph 10 (c), barrier due to prevailing practice. Because there is no exact definition of how exactly to demonstrate the barrier, the project proponents use definitions of two approved CDM tools to demonstrate it; (1) TOOL19, version 9 (Appendix, paragraph 1) use penetration rate of less than five per cent as condition to be considered automatically additional. (2) TOOL32, version 2 use throughout the document a share of less than two per cent to be defined as automatically additional. Considering that bicycles are used as transport mode in less than 3% of the trips in Rio de Janeiro, 2.4% to be more precise (see Table 7), it seems more than reasonable to consider that a barrier due to the prevailing practice is demonstrated. | ✔ |

# 4 DATA AND PARAMETERS

## 4.1 Data and Parameters Available at Validation

From AMS-III.BM - lightweight two and three-wheeled personal transportation

**Table 1**

| Data / Parameter | $EF_{BL,benchmark}$ |
|---|---|
| Data unit | $tCO_2$/pkm |
| Description | Average $CO_2$ emission factor per passenger-kilometre corresponding to public transportation-mix in the city (excluding travels using passenger cars, and taxis) |

| | |
|---|---|
| Source of data | Official statistics from the transport authority or published studies conducted by a third party |
| Value applied: | It depends on the option used for the determination of the baseline emissions of the additional instance of the project activity. The parameter will be used when applying option 2 of the methodology for the determination of the baseline emissions.<br>Not applicable here as the example project will apply option 1. |
| Justification of choice of data or description of measurement methods and procedures applied | Steps 1 to 3 of the methodological tool "Baseline emissions for modal shift measures in urban passenger transport" (TOOL18) may be applied to complement existing data.<br>If the data from the statistics or from the studies only allow the determination of the activity levels in terms of pkm (passenger-kilometre), 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).<br>If the average $CO_2$ emission factor per passenger-kilometre determined is significantly higher than 50 gCO2/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" |
| Purpose of Data | Calculation of baseline emissions |
| Comments | Parameter used when applying option 2 of the methodology. |

Table 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 influence area e.g., surroundings of new bicycle parking area 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 |
| Value applied: | It depends on the option used for the determination of the baseline emissions of the additional instance of the project activity. The parameter will be used when applying option 2 of the methodology for the determination of the baseline emissions.<br>Not applicable here as the example project will apply option 1. |

| | |
|---|---|
| Justification of choice of data or description of measurement methods and procedures applied | In the 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.<br>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" (appendix B). |
| Purpose of Data | Calculation of baseline emissions |
| Comments | Parameter used when applying Option 2 of the methodology. |

Table 3

| | |
|---|---|
| Data / Parameter | $EF_{BL,CO2,survey}$ |
| Data unit | $tCO_2/pkm$ |
| Description | Average $CO_2$ emission factor per passenger-kilometre in the baseline |
| Source of data | Survey with users of e-bike promotion programs and bicycle sharing programs |
| Value applied: | It depends on the option used for the determination of the baseline emissions of the additional instance of the project activity. The parameter will be used when applying option 3 of the methodology for the determination of the baseline emissions.<br>Not applicable here as the example project will apply option 1. |
| Justification of choice of data or description of measurement methods and procedures applied | The survey's questionnaire shall be designed to determine the users travel modes and trip length prior to the project activity in terms of average emissions per passenger-kilometre ($gCO_2/pkm$).<br>Sampling shall be in accordance with the standard "Sampling and surveys for CDM project activities and programme of activities" (appendix B). The survey shall be conducted in the year 1 and optionally in the year 4 of the crediting period |
| Purpose of Data | Calculation of baseline emissions |
| Comments | Parameter used when applying Option 3 of the methodology. |

| | |
|---|---|
| | The emission factor is determined by applying Steps 1 to 3 from the latest approved version of the methodological tool "Baseline emissions for modal shift measures in urban passenger transport", using parameters estimated based on data collected during the survey. See description of the procedure in paragraph I.5 (Establishment and description of baseline scenario).<br><br>Average $CO_2$ emission factor per passenger-kilometre 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 <https://www.thegef.org/publications/manual-calculating-ghg-benefits-gef-transportation-projects> may be used for cross-checking. 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 evidence such as fuel receipts of cars, or travel tickets for bus or metro). |

From TOOL18 - Methodological tool - Baseline emissions for modal shift measures in urban passenger transport.

Table 4

| | |
|---|---|
| Data / Parameter | $SFC_{i,n,x}$ |
| Data unit | Mass or volume units of fuel/km |
| Description | Specific fuel consumption of vehicle category *i* using fuel type *n* in year *x* |
| Source of data | In decreasing order of preference:<br>1. Local measured data (studies, e.g., performed by universities, other institutions or ordered by project proponent).<br>2. National or international data from studies.<br>3. IPCC default values for the respective vehicle categories (latest IPCC report)<br>4. Design data for relevant vehicle categories<br>5. Globally applicable default values |

| | |
|---|---|
| **Value applied** | Values applied with references/sources disclosed in the ER calculation spreadsheet, submitted as annex. |
| **Justification of choice of data or description of measurement methods and procedures applied** | The following alternatives are proposed to determine specific fuel consumption (in order of preference). In case one of the alternatives does not provide required values for all categories, the combination of these alternatives can be used and justification for the use of combination should be provided.<br><br>**Alternative 1:** Measurement of fuel consumption data using total data (if available e.g., from bus or taxi companies) or a representative sample for the respective category and fuel type. Sampling per category and fuel should include, as core characteristics, vehicle age and motorization to ensure that the sample is as close as possible to the actual vehicle composition in the urban area(s) of the region for which the baseline is established. Vehicle age and technology (related often to emission standards such as Euro standards) are factors, which influence to a significant extent the fuel consumption. To be conservative, specific fuel consumptions based on samples shall be based on the lower limit of the uncertainty band at a 95 per cent confidence level.<br><br>**Alternative 2:** Use of fixed values based on national or international literature. The literature data can either be based on measurements of similar vehicles in comparable surroundings (e.g., from comparable cities of other countries) or may include identifying the vehicle age and technology of average vehicles circulating in the urban area(s) of the region for which the baseline is established and then matching this with the most appropriate IPCC default values. The most important proxy to identify vehicle technologies is the average age of vehicles used in the urban area(s) of the region for which the baseline is established, to determine whether either US, Japanese or European default factors apply, or local vehicle manufacturer information can be used (in the case of having a substantial domestic vehicle motor industry or source of origin of vehicle imports).<br><br>**Alternative 3:** latest IPCC default values reported matching the respective vehicle category, age, vehicle origin and technology.<br><br>**Alternative 4**. Design data for relevant vehicle categories.<br><br>**Alternative 5**. Globally applicable specific fuel consumption for vehicle category default values. |

| **Specific fuel consumption** | Value | Unit |
|---|---|---|

| | | | |
|---|---|---|---|
| | Gasoline car (personal and taxi) | 6 | l/100 km |
| | Diesel car (personal and taxi) | 5 | l/100 km |
| | Motorcycle | 2 | l/100 km |

| | |
|---|---|
| **Purpose of Data** | Calculation of baseline emissions. |
| **Comments** | - |

Table 5

| | |
|---|---|
| **Data / Parameter** | $SEC_{i,x}$ |
| **Data unit** | kWh/km |
| **Description** | Specific electricity consumption of vehicle category *i* using electricity in year *x* |
| **Source of data** | In decreasing order of preference:<br>1. Local measured data (studies, e.g., performed by universities, other institutions or ordered by project proponent).<br>2. National or international data from studies.<br>3. IPCC default values for the respective vehicle categories (latest IPCC report)<br>4. Design data for relevant vehicle categories<br>5. Globally applicable default values (See Table 2). |
| **Value applied** | Values applied with references/sources disclosed in the ER calculation spreadsheet, submitted as annex. |
| **Justification of choice of data or description of measurement methods and procedures applied** | The following alternatives are proposed to determine specific electricity consumption (in order of preference). In case one of the alternatives does not provide required value for all categories, the combination of these alternatives can be used and justification for the use of combination should be provided.<br>**Alternative 1:** Measurement of electricity consumption data using total data (if available e.g., from bus or taxi companies) or a representative sample for the respective category. Sampling per category should include, as core characteristics, vehicle age and technology to ensure that the sample is as close as possible to the actual vehicle composition in the urban area(s) of the region for which the baseline is established. To be conservative, specific |

