CLEAN DEVELOPMENT MECHANISM

CDM-MP78-A08

Draft Small-scale Methodology

SSC-III.XX: Ride-hailing services

Version 01.0

Sectoral scope(s): 07

United Nations
Framework Convention on
Climate Change

COVER NOTE

1. Procedural background

1. A request for new methodology (SSC-NM102) “Greenhouse gas emission reduction methodology for online ride-hailing service”, (hereinafter referred as NM-102) was submitted on 3 August 2018 by Beijing Didi Infinity Technology and Development Co., Ltd.

2. Purpose

2. The proposal submits a new methodology in the transport sector specifically to better utilize taxi loading factor.

3. Key issues and proposed solutions

3.1. Applicability

3. The methodology is applicable:

   (a) To passengers using ride-hailing application platform to book taxis, and/or to book their shared ride with another passenger or driver;

   (b) To passenger cars only;

   (c) For intra-city travel;

   (d) When share of passengers travelling by taxis using ride-hailing apps is <= 20% of the total passengers travelling by taxis in host city in recent 1 year.

4. Only the ride-hailing application platform shall apply for emission reductions from project activities applying this methodology.

3.2. Baseline scenario and baseline emissions

5. **Travelling by booking online taxi –** Emissions saving will be due to avoided unloaded cruising to find the passengers using ride-hailing application.

6. **Travelling by booking ride sharing with another passenger(s) –** Emissions saving will be due to avoided duplicate driving of separate vehicles with the same or similar route from passengers.

7. **Travelling by booking ride sharing with driver –** Emissions saving will be due to avoided duplicate driving of separate vehicles with same or similar route from passenger and driver.

3.3. Leakage

8. No leakage is considered.

3.4. Project emissions

9. Project emissions comprise of emissions due to:

   (a) Travelling by booking ride sharing with another passenger(s) ($PE_{o,y}$), calculated by multiplying the total travelling mileage of the online-hailing cars under car-sharing booking orders ($D_{o,y}$) by the emission factor per kilometre of online-hailing cars in year y ($EF_{\mathrm{km},o,y}$);

   (b) Travelling by booking ride sharing with a driver ($PE_{h,y}$), calculated by multiplying the total travelling mileage of the hailing-cars ($D_{h,y}$) by the emission factor per kilometer of hitch-riding cars in year y $\left(\mathrm{EF}_{\mathrm{km,h,y}}\right)$.

10. Travelling by booking taxis ($PE_{t,y}$) is deemed as zero as total travelling mileages of taxis remains the same under project activity.

4. Impacts

11. The new methodology if approved is expected allow for development of new CDM projects in the transport sector.

5. Subsequent work and timelines

6. The revision of the methodology is recommended by the MP for consideration by the Board at its 102nd meeting. No further work is envisaged.

7. Recommendations to the Board

12. The MP recommends that the Board adopt this new methodology, to be made effective at the time of the Board's approval.

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1. Introduction

1. The following table describes the key elements of the methodology:

Table 1. Methodology key elements

Typical project(s)	Project activities that involve the booking of taxis, ride hailing cars or hitch-riding cars using a ride-hailing app.
Type of GHG emissions mitigation action	Energy efficiency. Displacement of more-GHG-intensive transportation mode by less-GHG-intensive ones

2. Scope, applicability, and entry into force

2.1. Scope and Applicability

2. This methodology is applicable to:

(a) Passenger's use of ride-hailing application/platform (app) to book taxis, to book ride hailing cars (hereinafter referred as ride sharing with another passenger(s)) or to book hitch-riding cars (hereinafter referred as ride sharing with the driver);

(b) The cars under this methodology shall be taxis or passenger cars;

(c) All cars under the methodology should be in compliance with local or national regulations on the passenger transport service. The passenger cars without relevant licence, which are prevented by law from transporting passengers, should not be included in the project activity under the methodology;

(d) The share of passengers travelling by taxis using ride-hailing apps, which existed at the point of submission of the CDM-PDD for validation to the DOE or one calendar year prior to the implementation of the project activity (whichever is earlier) is less than or equal to 20% of the total passengers travelling by taxis in the host city;

(e) Only the ride-hailing app can apply for emission reductions from project activities under this methodology;

(f) The methodology is only applicable to the project activity with the annual emission reductions less than or equal to 60,000 tCO_2.

3. The methodology is not applicable for the travelling activity between different cities.

2.2. Entry into force

4. The date of entry into force is the date of the publication of the EB XX meeting report on DD Month YYYY.

2.3. Applicability of sectoral scope

5. For validation and verification of CDM projects and programme of activities by a designated operational entity (DOE) using this methodology, sectoral scope 07 is mandatory.

3. Normative references

6. This methodology is based on the proposed small-scale methodology "SSC-NM102: DiDi online ride-hailing service emission reduction project in Dongguan City" submitted by Beijing Didi Infinity Technology and Development Co., Ltd.

7. Project participants shall apply the "General guidelines for SSC CDM methodologies" and the "TOOL21: Demonstration of additionality of small-scale project activities" (previously known as attachment A to appendix B) provided at: <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html> mutatis mutandis.

8. This methodology also refers to the latest approved versions of the following methodologies and tools:

   (a) "Sampling and surveys for CDM project activities and programme of activities";

   (b) "Guidelines for sampling and surveys for CDM project activities and programme of activities";

   (c) "TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion";

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

   (e) "TOOL07: Tool to calculate the emission factor for an electricity system;

   (f) "TOOL18: Baseline emissions for modal shift measures in urban passenger transport";

   (g) "TOOL19: Demonstration of additionality of microscale project activities";

   (h) "TOOL21: Demonstration of additionality of small-scale project activities".