<table>
<tr><td></td><td>electricity consumptions based on samples shall be based on the lower limit of the uncertainty band at a 95 per cent confidence level.<br><br>Alternative 2: Use of fixed values based on national or international literature. The literature data can either be based on measurements of similar vehicles in comparable surroundings (e.g., from comparable cities of other countries) or may include identifying the vehicle age and technology of average vehicles circulating in the urban area(s) of the region for which the baseline is established and then matching this with the most appropriate IPCC default values. The most important proxy to identify vehicle technologies is the average age of vehicles used in the urban area(s) of the region for which the baseline is established, to determine whether either of US, Japanese or European default factors apply, or local vehicle manufacturer information can be used (in the case of having a substantial domestic vehicle motor industry or source of origin of vehicle imports).<br><br>Alternative 3: latest IPCC default values reported matching the respective vehicle category, age, vehicle origin and technology.<br><br>Alternative 4. Design data for relevant vehicle categories.<br><br>Alternative 5. Globally applicable default values. (Table 2).<br><br>
<table>
<tr><th>Table 2 - Specific electricity consumption</th><th>Value</th><th>Unit</th></tr>
<tr><td>Electric vehicles</td><td>0.12</td><td>kWh/km</td></tr>
</table>
</td></tr>
<tr><td>Purpose of Data</td><td>Calculation of baseline emissions</td></tr>
<tr><td>Comments</td><td>-</td></tr>
</table>

Table 6

| | |
|---|---|
| **Data / Parameter** | $N_{i,n,x}$ |
| **Data unit** | VKM or units |
| **Description** | Number of vehicle-kilometres vehicle category *i* using fuel type *n* driven in year *x* or number of vehicles in vehicle category *i* using fuel type *n* in year *x* |
| **Source of data** | Municipal transit authorities based on vehicle registration statistics from the respective city or data from vehicle control stations (technical and emission control stations). If no |

| | |
|---|---|
| | city/municipal data is available, regional data (canton, state) or, as a last option, national data can be used |
| Value applied | Values applied with references/sources disclosed in the ER calculation spreadsheet, submitted as annex. |
| Justification of choice of data or description of measurement methods and procedures applied | Used for all vehicle categories identified as relevant vehicle categories.<br>In the cases of buses and taxis, informal or illegal units may operate. While estimates on the number of informal units may be available, these are by their nature not trustworthy. For both categories it is thus recommended to only include formally registered units. For consistency, it is important that transported passengers are also based on the official records thus not including passenger trips of informal units.<br>For electrical vehicles fuel type *n* represents electricity |
| Purpose of Data | Calculation of baseline emissions |
| Comments | - |

Table 7

| | |
|---|---|
| Data / Parameter | $N_{i,n,x}$ / $N_{i,x}$ |
| Data unit | Percentage or share |
| Description | Percentage or share of vehicle-kilometres or vehicles in vehicle category i using fuel type n in year x |
| Source of data | National transport statistics based on vehicle registration statistics, company data (for buses) or surveys |
| Value applied: | Values applied with references/sources disclosed in the ER calculation spreadsheet, submitted as annex. |
| Justification of choice of data or description of measurement methods and procedures applied | For buses it should be based on urban units as urban buses often use a different fuel type than inter-urban units |
| Purpose of Data | Calculation of baseline emissions |
| Comments | Used for all relevant vehicle categories |

Table 8

| | |
|---|---|
| **Data / Parameter** | $NCV_{i,n}$ |
| **Data unit** | Energy/mass or volume units of fuel type n |
| **Description** | Net calorific value of fuel *n* used in vehicle category *i* |
| **Source of data** | Data sources in Table 4 may be used if the relevant conditions apply.<br>**Table 4 - Data sources and conditions for their usage**<br>(a) National default values — This source can be only used for liquid fuels and should be based on well documented reliable sources (such as national energy balances)<br>(b) IPCC default values at the lower limit of the uncertainty at a 95 per cent confidence interval as provided in table 1.2 of chapter 1 of volume 2 (energy) of the 2006 IPCC Guidelines on National GHG Inventories |
| **Value applied** | Values applied with references/sources disclosed in the ER calculation spreadsheet, submitted as annex. |
| **Justification of choice of data or description of measurement methods and procedures applied** | Following provisions established in TOOL18. |
| **Purpose of Data** | Calculation of baseline emissions |
| **Comments** | Vehicle owners or operators can buy fuel from a variety of sources (fuel stations). Therefore, in practice it is simpler to determine the parameter using options (a) or (b). |

Table 9

| | |
|---|---|
| **Data / Parameter** | $IR_i$ |

| | |
|---|---|
| **Data unit** | - |
| **Description** | Technology improvement factor for vehicle category *i* per year |
| **Source of data** | - |
| **Value applied** | Values applied with references/sources disclosed in the ER calculation spreadsheet, submitted as annex. |
| **Justification of choice of data or description of measurement methods and procedures applied** | When the tool is used for estimating baseline emissions for individual CDM project activities or Programmes of Activities, the default technology improvement factor is 0.99 for all vehicle categories. |
| **Purpose of Data** | Calculation of baseline emissions |
| **Comments** | - |

Table 10

| | |
|---|---|
| **Data / Parameter** | $OC_{i,x}$ *or* $OC_{B,x}$ / $OC_{T,x}$ / $OC_{C,x}$ / $OC_{MR,x}$ |
| **Data unit** | Passengers |
| **Description** | Average occupancy rate of vehicle category i in year x (e.g., buses (B), taxis (T), passenger cars (C), motorized rickshaws (MR) |
| **Source of data** | Option 1. Municipal transit authorities or specific studies. Vintage maximum three years.<br>Option 2. The following default values can be applied:<br>**Table 5 – Average occupancy as per vehicle type**<br>Vehicle type / Average occupancy (World, South Asia) / Unit<br>Car: 2.0, 2.0 — Person (including driver)<br>Taxi: 1.1, 1.1 — Person (excluding driver)<br>Motorcycle: 1.5, 1.5 — Person (including driver)<br>Bus: 40%, 80% — Total capacity<br>Option 3. Survey of occupancy of individual motorized transport (motorcycles, personal cars, taxis) in the urban area for which the baseline is established. The obtained occupancy rates can be used as default values for these vehicle categories at a country level, as |

| | |
|---|---|
| | variation in occupancy rates of individual motorized transport used in the urban context is relatively low.<br>Survey of occupancy rates of public transport (bus, light rail, tram, metro, BRTs, etc.) in the urban area for which the standardized baseline is established. If standardized baselines for multiple cities in a country are established, these cities need to be grouped in categories of similar cities (based on population size, population density, etc.) and surveys on occupancy rates of public transport of sample cities need to be conducted. If there is no big variation in occupancy rates of the same mode in the cities of the same category, then surveyed occupancy rates of public transport can be used as defaults for the rest of the cities in the same category |
| Value applied | Values applied with references/sources disclosed in the ER calculation spreadsheet, submitted as annex. |
| Justification of choice of data or description of measurement methods and procedures applied | Based on visual occupation studies for all vehicle categories.<br>For buses the occupation rate is based on boarding-alighting studies, electronic smart tickets or on visual occupation studies with expansion factors for routes served to determine the average occupation rate along the entire route. As an alternative for buses, the occupancy rate can be based on average trip distance of bus passengers, total passengers and total distance driven by buses.<br>For taxis (including motorized rickshaws), the driver should not be counted |
| Purpose of Data | Calculation of baseline emissions |
| Comments | - |