4. Definitions

9. The definitions contained in the Glossary of CDM terms shall apply.

10. The following definitions apply:

   (a) **Car booking model** – a type of project intervention such as booking of taxis or booking of ride hailing cars i.e. ride sharing with another passenger(s) or booking of hitch-riding cars i.e. ride sharing with the driver, using ride-hailing app;

   (b) **Cruising Taxi（hereinafter referred to as Taxi）-** vehicle cruises to find passengers providing travelling service. Taxi travels according to the needs of passengers and charges based on mileage and time;

(c) **Ride-hailing Car -** vehicle which provides travelling service to passengers through the ride-hailing app without cruising;

(d) **Hitch-riding Car** - when travelling by cars, drivers pose their own travelling route through the ride-hailing apps. Passengers who have the same or similar travelling route can share the car for travelling;

(e) **Empty Mileage -** the travelling mileage of the taxis without carrying any passenger;

(f) **Unloaded Ratio -** the proportion of the empty mileage in the total travelling mileage of the taxis;

(g) **Ride-hailing App -** the software or application/platform for ride-hailing service;

(h) **Ride-sharing with another passenger(s) -** process through which a number of passengers travelling separately with the same or similar travelling route, book and share the same hailing car through the ride-hailing app;

(i) **Travelling mileage -** the distance actually travelled by cars. The travelling mileage should include the mileage from the location of the car where the booking is accepted to the starting point of the passenger. The travelling mileage included in different travelling sharing orders should not be double counted;

(j) **City** - is a continuous area on which urban settlement has occurred and includes the historical core area and the adjacent suburbs defined by its administrative boundaries.

5. Baseline methodology

5.1. Project boundary

11. The spatial extent of the project boundary covers the city in which the project takes place. As the project cannot control the trip origins or destinations of passengers, the spatial area of the project is the entire urban zone of the city in which the project operates.

12. In case the cars use electricity from an interconnected grid or captive power plant, the project boundary also includes the power plants connected physically to the electricity system that supply power to the project, and/or the captive power plant.

13. The greenhouse gases included in or excluded from the project boundary are shown in Table 2.

Table 2. Emission sources included in or excluded from the project boundary

Source		Gas	Included	Justification/Explanation
Baseline	Mobile source emissions from different modes of transport that would have taken in the absence of project activity	CO_2	Yes	Major emission source
		CH_4	No	CH_4 emissions are a minor source of the total CO_2 emissions. Neglecting these emissions in baseline as well as project scenario is conservative, as fuel consumption and therefore CH_4 emissions, are reduced through the project.
		N_2O	No	N_2O emissions are a minor source of the total CO_2 emissions. Neglecting these emissions in baseline as well as project scenario is conservative, as fuel consumption and therefore N_2O emissions, are reduced through the project.
Project activity	Mobile source emissions from project vehicles	CO_2	Yes	Major emission source
		CH_4	No	See argument above
		N_2O	No	See argument above

5.2. Baseline scenario

14. The project activity involves the booking of taxi or booking a ride sharing with another passenger(s) or booking a ride sharing with the driver using ride hailing app. The project activity promotes improvement in taxi loading/utilization factor (i.e. reduced unloaded ratio). The baseline scenario for each car booking model is determined as follows:

    (a) **For the booking of taxis**, the baseline scenario is that the taxis find the passengers without the ride-hailing app, by cruising or waiting at the taxi stand/service centre or using web-based booking system or using phone booking on non-sharing basis. Also, when a taxi is not available, the passengers would take various transportation modes for travelling;

    (b) **For booking a ride sharing with another passenger(s)**, the baseline scenario is that the passengers would take transportation modes other than hailing cars sharing in the absence of the project activity;

    (c) **For booking a ride sharing with the driver**, the baseline scenario is that the drivers would travel alone without sharing the cars with the passengers or travel by other transportation modes, and the passengers would take different transportation modes other than hitch-riding cars in the absence of the project activity.

5.3. Additionality demonstration

15. The additionality shall be demonstrated applying the latest approved version of the "TOOL19: Demonstration of additionality of microscale project activities" or "TOOL21: Demonstration of additionality of small-scale project activities".

5.4. Baseline emissions

16. The project activity may lead to modal shift of passengers as well as drivers of hitch-riding cars. The baseline emissions are the mobile emissions of vehicles which would be taken in absence of the project activity. The baseline emissions are calculated by each car booking model respectively, as follows:

$$BE_y = \sum_i BE_{i,y} = BE_{t,y} + BE_{o,y} + BE_{h,y} \quad \text{Equation (1)}$$

$$= BE_{t,y} + BE_{o,y} + \left(BE_{h,d,y} + BE_{h,p,y}\right)$$

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2e)
$BE_{i,y}$	=	Baseline emissions of car-booking model *i* in year *y* (tCO_2e)
$BE_{t,y}$	=	Baseline emissions of the passengers travelling by booking taxis in year *y* (tCO_2e)
$BE_{o,y}$	=	Baseline emissions of the passengers travelling by booking a ride sharing with another passenger(s) in year *y* (tCO_2e)
$BE_{h,y}$	=	Baseline emissions of the passengers and drivers for booking a ride sharing with the driver in year *y* (tCO_2e)
$BE_{h,d,y}$	=	Baseline emissions of the drivers sharing their ride in year *y* (tCO_2e)
$BE_{h,p,y}$	=	Baseline emissions of the passengers travelling by booking a ride sharing with the driver in year *y* (tCO_2e)
y	=	Crediting year when emissions reductions are estimated
i	=	Car booking model under project activity, representing *t, o, h*
t	=	Traveling by booking taxis under project activity
o	=	Traveling by booking ride hailing cars under project activity
h	=	Traveling by booking hitch riding cars under project activity

17. The emission reduction under the methodology are generated from the shift of transport mode. Thus, the baseline transport mode should be identified for each car booking model i.e. booking of taxi, booking ride sharing with another passenger(s) or booking a ride sharing with the driver.