Table 11

| | |
|---|---|
| Data / Parameter | $EF_{CO2,n}$ |
| Data unit | g CO2/J |
| Description | Emission factor for fuel type n |
| Source of data | Data sources in Table 3 may be used if the relevant conditions apply. Note: In case biofuels or biofuel blends are used, the CO2 emission factor for the share of biofuels used as pure or in blends is equal to zero |
| Value applied | Values applied with references/sources disclosed in the ER calculation spreadsheet, submitted as annex. |

| | |
|---|---|
| Justification of choice of data or description of measurement methods and procedures applied | Following provisions established in TOOL18. |
| Purpose of Data | Calculation of baseline emissions |
| Comments | |

Table 12

| | |
|---|---|
| Data / Parameter | $EF_{CO2,x}$ |
| Data unit | g $CO_2$/kWh |
| Description | Emission factor for electricity in year x (g $CO_2$/kWh) |
| Source of data | Official source of data |
| Value applied | Values applied with references/sources disclosed in the ER calculation spreadsheet, submitted as annex. |
| Justification of choice of data or description of measurement methods and procedures applied | TOOL05 shall be applied. |
| Purpose of Data | Calculation of baseline emissions |
| Comments | - |

Table 13

| | |
|---|---|
| Data / Parameter | $EF_{KM,i,x}$ |
| Data unit | g $CO_2$/km |
| Description | Emission factor per kilometre of vehicle category i in year x (g $CO_2$/km) |
| Source of data | Official source of data |
| Value applied | Values applied with references/sources disclosed in the ER calculation spreadsheet, submitted as annex. |
| Justification of choice of data or description of | Emission factor for new vehicles. |

| | |
|---|---|
| measurement methods and procedures applied | |
| Purpose of Data | Calculation of baseline emissions |
| Comments | This option is available for taxis, personal cars, and motorcycles. Depending on the regions from which the cars are purchased (the US, European Union, Japan, domestic car industry, etc.) respective emission factors for new cars manufactured in these regions shall be used. |

Table 14

| | |
|---|---|
| Data / Parameter | $DE_{EL,i,x}$ |
| Data unit | km |
| Description | Average trip distance travelled by passengers using electricity-based vehicle category *i* in year *x* |
| Source of data | Official statistics or data obtained from the system operator. |
| Value applied | Not applicable here as the example project will be type 3, i.e., no e-bikes or e-tricycles. |
| Justification of choice of data or description of measurement methods and procedures applied | Data should be maximum three years old. Following provisions established in TOOL18. |
| Purpose of Data | Calculation of baseline emissions |
| Comments | |

Table 15

| | |
|---|---|
| Data / Parameter | $P_{EL,i,x}$ |
| Data unit | Passengers |
| Description | Total number of passengers transported per annum by electricity-based vehicle category i in year x |
| Source of data | Official statistics or data obtained from the system operator. Data not older than three years. |

| | |
|---|---|
| **Value applied:** | Not applicable here as the example project will be type 3, i.e., no e-bikes or e-tricycles. |
| **Justification of choice of data or description of measurement methods and procedures applied** | Following provisions established in TOOL18. |
| **Purpose of Data** | Calculation of baseline emissions |
| **Comments** | - |

## 4.2 Data and Parameters Monitored

From AMS-III.BM - lightweight two and three-wheeled personal transportation

Table 16

| | |
|---|---|
| **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 in the absence of the project in year y |
| **Source of data** | (a) Estimated via survey of the users of the infrastructure; or<br>(b) Directly measured via GPS; or<br>(c) As a conservative approach, the average distance travelled can be assumed as 2.5 km for bicycles and 5 km for e-bikes |
| **Description of measurement methods and procedures applied** | The survey shall be conducted with a representative sample of users of the bicycle lanes or bicycles parking areas, following the standard “Sampling and surveys for CDM project activities and programme of activities” (appendix B). |
| **Frequency of monitoring/recording** | The survey shall be conducted in the year 1 and optionally in the year 4 of the crediting period |
| **Value applied:** | Not applicable, because option 2 of the methodology is not used for any instance of the grouped project in the present monitoring report. |
| **Monitoring equipment** | N/A |

| | |
|---|---|
| QA/QC procedures applied | Average distance travelled per trip by the user 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 https://www.thegef.org/publications/manual-calculating-ghg-benefits-gef-transportation-projects may be used for crosschecking.<br><br>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 outcome of the survey is representative and reliable explaining the factors that lead to differences (e.g., based on sample-based checks of evidence such as fuel receipts of cars or travel tickets for bus or metro). |
| Purpose of data | Calculation of baseline emissions |
| Calculation method | Parameter used when applying Option 2 of the methodology. |
| Comments | - |

Table 17

| | |
|---|---|
| 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 directly and/or based on a sample basis |
| Description of measurement methods and procedures applied | 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.<br><br>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 program of activities" (appendix B). |

| | |
|---|---|
| **Frequency of monitoring/recording** | Measured continuously and consolidated daily if direct measurement methods are used |
| **Value applied:** | Not applicable, because option 2 of the methodology is not used for any instance of the grouped project in the present monitoring report. |
| **Monitoring equipment** | N/A |
| **QA/QC procedures applied** | N/A |
| **Purpose of data** | Calculation of baseline emissions |
| **Calculation method** | Parameter used when applying option 2 of the methodology. |
| **Comments** | - |

Table 18

| | |
|---|---|
| **Data / Parameter** | $DT_{u,y}$ |
| **Data unit** | km |
| **Description** | Total distance travelled by the individual user u of the e-bike promotion program or bicycle sharing program in year y |
| **Source of data** | (a) For programs that promoted e-bikes, data shall be sourced from mobile apps that record the distance travelled based on GPS.<br>(b) For bicycle sharing programs, data shall be sourced from mobile apps that record the distance travelled based on GPS or from sensors installed in bicycles.<br>(c) For bicycle sharing programs 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 |
| **Description of measurement methods and procedures applied** | (a) When using mobile apps, the user shall turn on the app when starting the travel and turn off when the travel finishes.<br>(b) When using sensors, the distance travelled shall be continuously measured |
| **Frequency of monitoring/recording** | The parameter shall be measured while travelling. The values shall be aggregated monthly for each individual user u |

| | |
|---|---|
| **Value applied:** | Not applicable, because option 3 of the methodology is not used for any instance of the grouped project in the present monitoring report. |
| **Monitoring equipment** | N/A |
| **QA/QC procedures applied** | A unique identification number shall be assigned to each user at the time of registering with the e-bike or bicycle sharing program. The manager of the program shall implement measures to link the distance travelled by each of the users to its unique identification number.<br>The records shall be made in a centralized database that allows the project proponent to have access to the information related to the users' travels. |
| **Purpose of data** | Calculation of baseline emissions |
| **Calculation method** | Parameter used when applying option 3 of the methodology. |
| **Comments** | Data shall be controlled for outliers, e.g., trips with travel distances longer than three standard deviations above the mean shall be excluded |