18. The share of the baseline transport mode should be determined through sampling survey as per requirements mentioned Appendix 1 for the calculation of baseline emissions. All the feasible transport modes should be listed for the survey. The baseline transport modes may include but are not limited to the following vehicle categories:

(a) Passenger cars;

(b) Taxis;

(c) Hailing cars without sharing;

(d) Buses;

(e) Motorcycles;

(f) Rail-based urban mass transit (metro, light rail transit, trams);

(g) Non-motorized vehicle;

(h) Other vehicle categories such as para-transit;

(i) Others.

19. If certain vehicle cannot be identified or listed, it should be categorized as "others", and the baseline emissions should be determined as zero.

20. Baseline emissions of car booking model *i* are estimated as following equation

$$BE_{i,y} = PEF_{b,i,y} \times PD_{b,i,y} \times 10^{-6} \quad \text{Equation (2)}$$

Where:

$PEF_{b,i,y}$	=	Baseline emissions factor per passenger-kilometer of car booking model *i* in year *y* (gCO_2/pkm)
$PD_{b,i,y}$	=	Baseline passenger-mileage of car-booking model *i* in year *y* (pkm)
10^{-6}	=	Conversion from gCO_2e to tCO_2e

5.4.1. Determination of the baseline emission factor:

21. The baseline emission factor should be determined for each car booking model based on the share of passengers shifted from baseline vehicle categories *j*.

$$PEF_{b,i,y} = \sum_{j} \left(EF_{pkm,j,y} \times SD_{i,j} \right) \quad \text{Equation (3)}$$

Where:

$PEF_{b,i,y}$	=	Baseline emissions factor per passenger-kilometer of car booking model *i* in year *y* (gCO_2/pkm)
$EF_{pkm,j,y}$	=	Emission factor per passenger-kilometer of vehicle category *j* in year *y* (gCO_2/pkm)
$SD_{i,j}$	=	Share of vehicle category *j* as mentioned in paragraph 18, used in baseline scenario by passengers using car booking model *i* in the project scenario (%)

22. The share of passengers booking the taxis ($SD_{t,j}$), share of passengers booking a ride sharing with another passenger(s) ($SD_{o,j}$), share of passengers booking a ride sharing with the driver ($SD_{h,p,j}$) and share of hitch-riding cars' drivers sharing their ride ($SD_{h,d,j}$) who would take baseline vehicle category *j* as mentioned in paragraph 18 in baseline scenario should be determined by a sampling survey.

5.4.1.1. Determination of baseline emission factor per passenger-kilometer:

5.4.1.1.1. Electricity based transport system.

23. The emission factor per passenger-kilometer for electricity-based transport systems (e.g. urban rail-based systems) is determined using the following equation:

$$EF_{pkm,j,y} = \frac{TE_{EL,j,y}}{PE_{EL,j,y} \times D_{EL,j,y}} \times 10^6 \quad \text{Equation (4)}$$

Where:

$EF_{pkm,j,y}$	=	Emission factor per passenger-kilometer for electricity-based vehicle category *j* in year *y* (g CO_2/PKM)
$TE_{EL,j,y}$	=	Total emissions from electricity-based vehicle category *j* in year *y* (t CO_2), calculated using the "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation"
$PE_{EL,j,y}$	=	Total number of passengers transported by electricity-based vehicle category *j* in year *y* (passengers)
$D_{EL,j,y}$	=	Average trip distance travelled by passengers using electricity-based vehicle category *j* in year *y* (km)

5.4.1.1.2. Fuel based transport system.

24. Emission factors per PKM for fuel-based transport systems (e.g. road-based vehicles) should be calculated as follows:

$$EF_{pkm,j,y} = \frac{EF_{km,j,y}}{OC_{j,y}} \quad \text{Equation (5)}$$

Where:

$EF_{pkm,j,y}$	=	Emission factor per passenger-kilometer for vehicle category *j* in year *y* (g CO_2/pkm)
$EF_{km,j,y}$	=	Emission factor per kilometer of vehicle category *j* in year *y* (g CO_2/km)
$OC_{j,y}$	=	Average occupancy rate of vehicle category *j* in year *y* (passengers)

25. Emission factor per kilometer should be calculated based on the fraction of vehicles using a specific fuel type, the consumption of each fuel type and CO_2e emissions per unit of fuel consumed:

$$EF_{km,j,y} = \sum_n \frac{N_{j,n,y}}{N_{j,y}} \times \left(SFC_{j,n,y} \times NCV_{j,n} \times EF_{CO2,n}\right) + \frac{N_{j,e,y}}{N_{j,y}} \times \left[SEC_{j,e,y} \times EF_{CO2,y} \times \left(1 + TDL_{j,y}\right)\right] \quad \text{Equation (6)}$$

Where:

$EF_{km,j,y}$	=	Emission factor per kilometer of vehicle category *j* in year *y* (gCO_2/km)
$N_{j,n,y}$	=	Number of vehicle-kilometers of vehicle category *j* using fuel type n driven in year *y* (VKM) or number of vehicles in vehicle category *j* using fuel type n in year *y* (units)
$N_{j,e,y}$	=	Number of vehicle-kilometers of vehicle category *j* using electricity driven in year *y* (VKM) or number of vehicles in vehicle category *j* using electricity in year *y* (units)
$N_{j,y}$	=	Number of vehicle-kilometers of category *j* driven in year *y* (VKM) or number of vehicles of category *j* in year *y* (units)
$SFC_{j,n,y}$	=	Specific fuel consumption of vehicle category *j* using fuel type n in year *y* (mass or volume units of fuel/km)
$SEC_{j,e,y}$	=	Specific electricity consumption of vehicle category *j* using electricity in year *y* (kWh/km)
$NCV_{j,\mathrm{n}}$	=	Net calorific value of fuel n used in vehicle category *j* (MJ/mass or volume units of fuel)
$EF_{CO2,n}$	=	Emission factor for fuel type n (g CO_2/MJ)
$EF_{CO2,y}$	=	Emission factor for electricity in year *y* (g CO_2/kWh)
$TDL_{j,y}$	=	Average technical transmission and distribution losses for providing electricity to vehicle category *j* using electricity
n	=	Fuel types used by vehicle category *j* in year *y*
y	=	Crediting year when emissions reductions are estimated
j	=	Vehicle categories

26. Instead of the parameters $N_{j,n,y}$,$N_{j,e,y}$ and $N_{j,y}$, it is permitted to use a single parameter $N_{j,n,y}/N_{j,y}$ or $N_{j,e,y}/N_{j,y}$ defined using one of the following options, described in the order of preference (refer to "Data and parameters" section for further guidance on data requirements):

    (a) Approach 1. The share of vehicle-kilometers within vehicle category *j* that are driven by vehicles using fuel type n or electricity, if a reliable data source for this parameter exists (refer to "Data and parameters" section for further guidance on data requirements). This is the preferred option;

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

5.4.2. Determination of baseline passenger-mileage

27. The baseline passenger-mileage should be determined using project passenger number and mileage of each booking order.

    (a) **For the booking of taxis**, taxi drivers take booking orders from the passengers nearby through ride-hailing app, so that long distance cruising to find the passengers may be shortened and the unloaded ratio of taxis is reduced. Thus, the taxis transport more passengers compared with the baseline scenario. The baseline mileages of the passengers travelling by booking taxis are the unloaded

mileages reduced under project activity. The baseline passenger-mileages is calculated as:

$$PD_{b,t,y} = PD_{t,y} \times \left(\frac{k_B}{(1-k_B)} - \frac{k_{P,y}}{(1-k_{P,y})} \right)$$ Equation (7)

Where:

$PD_{b,t,y}$ = Passenger-mileage of travelling by booking taxis in year *y* (pkm)

$PD_{t,y}$ = Total travelling passenger-mileage of taxis under the project activity (km)

k_B = The average unloaded ratio of the taxis under baseline scenario (%)

$k_{P,y}$ = The average unloaded ratio of the taxis under project scenario in year *y* (%)

(b) **For booking a ride sharing with another passenger(s)**, the passengers with the same or similar route share the cars for travelling, which avoids the same trip taking place for each passenger under the baseline transportation mode. The baseline passenger-mileages $PD_{b,o,y}$ is calculated by the baseline mileage and passenger number of each hailing cars sharing booking order *k* as follows:

$$PD_{b,o,y} = \sum_k \left(BD_{o,k,y} \times NP_{o,k,y} \right)$$ Equation (8)

Where:

$PD_{b,o,y}$ = Baseline passenger-mileage of hailing cars sharing (pkm)

$BD_{o,k,y}$ = Baseline travelling mileage under booking order *k* of hailing cars sharing (km)

$NP_{o,k,y}$ = Number of passengers under booking order *k* of hailing cars sharing (passenger)

k = Travelling booking order

(c) **For booking a ride sharing with the driver**, the baseline mileages of drivers $PD_{b,d,y}$ and the baseline mileage of passengers $PD_{b,p,y}$ should be determined respectively. The baseline passenger-mileages of drivers to be considered are the mileage of drivers which would not have used their personal car in the baseline scenario. The baseline passenger-mileage of passengers $PD_{b,p,y}$ should be calculated by the baseline mileage and passenger number of each hitch-riding cars booking order. The baseline passenger-mileages $PD_{b,d,y}$ and $PD_{b,p,y}$ are calculated as:

$$PD_{b,d,y} = \sum_k \left(BD_{h,d,k,y} \times ND_{h,k,y} \right) = \sum BD_{h,d,y}$$ Equation (9)

Where:

$PD_{b,d,y}$ = Baseline passenger-mileage of hitch-riding cars' drivers (pkm)

$BD_{h,d,k,y}$ = Baseline passenger-mileage of hitch-riding cars' drivers under booking order k (pkm)

$ND_{h,k,y}$	=	Number of hitch-riding cars' driver under booking order k, which equals to 1 (person)
$BD_{h,d,y}$	=	Total baseline passenger-mileage of hitch-riding cars' drivers (pkm)
k	=	Travelling booking order

$$PD_{b,p,y} = \sum_k \left(BD_{h,k,y} \times NP_{h,k,y} \right) \quad \text{Equation (10)}$$

Where:

$PD_{b,p,y}$	=	Baseline passenger-mileage of passengers travelling by hitch-riding cars (pkm)
$BD_{h,k,y}$	=	Baseline travelling mileage under booking order *k* of hitch-riding cars (km)
$NP_{h,k,y}$	=	Number of passenger under booking order *k* of hitch-riding cars (passenger)
k	=	Travelling booking order

28. The baseline emissions are the summation of the baseline emissions from each car booking model covered by the project activity.

29. To obtain the parameters of baseline mileage $BD_{o,k,y}$, $BD_{h,d,y}$ and $BD_{h,k,y}$, the planned shortest mileage between starting point and destination of each booking order should be used to avoid the inclusion of the detour mileage.