Table 19

| | |
|---|---|
| **Data / Parameter** | $ECP_{j,y}$ |
| **Data unit** | kWh |
| **Description** | Quantity of electricity consumed to recharge the batteries of e-bikes or e-tricycles in year y |
| **Source of data** | Continuous measurements |
| **Description of measurement methods and procedures applied** | As per the latest version of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (TOOL05).<br>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 form the grid and electricity consumed from the captive power plant, whichever applicable. |
| **Frequency of monitoring/recording** | As per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (TOOL05) |

| | |
|---|---|
| **Value applied:** | Not applicable, because no e-bikes or e-tricycles are used for any instance of the grouped project in the present monitoring report. |
| **Monitoring equipment** | As per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (TOOL05) |
| **QA/QC procedures applied** | As per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (TOOL05) |
| **Purpose of data** | Calculation of project emissions |
| **Calculation method** | As per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (TOOL05) |
| **Comments** | If this parameter is determined through paragraph 33(b) of the methodology, only the parameter "Total distance travelled by the individual user u of the infrastructure and/or of the promoted e-bikes in year y" ($DT_{u,y}$) needs to be monitored. |

**From TOOL18 - Methodological tool - Baseline emissions for modal shift measures in urban passenger transport**

Table 20

| | |
|---|---|
| **Data / Parameter** | *Di* |
| **Data unit** | kilometres |
| **Description** | Average trip distance travelled by passengers who shifted from electricity-based or road-based vehicle category i |
| **Source of data** | Survey |
| **Description of measurement methods and procedures applied** | Survey of the project passengers in year 1 and optionally in year 4 of the first crediting period asking about the entry and exit stations in the project system and noting electricity-based or road-based vehicle category i each surveyed passenger used prior to shifting to the project system (Si). |
| **Frequency of monitoring/recording** | At the survey in year 1 and optionally in the year 4 when applying option 1 or continuous when applying option 3.<br>For all instances added up to the present monitoring report, deviation 1 (survey carried out by public authorities instead of ex-post survey of baseline travel modes in year 1 and optionally in |

| | |
|---|---|
| | year 4 of the first crediting period) is applied. Project proponents could use the average trip travelled passengers who shifted from electricity-base or road-based vehicles in the first project year, but as all included project instances monitor the distances travelled by each and all passengers, the actual annual monitored average trip distance is used. |
| **Value applied:** | |

| *year* | $P_y$ (Sao Paulo) | $P_y$ (Rio) |
|---|---|---|
| 2018 (From 18-Dec) | 2.26 | 2.29 |
| 2019 | 2.26 | 2.13 |
| 2020 | 1.70 | 1.99 |
| 2021 (Up to 26-Jan) | 2.01 | 2.20 |

| | |
|---|---|
| **Monitoring equipment** | N/A |
| **QA/QC procedures applied** | Official source of data or following provisions established in the standard "Sampling and surveys for CDM project activities and program of activities" (appendix B) and TOOL18. |
| **Purpose of data** | Calculation of baseline emissions |
| **Calculation method** | Parameter used when applying Option 1 of TOOL18 |
| **Comments** | - |

Table 21

| | |
|---|---|
| **Data / Parameter** | $S_i$ |
| **Data unit** | % |
| **Description** | Share of passengers who shifted from electricity-based or road-based vehicle category *i* |
| **Source of data** | Survey |
| **Description of measurement methods and procedures applied** | Survey of the project passengers in year 1 and optionally in year 4 of the first crediting period asking about electricity-based or road-based vehicle category i each surveyed passenger used prior to shifting to the project system and noting the entry and exit stations in the project system (Di,y). |

<table>
<tr><td>Frequency of monitoring/recording</td><td>At the survey in year 1 and optionally in the year 4 when applying option 1 or continuous when applying option 3.</td></tr>
<tr><td>Value applied:</td><td>
<table>
<tr><th>Vehicle category</th><th>Share of passengers<br>Sao Paulo</th></tr>
<tr><td>Bus</td><td>20.4%</td></tr>
<tr><td>Minibus (lotação)</td><td>5.0%</td></tr>
<tr><td>Subway</td><td>8.1%</td></tr>
<tr><td>Railway</td><td>3.0%</td></tr>
<tr><td>Car</td><td>28.1%</td></tr>
<tr><td>Motorcycle</td><td>2.5%</td></tr>
<tr><td>Bicycle</td><td>0.9%</td></tr>
<tr><td>Walking</td><td>32.0%</td></tr>
<tr><th>Vehicle category</th><th>Share of passengers<br>Rio de Janeiro</th></tr>
<tr><td>Bus</td><td>38.2%</td></tr>
<tr><td>Minibus (lotação)</td><td>4.8%</td></tr>
<tr><td>Subway</td><td>3.0%</td></tr>
<tr><td>Railway</td><td>2.5%</td></tr>
<tr><td>Car</td><td>17.9%</td></tr>
<tr><td>Motorcycle</td><td>0.9%</td></tr>
<tr><td>Bicycle</td><td>2.4%</td></tr>
<tr><td>Walking</td><td>30.3%</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>N/A</td></tr>
<tr><td>QA/QC procedures applied</td><td>Official source of data or following provisions established in the standard “Sampling and surveys for CDM project activities and programme of activities” (appendix B) and TOOL18.</td></tr>
<tr><td>Purpose of data</td><td>Calculation of baseline emissions</td></tr>
<tr><td>Calculation method</td><td>Parameter used when applying Option 1 of TOOL18.</td></tr>
</table>

| | |
|---|---|
| **Comments** | - |

Table 22

| | |
|---|---|
| **Data / Parameter** | $SD_i$ |
| **Data unit** | % |
| **Description** | Share of passenger-kilometres who shifted from electricity-based or road-based vehicle category *i* (%) |
| **Source of data** | Survey |
| **Description of measurement methods and procedures applied** | Survey of the project passengers in year 1 and optionally in year 4 of the first crediting period asking about electricity-based or road-based vehicle category i each surveyed passenger used prior to shifting to the project system and noting the entry and exit stations in the project system to determine the share of passenger-kilometres SDi (%) out of total number of passengers using the project system who have shifted from each relevant vehicle category. |
| **Frequency of monitoring/recording** | At the survey in year 1 and optionally in the year 4 when applying option 1 or continuous when applying option 3. |
| **Value applied:** | Not applicable, because option 2 of the methodology is not used for any instance of the grouped project in the present monitoring report. |
| **Monitoring equipment** | N/A |
| **QA/QC procedures applied** | Official source of data or following provisions established in the standard “Sampling and surveys for CDM project activities and program of activities” and TOOL18. |
| **Purpose of data** | Calculation of baseline emissions |
| **Calculation method** | Parameter used when applying Option 2 of TOOL18 |
| **Comments** | - |

Table 23

| | |
|---|---|
| **Data / Parameter** | $P_y$ |
| **Data unit** | Passengers |

| | |
|---|---|
| **Description** | Number of passengers travelled by the project system in year *y* |
| **Source of data** | Project system operator. Electronic ticketing system or any other official records |
| **Description of measurement methods and procedures applied** | - |
| **Frequency of monitoring/recording** | Monitored annually |
| **Value applied:** | |

| *year* | $P_y$ (Sao Paulo) | $P_y$ (Rio) |
|---|---|---|
| 2018 (from 18-Dec) | 53,235 | 239,711 |
| 2019 | 2,662,506 | 8,929,480 |
| 2020 | 2,352,394 | 7,232,320 |
| 2021 (up to 26-Jan) | 109,015 | 511,801 |

| | |
|---|---|
| **Monitoring equipment** | N/A |
| **QA/QC procedures applied** | Following provisions established in the standard "Sampling and surveys for CDM project activities and programme of activities" and TOOL18. |
| **Purpose of data** | Calculation of baseline emissions |
| **Calculation method** | Parameter used when applying Option 1 or 2 of TOOL18 |
| **Comments** | - |

Table 24

| | |
|---|---|
| **Data / Parameter** | $PD_y$ |
| **Data unit** | PKM |
| **Description** | Number of passenger-kilometres travelled by the project system in year *y* |
| **Source of data** | Project system operator. Electronic ticketing system or any other official records. |

| | |
|---|---|
| **Description of measurement methods and procedures applied** | Estimated annually. Can be estimated by transport operators based on surveys, occupancy rates at different points in the network. |
| **Frequency of monitoring/recording** | Estimated annually |
| **Value applied:** | Not applicable, because option 2 of the methodology is not used for any instance of the grouped project in the present monitoring report. |
| **Monitoring equipment** | N/A |
| **QA/QC procedures applied** | Following provisions established in the standard "Sampling and surveys for CDM project activities and programme of activities" and TOOL18. |
| **Purpose of data** | Calculation of baseline emissions |
| **Calculation method** | Parameter used when applying Option 2 of TOOL18. |
| **Comments** | - |

## 4.3 Monitoring Plan

Most of the data and parameters used in the emissions reduction calculations are not monitored and will be sourced from local measured data (published national or international studies by governmental, academic, or private institutions or, if necessary, commissioned by the project participants).

Monitored data and parameters will depend on the baseline emissions option used for the calculation but are all related to the use of the two and three-wheeled personal transportation and will all be determined in surveys.

Surveys will be detailed at the project activity instance level and in accordance with procedures from the Standard for Sampling and Surveys for CDM project activities and programme of Activities (version 7.0, May 2017), summarized in appendix B.

With respect to the organizational structure, responsibilities and competencies of personnel, methods used for generating, recording, and reporting date of monitored parameters, and handling any internal auditing and non-conformities, the following applies:

- Project instances operators (Tembici, in the case of operational instances)
  - Currently, the data engineering area is responsible for collecting data from different sources/suppliers, following the supplier's documentation and recommendation.
  - The data is collected from an automated process in Google's Private Cloud (GCP), and, without any type of change, is stored in a layer called transient.

- Subsequently, these data are sent to the Data Lake, where they are available for the Data team to apply business rules to make the data available in table form in the Data Warehouse layer. This last layer is responsible for extracting the data available for all the work carried out.

- ZCO2
  - Received project instances operation data is treated by the technical department, which is responsible for carrying data quality and assurance review, and non-conformities handling.
  - Collection evaluation and treatment of literature data (full referenced in monitoring reports)

# 5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

## 5.1 Baseline Emissions

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:

Option I: Ex-post survey of baseline travels models

Option II: Baseline emissions based on public transportation (excluding cars, taxis, and motorcycles) as benchmark

Option III: Based on survey of users of e-bikes and users of bicycle sharing programs

**Table 6 - Types of projects eligible under this methodology**

| Type of project | Description | Baseline options applicable (As per AMS-III.BM, section 5.4) | | |
|---|---|---|---|---|
| | | Option 1 | Option 2 | Option 3 |
| Type 1 | Construction of new bicycle lanes | ✔ | ✔ | |
| Type 2 | Extension of the existing bicycle lanes | ✔ | ✔ | |
| Type 3 | Implementation of new bicycle sharing program | ✔ | | ✔ |
| Type 4 | Expansion of an existing bicycle sharing program | ✔ | | ✔ |
| Type 5 | Construction of new bicycle parking areas. These parking areas may be connected to public transport | ✔ | ✔ | |

| | | | | |
|---|---|---|---|---|
| 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 | ✔ | | |

While applying Option 1, steps from 1 to 4 of TOOL18 shall be applied; while applying Option 2, steps from 1 to 3 of TOOL18. Appendix A presents steps according to TOOL18 for the calculation of baseline emissions.

Option 1: Ex post survey of baseline travel modes

Under this option, baseline emissions cover the emissions, which would have been caused by the user of the bicycle-sharing program in absence of the project from origin (O) to destination (D), where the O and D points of the trip are assumed equal for both the baseline and the project scenarios.

Baseline emissions are determined by applying Steps 1 to 4 from the latest approved version of the methodological tool "Baseline emissions for modal shift measures in urban passenger transport" (TOOL18) as presented in Appendix A, using parameters estimated based on data collected during the survey[18] in the year 1 and optionally in the year 4 of the crediting period:

The vehicle categories index i indicated in Step 1 of TOOL18 shall be included, and "cycling" and "walking" should be considered as potential baseline "vehicle categories" with an emission factor of zero. 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 the TOOL18. The survey may be conducted with a sample of users in the case of the bicycle sharing program or new tricycles, e-bikes or e-tricycles.

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

(a) 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.

(b) Parameter $D_i$ (Average trip distance travelled by passengers) may be determined:

  i. From the survey with the users in the project.

  ii. As an average value for bicycle, tricycle, e-tricycle or e-bike trips (as relevant) from official data or studies at the city level; or

  iii. By applying the default conservative value of 2.5 km for bicycle or tricycle trips and 5 km for e-bike or e-tricycle trips.

Sampling and surveys may be used following "Sampling and surveys for CDM project activities and programme of activities" (appendix B).

[18] The survey shall be conducted with the users of the infrastructure, bicycle sharing program.

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

This option is suitable for Type 1 and Type 2 (i.e., construction of new or extension of existing bicycle lanes) and Type 5 and Type 6 (i.e., construction of new or expansion of existing bicycle parking areas).

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 "Baseline emissions for modal shift measures in urban passenger transport" (TOOL18) may be applied to complement existing data, if necessary (appendix A). Also, the number of cycling trips prior to installation of the new infrastructure ($N_{bicycles,BL}$) shall be determined ex ante.

The baseline emissions are calculated considering the number of cycling trips after installation of the new infrastructure and the distance travelled by the users of the infrastructure.

$$BE_y = 0.9 \times \left(N_{bicycles,y} - N_{bicycles,BL}\right) \times ADT_{u,y} \times EF_{BL,benchmark} \quad \text{Equation 1}$$

Where:

$BE_y$ = Baseline emissions in year $y$ ($tCO_2$)

$0.9$ = Net-to-gross adjustment factor to account for 'walking' in the baseline

$N_{bycicles,y}$ = Number of bicycles trips travelling through the bicycle infrastructure in year y

$N_{bycicles,BL}$ = 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)

$EF_{BL,benhcmark}$ = Weighted average $CO_2$ emission factor per passenger-kilometre 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

**Option 3: Based on a survey of users of e-bikes and users of bicycle sharing programs**

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

Baseline emissions are determined through the equation below:

| $BE_y = EF_{BL,CO2,survey} \times \sum_u DT_{u,y}$ | Equation 2 |
|---|---|

| Where: | |
|---|---|
| $BE_y$ = | Baseline emissions in year *y* ($tCO_2$) |
| $EF_{BL,CO2,survey}$ = | Average $CO_2$ emission factor per passenger-kilometre based on survey conducted with users of e-bike promotion programs or bicycle sharing programs ($tCO_2$/pkm) |
| $DT_{u,y}$ = | Total distance travelled by the individual user *u* of the bicycle sharing program and/or of the promoted e-bikes in year *y* (km) |

While applying Option 1 and 2 above, steps of TOOL18 shall be considered for the calculation of baseline emissions as presented in appendix A.

PROJECT ACTIVITY INSTANCE 1 – TEMBICI (CITY OF SÃO PAULO)

*"Tembici Participações S.A."* (Tembici) is a company focused on shared bicycles and e-bicycles with sharing stations in the whole country. However, no e-bicycles were included in this monitoring period.

In São Paulo, Tembici implements the Program "Bike Sampa" aiming to encourage the modal switch under public spaces (figure 2).


**Figure 1 – Sharing station of Tembici in Sao Paulo (source: https://tembici.com.br/)**

According to the PD, project activity instances must follow the eligibility criteria for its inclusion in Bikes4PlanetBR.

The compliance assessment for the inclusion of the proposed project activity instance 1 can be confirmed in the registered joint project description and monitoring report.

PROJECT ACTIVITY INSTANCE 2 - GROW

Project activity instance 2 is not operational anymore and, therefore, is not considered here.