5.5. Leakage

30. No other leakage emissions are considered.

5.6. Project emissions

31. The project emissions are to be calculated as follows:

$$PE_y = PE_{t,y} + PE_{o,y} + PE_{h,y} \quad \text{Equation (11)}$$

Where:

PE_y	=	Project emissions in year *y* (tCO_2e)
$PE_{t,y}$	=	Project emissions for the booking of taxis in year *y* (tCO_2e)
$PE_{o,y}$	=	Project emissions for booking a ride sharing with another passenger(s) in year *y* (tCO_2e)
$PE_{h,y}$	=	Project emissions for booking a ride sharing with the driver in year *y* (tCO_2e)

32. Project emissions of travelling by booking taxis $PE_{t,y}$ is deemed as zero since the total travelling mileages of taxis remains the same under project activity scenario.

33. The project emissions of the travelling by booking a ride sharing with another passenger(s) are calculated as follows:

$$PE_{o,y} = D_{o,y} \times EF_{km,o,y} \times 10^{-6}$$ Equation (12)

Where:

$PE_{o,y}$ = Project emissions of the travelling by booking ride sharing with another passenger(s) in year *y* (tCO_2e)

$D_{o,y}$ = The total travelling mileage of the hailing cars under car-sharing booking orders (km)

$EF_{km,o,y}$ = The emission factor per kilometer of hailing cars in year *y* (gCO_2/km), to be calculated according to equation (6), in which the vehicle category *j* refers to hailing cars

34. The project emissions of the booking a ride sharing with the driver are calculated as follows:

$$PE_{h,y} = D_{h,y} \times EF_{km,h,y} \times 10^{-6}$$ Equation (13)

Where:

$PE_{h,y}$ = Project emissions for ride sharing with the driver in year *y* (tCO_2e)

$D_{h,y}$ = The total travelling mileage of the hitch-riding cars (km)

$EF_{km,h,y}$ = The emission factor per kilometer of hitch-riding cars in year *y* (gCO_2/km), to be calculated according to equation (6), in which the vehicle category *j* refers to hitch-riding cars

35. The emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$ Equation (14)

Where:

ER_y = Emission reductions in year *y* (tCO_2e)

BE_y = Baseline emissions in year *y* (tCO_2e)

PE_y = Project emissions in year *y* (tCO_2e)

36. Only the data of the booking orders which have been fulfilled can be included in the emission reductions.

6. Monitoring methodology

37. In addition to the parameters listed in the tables below, the procedures contained in the tools referred to in this methodology also apply.

6.1. Data and parameters monitored

Data / Parameter table 1.

Data / Parameter:	$SD_{i,j}$
Data unit:	%
Description:	Share of vehicle category *j* which would been taken in baseline scenario by passengers using car booking model *i* in the project scenario
Source of data:	Survey
Measurement procedures (if any):	The sampling survey on the travelling modes may be conducted by the project system operator or by third-party entity. The sampling may be a questionnaire survey. The target may be the passengers who take the taxis or cars using the ride-hailing app.
Monitoring frequency:	For fixed crediting period or first seven years of a renewable crediting period: The year 1 and 4. The data from the survey in year 1 shall be used for the first three years of the first crediting period while the data from the survey in year 4 shall be used until the end of the crediting period of the project activity. Second and third crediting periods of a renewable crediting period: Year 1.
QA/QC procedures:	Samples shall be based on 90/10 confidence/precision
Any comment:	-

Data / Parameter table 2.

Data / Parameter:	$SD_{t,j}$
Data unit:	%
Description:	Share of passengers booking the taxis who would take vehicle category *j* in baseline scenario
Source of data:	Survey
Measurement procedures (if any):	The sampling survey on the travelling modes may be conducted by the project system operator or by third-party entity. The sampling may be questionnaire survey. The target may be the passengers who take the taxis using the ride-hailing app.
Monitoring frequency:	For fixed crediting period or first seven years of a renewable crediting period: The year 1 and 4. The data from the survey in year 1 shall be used for the first three years of the first crediting period while the data from the survey in year 4 shall be used until the end of the crediting period of the project activity. Second and third crediting periods of a renewable crediting period: Year 1.
QA/QC procedures:	Samples shall be based on 90/10 confidence/precision
Any comment:	-

Data / Parameter table 3.

Data / Parameter:	$SD_{o,j}$
Data unit:	%
Description:	Share of passengers booking a ride with another passenger(s) who take vehicle category *j* in baseline scenario
Source of data:	Survey
Measurement procedures (if any):	The sampling survey on the travelling modes may be conducted by the project system operator or by third-party entity. The sampling may be questionnaire survey. The target may be the passengers who use the hailing cars sharing.
Monitoring frequency:	For fixed crediting period or first seven years of a renewable crediting period: The year 1 and 4. The data from the survey in year 1 shall be used for the first three years of the first crediting period while the data from the survey in year 4 shall be used until the end of the crediting period of the project activity. Second and third crediting periods of a renewable crediting period: Year 1.
QA/QC procedures:	Samples shall be based on 90/10 confidence/precision
Any comment:	-

Data / Parameter table 4.

Data / Parameter:	$SD_{h,p,j}$
Data unit:	%
Description:	Share of passengers booking a ride with the driver, where passenger take vehicle category *j* in baseline scenario
Source of data:	Survey
Measurement procedures (if any):	The sampling survey on the travelling modes may be conducted by the project system operator or by third-party entity. The sampling may be questionnaire survey. The target may be the passengers who use the hitch-riding cars.
Monitoring frequency:	For fixed crediting period or first seven years of a renewable crediting period: The year 1 and 4. The data from the survey in year 1 shall be used for the first three years of the first crediting period while the data from the survey in year 4 shall be used until the end of the crediting period of the project activity. Second and third crediting periods of a renewable crediting period: Year 1.
QA/QC procedures:	Samples shall be based on 90/10 confidence/precision
Any comment:	

Data / Parameter table 5.