PROJECT ACTIVITY INSTANCE 3 – TEMBICI (CITY OF RIO DE JANEIRO)

In Rio de Janeiro, Tembici implemented the Program "Bike Rio" aiming to encourage the modal switch under public spaces. It also has activities under private spaces.

According to the registered joint Project Description and Monitoring Report, the eligibility criteria for the inclusion of a new project activity instance is defined using a 5-step procedure, detailed below for project activity instance 3:

1. Meet the applicability conditions set out in the methodology applied to the project

| | |
|---|---|
| The proposed project activity instance follows all applicable requirements described in the registered project description:<br><br>The measure is the implementation of new bicycle sharing program (through dockless bicycles or sharing stations)<br><br>The measure will result in emission reductions of less than or equal to 60 kt $CO_2$ equivalent annually.<br><br>The measure applies the applicability conditions set in the methodological TOOL21 "demonstration of additionality of small-scale project activities", version 13 (see applicability condition 5 below) | ✔ |

2. Use the technologies or measures specified in the project description

| | |
|---|---|
| The proposed project activity instance applies type 3 of as described in the registered project description. (Construction of a new bicycle share program through dockless bicycles or docking stations). | ✔ |

3. Apply the technologies or measures in the same manner as specified in the project description

| | |
|---|---|
| The proposed project activity instance applies type 3 of as described in the registered project description (Construction of new bicycle share program through dockless bicycles or docking stations). | ✔ |

4. Are subject to the baseline scenario determined in the project description for the specified project activity and geographic area

| | |
|---|---|
| The baseline scenario of the proposed project activity instance is the ones presented in the registered project description, i.e., the continuation of the use of the existing modes of transport. | ✔ |

5. Have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area.

| | |
|---|---|
| The proposed project activity instance complies with the criteria set in the methodological TOOL21 "demonstration of additionality of small-scale project activities", version 13: According to paragraph 10 (c), barrier due to prevailing | ✔ |

| | |
|---|---|
| practice. Because there is no exact definition of how exactly to demonstrate the barrier, the project proponents use definitions of two approved CDM tools to demonstrate it; (1) TOOL19, version 9 (Appendix, paragraph 1) use penetration rate of less than five per cent as condition to be considered automatically additional. (2) TOOL32, version 2 use throughout the document a share of less than two per cent to be defined as automatically additional. Considering that bicycles are used as transport mode in less than 3% of the trips in Rio de Janeiro, 2.4% to be more precise (see Table 7), it seems more than reasonable to consider that a barrier due to the prevailing practice is demonstrated. | |

All proposed activity instances apply option 1 (ex-post survey of baseline travel modes) of AMS-III.BM for the determination baseline emission calculation using data from the origin-destination survey carried out by Metrô and SeTrans-RJ on transport modes used in the metropolitan areas of São Paulo and Rio de Janeiro.

Project Proponents are aware that the use of the survey carried out by Metrô and SeTrans-RJ are a deviation of the methodology. The use of the Metrô (for instance 1) and SeTrans-RJ (for instance 3) surveys is explained and justified in item 3.2 above.

The following public transit authorities' studies are used to determine the weighted average $CO_2$ emission factor per passenger-kilometre corresponding to public transportation-mix in the city:

- Metrô (2018). *Relatório de Sustentabilidade do Metrô de São Paulo.* Companhia do Metropolitano de São Paulo.
- Metrô (2019). Pesquisa Origem Destino 2017 - Balanço da realização e os primeiros resultados da Pesquisa Origem e Destino 2017. Companhia do Metropolitano de São Paulo.
- STRJ (2014). Plano Diretor de Transporte Urbano da Região Metropolitana do Rio de Janeiro - PDTU (Setembro de 2014). Secretaria de Transportes, Governo do Estado do Rio de Janeiro.
- ANTP (2020). Sistema de Informações da Mobilidade Urbana da Associação Nacional de Transportes Público (SIMOB/ANTP) - Relatório geral 2018 (Maio de 2020)
- Cetesb (2018). *Emissões veiculares no estado de São Paulo 2017.* Companhia Ambiental do Estado de São Paulo.
- EPE (2018). *Brazilian Energy Balance 2018: Base Year 2017.* Empresa de Pesquisa Energética.

Section 5.4 below and, the emission reduction calculation spreadsheet, also submitted as part of this monitoring report, provide sufficient information to allow the reader to reproduce the calculation of GHG emission reductions and removals, i.e., baseline emissions, project emissions and leakage.

## 5.2 Project Emissions

Project emissions are determined based on the amount of electricity consumed to recharge the batteries of e-bikes or e-tricycles ($EC_{PJ,y}$) using Equation (1) from the methodological tool

"Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (TOOL05).

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

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

(b) Alternatively, assuming a default consumption of 0.015 kWh/km travelled[19]. In this situation, the electricity consumed is determined according to the equation below:

| $EC_{PJ,y} = 0.015 \times \sum_{u} DT_{u,y}$ | **Equation 3** |
|---|---|

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

Both project activity instances do not include e-bikes or e-tricycles and, therefore, according to the approved methodology AMS-III.BM, project emissions are 0 (zero).

Section 5.4 below and, the emission reduction calculation spreadsheet, also submitted as part of this monitoring report, provide sufficient information to allow the reader to reproduce the calculation of GHG emission reductions and removals, i.e., baseline emissions, project emissions and leakage.

## 5.3 Leakage

In accordance with AMS-III.BM, leakage does not have to be considered.

Section 5.4 below and, the emission reduction calculation spreadsheet, also submitted as part of this monitoring report, provide sufficient information to allow the reader to reproduce the calculation of GHG emission reductions and removals, i.e., baseline emissions, project emissions and leakage.

## 5.4 Net GHG Emission Reductions and Removals

The following description of achieved GHG emission reductions is related to project activity instance 1 and project activity instance 3 (instance 2 is not operational anymore) under the grouped project for the monitoring period from 18-dec-2018 to 26-Jan-2021.

Project activity instances located in the city of Sao Paulo, state of Sao Paulo, and city of Rio de Janeiro, state of Rio de Janeiro, Brazil and apply type 3 of AMS-III.BM, i.e., Implementation of a new bicycle sharing program through sharing stations.

[19] This parameter depends on several factors, such as terrain, level of assistance from batteries to offset pedalling 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.

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$ **Equation 4**

Where:

$ER_y$ = Emission reductions in year *y* ($tCO_2$)

$BE_y$ = Baseline emissions in year *y* ($tCO_2$)

$PE_y$ = Project emissions in year *y* ($tCO_2$)

GHG emission reductions are based on assumptions considered for the Bikes4PlanetBR.

In the calculation below "option 1: ex-post survey of baseline travel modes" is selected to determine the baseline emissions, using data from the origin-destination survey carried out by Metrô[20] on transport modes used in the Metropolitan Region of Sao Paulo (nicknamed OD2017). Metrô published preliminary results of the survey[21] in December 2018 and synthesis report[22] plus detailed data made available in July 2019 (available at http://www.metro.sp.gov.br/pesquisa-od/, accessed on 8-November-2019). The government of Rio de Janeiro published results of the survey in September 2014 on transport modes used in the Metropolitan Region of Rio de Janeiro (nicknamed PDTU2014).

The following steps from TOOL18 were applied for the calculation of estimated net baseline emissions:

**Step 1: Determine relevant vehicle categories**

The following vehicle categories are considered relevant for urban transport:

(a) Bus ("ônibus" + "fretado").

(b) Minibus ("escolar + lotação"[23]).

(c) Subway.

(d) Railway.

(e) Car (private and taxis).

(f) Motorcycle.

(g) Bicycle.

(h) Walking.

[20] The City of São Paulo Subway System (Metrô) is operated by the "Companhia do Metropolitano de São Paulo", one of the urban railways that serves the city of São Paulo, alongside with the "Companhia Paulista de Trens Metropolitanos" (CPTM), forming the largest metropolitan rail transport network of Latin America.