Data / Parameter:	$SD_{h,d,j}$
Data unit:	%
Description:	Share of hitch-riding cars' drivers who take vehicle category *j* in baseline scenario

Source of data:	Survey
Measurement procedures (if any):	The sampling survey on the travelling modes may be conducted by the project system operator or by third-party entity. The sampling may be questionnaire survey. The target may be the hitch-riding cars' drivers.
Monitoring frequency:	For fixed crediting period or first seven years of a renewable crediting period: The year 1 and 4. The data from the survey in year 1 shall be used for the first three years of the first crediting period while the data from the survey in year 4 shall be used until the end of the crediting period of the project activity. Second and third crediting periods of a renewable crediting period: Year 1.
QA/QC procedures:	Samples shall be based on 90/10 confidence/precision
Any comment:	-

Data / Parameter table 6.

Data / Parameter:	$PE_{EL,j,y}$
Data unit:	passengers
Description:	Total number of passengers transported per annum by electricity-based vehicle category *j* in year *y*
Source of data:	As per "TOOL18: Baseline emissions for modal shift measures in urban passenger transport"
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 7.

Data / Parameter:	$D_{EL,j,y}$
Data unit:	km
Description:	Average trip distance travelled by passengers using electricity-based vehicle category *j* in year *y*
Source of data:	As per "TOOL18: Baseline emissions for modal shift measures in urban passenger transport"
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 8.

Data / Parameter:	$OC_{j,y}$
Data unit:	passengers

Description:	Average occupancy rate of vehicle category *j* in year *y*
Source of data:	As per "TOOL18: Baseline emissions for modal shift measures in urban passenger transport"
Measurement procedures (if any):	As per "TOOL18: Baseline emissions for modal shift measures in urban passenger transport"
Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 9.

Data / Parameter:	$N_{j,n,y}$
Data unit:	vkm or units
Description:	Number of vehicle-kilometers vehicle category *j* using fuel type *n* driven in year *y* (VKM) or number of vehicles in vehicle category *j* using fuel type *n* in year *y* (units).
Source of data:	The data from the project system operator, 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 national data from the statistical data or other publicly available information, such as industry research data, literature data can be used.
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	In case the data of vehicle category *j* is obtained from the system operator, the registration information of the cars in the project system should be used. Used for all vehicle categories identified as relevant. 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 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 on informal transport.
Any comment:	Used for all relevant vehicle categories. Or use the parameter $N_{j,n,y}/N_{j,y}$

Data / Parameter table 10.

Data / Parameter:	$N_{j,e,y}$
Data unit:	vkm or units
Description:	Number of vehicle-kilometers vehicle category *j* using electricity driven in year *y* (VKM) or number of vehicles in vehicle category *j* using electricity in year *y* (units).

Source of data:	The data from the project system operator, 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 national data from the statistical data or other publicly available information, such as industry research data, literature data can be used
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	In case the data of vehicle category *j* is obtained from the system operator, the registration information of the cars in the project system should be used. 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 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 on informal transport.
Any comment:	Used for all relevant vehicle categories. Or use the parameter $N_{j,e,y}/N_{j,y}$

Data / Parameter table 11.

Data / Parameter:	$N_{j,y}$
Data unit:	vkm or units
Description:	Number of vehicle-kilometers of category *j* driven in year *y* (VKM) or number of vehicles of category *j* in year *y* (units)
Source of data:	The data from the project system operator, 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 national data from the statistical data or other publicly available information, such as industry research data, literature data can be used.
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	In case the data of vehicle category *j* is obtained from the system operator, the registration information of the cars in the project system should be used. 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 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 on informal transport.

Any comment:	Used for all relevant vehicle categories. Or use the parameter $N_{j,n,y}/N_{j,y}$, $N_{j,e,y}/N_{j,y}$

Data / Parameter table 12.

Data / Parameter:	$N_{j,n,y}/N_{j,y}$
Data unit:	%
Description:	The fraction of vehicles using fuel type *n in* vehicle category *j*
Source of data:	National transport statistics based on vehicle registration statistics, company data (for buses), surveys or other publicly available information, such as industry research data, literature data.
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	In case the data of vehicle category *j* is obtained from the system operator, the registration information of the cars in the project system should be used. 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 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 on informal transport.
Any comment:	Used for all relevant vehicle categories

Data / Parameter table 13.

Data / Parameter:	$N_{j,e,y}/N_{j,y}$
Data unit:	%
Description:	The fraction of vehicles using electricity *in* vehicle category *j*
Source of data:	National transport statistics based on vehicle registration statistics, company data (for buses), surveys or other publicly available information, such as industry research data, literature data, etc.
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	In case the data of vehicle category *j* is obtained from the system operator, the registration information of the cars in the project system should be used. 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 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 on informal transport.
Any comment:	Used for all relevant vehicle categories

Data / Parameter table 14.

Data / Parameter:	$SFC_{j,n,y}$
Data unit:	mass or volume units of fuel/km
Description:	Specific fuel consumption of vehicle category *j* using fuel type *n* in year *y*
Source of data:	As per "TOOL18: Baseline emissions for modal shift measures in urban passenger transport"
Measurement procedures (if any):	As per "TOOL18: Baseline emissions for modal shift measures in urban passenger transport"
Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 15.

Data / Parameter:	$SEC_{j,e,y}$
Data unit:	kWh/km
Description:	Specific electricity consumption of vehicle category *j* using electricity in year *y*
Source of data:	As per "TOOL18: Baseline emissions for modal shift measures in urban passenger transport"
Measurement procedures (if any):	As per "TOOL18: Baseline emissions for modal shift measures in urban passenger transport"
Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 16.

Data / Parameter:	$NCV_{j,n}$
Data unit:	MJ/mass or volume units of fuel
Description:	Net calorific value of fuel *n* used in vehicle category *j*
Source of data:	As per "TOOL18: Baseline emissions for modal shift measures in urban passenger transport"
Measurement procedures (if any):	-
Monitoring frequency:	As per "TOOL18: Baseline emissions for modal shift measures in urban passenger transport"
QA/QC procedures:	As per "TOOL18: Baseline emissions for modal shift measures in urban passenger transport"
Any comment:	As per "TOOL18: Baseline emissions for modal shift measures in urban passenger transport"

Data / Parameter table 17.

Data / Parameter:	$EF_{CO2,n}$
Data unit:	g CO_2/MJ
Description:	Emission factor for fuel type *n*
Source of data:	As per "TOOL18: Baseline emissions for modal shift measures in urban passenger transport"
Measurement procedures (if any):	-
Monitoring frequency:	As per ""TOOL18: Baseline emissions for modal shift measures in urban passenger transport"
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 18.

Data / Parameter:	$EF_{CO2,y}$
Data unit:	gCO_2/kWh
Description:	Emission factor for electricity in year *y*
Source of data:	As per "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation"
Measurement procedures (if any):	As per "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation"
Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 19.

Data / Parameter:	$TDL_{j,y}$
Data unit:	%
Description:	Average technical transmission and distribution losses for providing electricity to vehicle category *j* using electricity in year *y*
Source of data:	As per "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation"
Measurement procedures (if any):	As per "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation"
Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 20.

Data / Parameter:	$PD_{t,y}$
Data unit:	km
Description:	Travelling passenger-mileage of the taxis under the project activity

Source of data:	Project system operator
Measurement procedures (if any):	Accumulated by the carrying mileage multiplying passenger number of each taxi booking order. Default value of taxi passenger number from "TOOL18: Baseline emissions for modal shift measures in urban passenger transport" may be used.
Monitoring frequency:	Monitored by each booking order, recorded at least annually
QA/QC procedures:	The maintenance and management of GPS-based positioning system or taxi odometer shall meet the requirements of relevant international/national standards. The carrying mileage should be checked with the billing data.
Any comment:	-

Data / Parameter table 21.

Data / Parameter:	k_B
Data unit:	%
Description:	Average unloaded ratio of the taxis under baseline scenario
Source of data:	In decreasing order of preference: (a) Calculated by monitoring the taxis' unloaded mileage and total travelling mileage; (b) The data obtained from local taxi company; (c) The statistical data in the city, region or the country where the project activity takes place; (d) The data from other publicly available information, such as industry research data, literature data, etc.
Measurement procedures (if any):	If the data source by monitoring the mileage of the taxis is chosen, the data can be monitored with the assistant of local taxi company or administrative department or by sampling survey. The vintage of the data may be as follows in decreasing order of preference: 1. The data of the taxis without ride-hailing app in year *y*; 2. The lowest value of the data in the most recent 3 years before the starting date of the project.
Monitoring frequency:	Once, before the project start date
QA/QC procedures:	In case sampling survey is conducted, samples shall be based on 90/10 confidence/precision. The mileage data should be monitored and recorded by GPS, odometer or other electronic method. The maintenance and management of GPS-based positioning system or odometer shall meet the requirements of relevant international/national standards.
Any comment:	All the existing practices for booking taxi should be considered for the determination of k_B. The existing practices may include taxi cruising, taxi waiting at the taxi stand or passenger calling taxi service centre, etc.

Data / Parameter table 22.

Data / Parameter:	**Unloaded mileage of taxis under baseline scenario**
Data unit:	km
Description:	Unloaded travelling mileage of the taxis under baseline scenario
Source of data:	If the data source of k_B by monitoring is chosen, the data can be monitored with the assistance of local taxi company or administrative department or by sampling survey.
Measurement procedures (if any):	Using GPS and odometer to record the total travelling mileage and the mileage carrying passenger. The difference should be the unloaded mileage. All the existing practices for booking taxi should be considered. The existing practices may include taxi cruising, taxi waiting at the taxi stand or passenger calling taxi service centre, etc. For total travelling mileage, only the mileage under business mode of taxis should be considered. The mileage during the period when the taxi is not available for carrying passengers, such as shifting duty or the driver travelling home, should not be included as total travelling mileage.
Monitoring frequency:	Once, before the project start date
QA/QC procedures:	In case sampling survey is conducted, samples shall be based on 90/10 confidence/precision. The mileage data should be monitored and recorded by GPS, odometer or other electronic method. The maintenance and management of GPS-based positioning system or odometer shall meet the requirements of relevant international/national standards. The carrying mileage should be checked with the billing data.
Any comment:	Used for calculating k_B when option (a) is selected.

Data / Parameter table 23.

Data / Parameter:	$k_{P,y}$
Data unit:	%
Description:	Average unloaded ratio of the taxis under project scenario in year *y*
Source of data:	The data obtained from local taxi company by monitoring the taxis' unloaded mileage and total travelling mileage in the city.
Measurement procedures (if any):	The data may be obtained by monitoring 100% of the taxis under the project activity, or by sampling survey
Monitoring frequency:	Annually
QA/QC procedures:	In case sampling survey is conducted, samples shall be based on 90/10 confidence/precision. The mileage data should be monitored and recorded by GPS, odometer or other electronic method. The maintenance and management of GPS-based positioning system or odometer shall meet the requirements of relevant international/national standards.

Any comment:	The traveling mileage during the period when driver turn-off their availability in the system should be included. If it is not able to know whether the taxi is taking any passenger during the period, the mileage during the period should be deemed as unloaded mileage to be conservative.

Data / Parameter table 24.