[21] Metrô (2018). *Balanço da realização e os primeiros resultados da Pesquisa Origem e Destino 2017.* Companhia do Metropolitano de São Paulo.

[22] Metrô (2019). A Mobilidade Urbana da Região Metropolitana de São Paulo em Detalhes. Companhia do Metropolitano de São Paulo.

[23] "Lotação" is a mode of transport which falls between taxicabs and buses. These vehicles for hire are typically smaller than buses ("transporters") and usually take passengers on a fixed or semi-fixed route without timetables. They may stop anywhere to pick up or drop off passengers.

**Table 7 – Share of transport means categories (sources: METRÔ, 2019[24]; STRJ, 2014[15])**

| Vehicle categories | Transportation share use | |
|---|---|---|
| | SP | RJ |
| Bus | 20.4% | 38.2% |
| Minibus | 5.0% | 4.8% |
| Subway | 8.1% | 3.0% |
| Railway | 3.0% | 2.5% |
| Car | 28.1% | 17.9% |
| Motorcycle | 2.5% | 0.9% |
| Bicycle | 0.9% | 2.4% |
| Walking | 32.0% | 30.3% |

**Step 2: Determine the emission factor per kilometer for each relevant road-based vehicle category**

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

Relevant fuel types for each relevant vehicle category are as follows:

**Table 8 – Fuel type per transport means categories (source: CETESB, 2018)[25]**

| Vehicle categories | Fuel type |
|---|---|
| Bus | Diesel oil |
| Minibus (lotação) | Diesel oil |
| Metrô (subway) | Electricity |
| CPTM (railway) | Electricity |
| Bicycle | Not applicable |
| Walking | Not applicable |

[24] Metrô (2019). *Pesquisa Origem Destino 2017 - 50 anos - A mobilidade urbana da região metropolitana de São Paulo em detalhes.* Companhia do Metropolitano de São Paulo (preliminary results published in December 2018; Summary report and published data in July 2019). Available at http://www.metro.sp.gov.br/pesquisa-od/ (access on October 20, 2019).

[25] CETESB (2019). *Emissão veicular 2018.* Companhia Ambiental do Estado de São Paulo. Available at: https://cetesb.sp.gov.br/veicular/relatorios-e-publicacoes/ (access on October 04, 2019).

Estimated emission factor per kilometre based on the fraction of vehicles using a specific fuel type was calculated according to equation 6 as follows:

**Table 9 - Emission factor per kilometer for fossil fuel motorized vehicle categories**

| Vehicle Categories | Fuel Type | | Density (kg/l) | Fuel/Electric consumption (un./km or kWh) | Net calorific value (kcal/kg) | Emission Factor (kgCO2/TJ) | Emission Factor (kgCO2/km) |
|---|---|---|---|---|---|---|---|
| Parameter | N | unit | d | $SFC_{i,n,x}$ or $SEC_{i,x}$ | NCVi,n | $EF_{CO2,n/x}$ | $EF_{KM,i,x}$ |
| Bus | Diesel oil | liters | 0,840 | 0,471 | 10.100 | 72.600 | 1,21 |
| Minibus | Diesel oil | liters | 0,840 | 0,303 | 10.100 | 72.600 | 0,78 |
| Car (private+taxi) | Gasoline | liters | 0,742 | 0,070 | 10.400 | 67.500 | 0,15 |
| | Ethanol | liters | 0,809 | 0,102 | 6.300 | 0 | 0,00 |
| Motorcycle | Gasoline | liters | 0,742 | 0,017 | 10.400 | 67.500 | 0,04 |
| | Ethanol | liters | 0,809 | 0,028 | 6.300 | 0 | 0,00 |
| Source | | - | BEN (2018) | Cetesb (2018) | BEN (2018) | IPCC (2006) | Calculated |
| Level | City | - | National | State | National | Default | TOOL18 |

The emission factor per kilometre of vehicle category ($EF_{km,i,x}$) is calculated to determine the emission factor per passenger-kilometre ($EF_{PKM,i,x}$).

As prescribed in TOOL18. instead of the two parameters $N_{i,n,x}$ and $N_{i,x}$, it is possible to use one parameter $N_{i,n,x}/N_{i,x}$ which can be defined using the following options, which are described in the order of preference (see "Data and parameters" section for further guidance on data requirements):

(a) Approach 1. The share of vehicle-kilometres within vehicle category i that are driven by vehicles using fuel type n, if a reliable data source for this parameter exists (see TOOL18, "Data and parameters" section for further guidance on data requirements). This is the preferred option.

(b) Approach 2. In case data on vehicle-kilometres required in approach 1 is not available the share of vehicles within vehicle category i that use fuel type n should be used if a reliable data source for this parameter exists.

As data on vehicle kilometres required in approach 1 is not available, "approach 2 (share of vehicles within category i that used fuel type n) is used for the determination of $N_{i,n,x}/N_{i,x}$. The data was derived from the OD2017 survey and is presented in table 4.

In the case of subway and railway, $EF_{PKM,i,x}$ is already provided by the public state transport companies (METRÔ and CPTM)[26] and, therefore, there is no need to calculate $EF_{km,i,x}$ parameter above for these categories.

**Step 3: Determine the emission factor passenger-kilometre**

The emission factor passenger-kilometre for electricity-based transport system is calculated by the public state transport companies (METRÔ and CPTM) and is 6.00 $gCO_2$/pkm for both means of transport. Considering the share applied to each of the transport system ($N_{i,n,x}/N_{i,x}$, table 4), results are as follows:

**Table 10 - Emission factor per passenger-kilometre for electricity-based transport ($gCO_2$/pkm)**

| | |
|---|---|
| $EF_{PKM,subway,2018}$ = | 6.00 |

[26] Metrô (2019b). *Relatório Integrado 2018.* Companhia do Metropolitano de São Paulo.

| | |
|---|---|
| $EF_{PKM,railway,2018}$ = | 6.00 |

Although the parameters are calculated by the public transport companies operating in the Metropolitan area of São Paulo (instance 1), it is reasonable to assume that the electricity-based transport systems are similar in the Metropolitan of Rio de Janeiro and, therefore, the same parameters are used for project instance 3.

For the determination of the emission factor passenger-kilometre for fuel-based transport system, equation 8 was considered and results are as follows:

**Table 11 - Emission factor per passenger-kilometer for fuel-based transport ($gCO_2$/pkm)**

| Vehicle | $EF_{KM,i,x}$ ($kgCO_2$/km) | $OC_{i,x}$ (passengers) | $EF_{PKM,I,x}$ ($gCO_2$/pkm) |
|---|---|---|---|
| Bus | 1.21 | 40% x 40 seats = 16.0 | 77.42 |
| Minibus | 0.78 | 40% x 10 seats = 4.0 | 199.31 |
| Car | 0.15 | 2.0[27] | 78.84 |
| Motorcycle | 0.04 | 1.5 | 25.52 |
| Source of data | Calculated table 6 | Default TOOL18 | Calculated TOOL18 |

In summary, emission factors are as follows:

**Table 12 - Emission factor per passenger-kilometer ($gCO_2$/pkm)**

| | |
|---|---|
| $EF_{PKM,bus,2018}$ = | 77.42 |
| $EF_{PKM,minibus,2018}$ = | 199.31 |
| $EF_{PKM,subway,2018}$ = | 6.00 |
| $EF_{PKM,railway,2018}$ = | 6.00 |
| $EF_{PKM,car,2018}$ = | 78.84 [28] |
| $EF_{PKM,\ motorcycle,2018}$ = | 25.52 [21] |
| $EF_{PKM,bicycle,2018}$ = | 0.00 |
| $EF_{PKM,walking,2018}$ = | 0.00 |

[27] Taxis and private cars are grouped in the category "cars". Tool18 recommended occupancy rate for taxis is "1.1", but for simplicity and conservative reasons (the higher the occupancy rate, the smaller is the emission factor per passenger-kilometer) the same figure applied for cars ("2.0") is used.

[28] Using the total fuel consumption of 2017 (source: Cetesb, 2018) in the State of São Paulo: 52.1% gasoline, 13.3% anhydrous bioethanol and 34.6% hydrated bioethanol (shares in energy terms). For biofuels emission factor is assumed to be zero.

Step 4: Determine baseline emissions

For the determination of ex-ante baseline emissions, option 1 of TOOL18 is considered based on average distance trip ($D_i$), number of passengers ($P_y$) and share of passengers who shifted from electricity-based or road-base vehicle category ($S_i$) following equation 9 (appendix A).

For the technology improvement factor for fleet, default value of 0.99 is considered for all vehicles as required by TOOL18 to determine baseline emissions.

For the determination of baseline emissions, the technology improvement factor considered was the default value provided by TOOL18, i.e., 0.99. The following monitored data was considered for each project activity instances:

**Table 13 - Data monitored & baseline emissions, project activity instance 1 – Tembici SP**

| Parameter | | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| Time Diff. (years) | $T_i$ | 1 | 2 | 3 | 4 |
| Avg. Dist. (km) | $D_i$ | 2.26 | 2.26 | 1.70 | 2.01 |
| Passengers | $P_y$ | 53,235 | 2,662,506 | 2,352,394 | 109,015 |
| Baseline emissions | $BE_y$ | 6 | 286 | 189 | 10 |

**Table 14 - Data monitored & baseline emissions, project activity instance 2 – Grow**

| Parameter | | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| Time Diff. (years) | $T_i$ | 1 | 2 | 3 | 4 |
| Avg. Dist. (km) | $D_i$ | 0 | 0 | 0 | 0 |
| Passengers | $P_y$ | 0 | 0 | 0 | 0 |
| Baseline emissions | $BE_y$ | 0 | 0 | 0 | 0 |

**Table 15 - Data monitored & baseline emissions, project activity instance 3 – Tembici RJ**

| Parameter | | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| Time Diff. (years) | $T_i$ | 1 | 2 | 3 | 4 |
| Avg. Dist. (km) | $D_i$ | 2.29 | 2.13 | 1.99 | 2.20 |
| Passengers | $P_y$ | 239,711 | 8,929,480 | 7,232,320 | 511,801 |
| Baseline emissions | $BE_y$ | 29 | 994 | 743 | 58 |

Parameter "$D_i$" (average trip distance travelled by passengers) is individually and directly measured for each project instance as follows:

- For project activity instance 1 and 3 (Tembici), measurement is made using the shortest road path between the station where the bicycle is taken and the station where it is returned. For conservative reasons, if the stations where the bicycle is taken and returned are the same, a zero km distance trip is assumed. Yearly chronological averages are used in the determination of $D_i$.
- For project activity instance 2 (Grow), all trips are directly measured and the average trip distance for the country[29] is used.

Parameter $P_y$ (number of passengers travelled by the project system in year y) is directly determined by each project instance for each chronological year.

**Table 16 - Net GHG emission reductions and removals, project activity instance 1 – Tembici SP**

| Year | Baseline emissions or removals ($tCO_2e$) | Project emissions or removals ($tCO_2e$) | Leakage emissions ($tCO_2e$) | Net GHG emission reductions or removals ($tCO_2e$) |
|---|---|---|---|---|
| ~~Year 1 - 2018~~ ~~(30 Jan 2018 to 17 Dec 2018)~~ --- issued --- | ~~120~~ | ~~0~~ | ~~0~~ | ~~120~~ |
| Year 1 - 2018 (18-Dec-2018 to 31-Dec-2018) | 5 | 0 | 0 | 5 |
| Year 2 - 2019 (01-Jan-2019 to 31-Dec-2019) | 285 | 0 | 0 | 285 |
| Year 3 - 2020 (01-Jan-2020 to 31-Dec-2020) | 188 | 0 | 0 | 188 |
| Year 4 - 2021 (01-Jan-2021 to 26-Jan-2021) | 10 | 0 | 0 | 10 |
| **Total** | **488** | **0** | **0** | **488** |

**Table 17 - Net GHG emission reductions and removals, project activity instance 2 - Grow**

| Year | Baseline emissions or removals ($tCO_2e$) | Project emissions or removals ($tCO_2e$) | Leakage emissions ($tCO_2e$) | Net GHG emission reductions or removals ($tCO_2e$) |
|---|---|---|---|---|
| ~~Year 1 - 2018~~ ~~(30 Jan 2018 to 17 Dec 2018)~~ --- issued --- | ~~120~~ | ~~0~~ | ~~0~~ | ~~120~~ |

[29] Grow (2019). *Micromobilidade: um panorama Latino-americano.* Grow Mobility Blog, 12-Ago-2019 (URL: https://blog.grow.mobi/micromobilidade-panorama-latino-americano/, access on 17-Oct-2019).

| | | | | |
|---|---|---|---|---|
| Year 1 - 2018<br>(18-Dec-2018 to 31-Dec-2018) | 0 | 0 | 0 | 0 |
| Year 2 - 2019<br>(01-Jan-2019 to 31-Dec-2019) | 0 | 0 | 0 | 0 |
| Year 3 - 2020<br>(01-Jan-2020 to 31-Dec-2020) | 0 | 0 | 0 | 0 |
| Year 4 - 2021<br>(01-Jan-2021 to 26-Jan-2021) | 0 | 0 | 0 | 0 |
| **Total** | **0** | **0** | **0** | **0** |

**Table 18 - Net GHG emission reductions and removals, project activity instance 3 – Tembici RJ**

| Year | Baseline emissions or removals ($tCO_2e$) | Project emissions or removals ($tCO_2e$) | Leakage emissions ($tCO_2e$) | Net GHG emission reductions or removals ($tCO_2e$) |
|---|---|---|---|---|
| Year 1 - 2018<br>(18-Dec-2018 to 31-Dec-2018) | 28 | 0 | 0 | 28 |
| Year 2 - 2019<br>(01-Jan-2019 to 31-Dec-2019) | 993 | 0 | 0 | 993 |
| Year 3 - 2020<br>(01-Jan-2020 to 31-Dec-2020) | 743 | 0 | 0 | 743 |
| Year 4 - 2021<br>(01-Jan-2021 to 26-Jan-2021) | 57 | 0 | 0 | 57 |
| **Total** | **1,821** | **0** | **0** | **1,821** |

**Table 19 - Total net GHG emission reductions and removals achieved, grouped project**

| Year | Baseline emissions or removals ($tCO_2e$) | Project emissions or removals ($tCO_2e$) | Leakage emissions ($tCO_2e$) | Net GHG emission reductions or removals ($tCO_2e$) |
|---|---|---|---|---|
| ~~Year 1 - 2018~~<br>~~(30 Jan 2018 to 17 Dec 2018)~~<br>--- issued --- | ~~240~~ | ~~0~~ | ~~0~~ | ~~240~~ |
| Year 1 - 2018<br>(18-Dec-2018 to 31-Dec-2018) | 33 | 0 | 0 | 33 |
| Year 2 - 2019<br>(01-Jan-2019 to 31-Dec-2019) | 1,278 | 0 | 0 | 1,278 |

| | | | | |
|---|---|---|---|---|
| Year 3 - 2020<br>(01-Jan-2020 to 31-Dec-2020) | 931 | 0 | 0 | 931 |
| Year 4 - 2021<br>(01-Jan-2021 to 26-Jan-2021) | 67 | 0 | 0 | 67 |
| **Total** | **2,309** | **0** | **0** | **2,309** |