Data / Parameter:	**Unloaded mileage of taxis under project scenario**
Data unit:	km
Description:	Unloaded travelling mileage of the taxis under project scenario
Source of data:	Project system operator
Measurement procedures (if any):	The data may be obtained by monitoring 100% of the taxis under the project activity, or by sampling survey. Using GPS and odometer to record the total travelling mileage and the mileage carrying passenger. The difference should be the unloaded mileage. The traveling mileage during the period when driver turn-off their availability in the system should be included in the total travelling mileage. If it is not able to know whether the taxi is taking any passenger during the period, the mileage during the period should be deemed as unloaded mileage to be conservative.
Monitoring frequency:	Annually
QA/QC procedures:	In case sampling survey is conducted, samples shall be based on 90/10 confidence/precision. The mileage data should be monitored and recorded by GPS, odometer or other electronic method. The maintenance and management of GPS-based positioning system or odometer shall meet the requirements of relevant international/national standards.
Any comment:	Used for calculating $k_{P,y}$ when option (a) is selected.

Data / Parameter table 25.

Data / Parameter:	$\boldsymbol{BD_{o,k,y}}$
Data unit:	km
Description:	Baseline travelling mileage under booking order *k* of hailing cars sharing
Source of data:	Project system operator
Measurement procedures (if any):	The baseline mileage should be recorded as the shortest planned mileage between the starting point and the destination of each hailing cars sharing booking order. The method how the planed mileage is determined should be justified to ensure the reasonableness and conservativeness of baseline travelling mileage data.
Monitoring frequency:	Monitored by each booking order, recorded at least annually

QA/QC procedures:	The maintenance and management of GPS-based positioning system or odometer shall meet the requirements of relevant international/national standards. The mileage data should be checked with the billing data.
Any comment:	-

Data / Parameter table 26.

Data / Parameter:	$NP_{o,k,y}$
Data unit:	km
Description:	Number of passenger under booking order *k* of hailing cars sharing
Source of data:	Project system operator
Measurement procedures (if any):	When booking hailing cars, passenger usually need to submit the number of passenger under the booking order to meet the carrying capacity of hailing cars. The project system should record the data correspondingly to $BD_{o,k,y}$
Monitoring frequency:	Monitored by each booking order, recorded at least annually
QA/QC procedures:	The passenger data shall be recorded by a data logger and be protected such that it cannot be modified artificially.
Any comment:	-

Data / Parameter table 27.

Data / Parameter:	$BD_{h,d,y}$
Data unit:	km
Description:	Total baseline passenger-mileage of hitch-riding cars' drivers
Source of data:	Project system operator
Measurement procedures (if any):	Accumulated and recorded as the shortest planned mileage between the starting point and the destination of the hitch-riding cars' drivers. The method how the planned mileage is determined should be justified to ensure the reasonableness and conservativeness of baseline travelling mileage data.
Monitoring frequency:	Monitored by each booking order, recorded at least annually
QA/QC procedures:	The maintenance and management of GPS-based positioning system or taxi odometer shall meet the requirements of relevant international/national standards.
Any comment:	-

Data / Parameter table 28.

Data / Parameter:	$BD_{h,k,y}$
Data unit:	km
Description:	Baseline travelling mileage under order *k* of hitch-riding cars
Source of data:	Project system operator

Measurement procedures (if any):	The baseline mileage should be recorded as the shortest planned mileage between the starting point and the destination of each hitch-riding cars booking order booking order. The method how the planed mileage is determined should be justified to ensure the reasonableness and conservativeness of baseline travelling mileage data.
Monitoring frequency:	Monitored by each booking order, recorded at least annually
QA/QC procedures:	The maintenance and management of GPS-based positioning system or odometer shall meet the requirements of relevant international/national standards. The mileage data should be checked with the billing data.
Any comment:	-

Data / Parameter table 29.

Data / Parameter:	$NP_{h,k,y}$
Data unit:	km
Description:	Number of passenger under order *k* of hitch-riding cars
Source of data:	Project system operator
Measurement procedures (if any):	When booking hitch-riding cars, passenger usually need to submit the number of passenger under the booking order to meet the carrying capacity of hitch-riding cars. The project system should record the data correspondingly to $BD_{h,k,y}$
Monitoring frequency:	Monitored by each booking order, recorded at least annually
QA/QC procedures:	The passenger data shall be recorded by a data logger and be protected such that it cannot be modified artificially.
Any comment:	-

Data / Parameter table 30.

Data / Parameter:	$D_{o,y}$
Data unit:	km
Description:	The total travelling mileage of the hailing cars under car-sharing booking orders.
Source of data:	Project system operator
Measurement procedures (if any):	The data should be monitored and recorded by GPS, odometer or other electronic method.
Monitoring frequency:	Continuously, recorded at least annually
QA/QC procedures:	The maintenance and management of GPS-based positioning system or taxi odometer shall meet the requirements of relevant international/national standards.
Any comment:	

Data / Parameter table 31.

Data / Parameter:	$D_{h,y}$
Data unit:	km

Description:	The total travelling mileage of the hitch-riding cars
Source of data:	Project system operator
Measurement procedures (if any):	The data should be monitored and recorded by GPS, odometer or other electronic method.
Monitoring frequency:	Continuously, recorded at least annually
QA/QC procedures:	The maintenance and management of GPS-based positioning system or taxi odometer shall meet the requirements of relevant international/national standards.
Any comment:	

Appendix 1. Methodological design of survey

1. Survey objective

1. The survey objective is to determine the baseline travelling modes in absence of the project activity and the ratio of each baseline travelling mode.

2. Target population

2. The target population are all passengers who use taxis, ride hailing cars or hitch-riding cars, as well as the drivers of hitch-riding cars under the project activity, respectively.

3. Sample frame

3. Data for the passenger/driver frame is obtained from the project system.

4. Sample design

4. Since the travelling activity take place across the city, the simple random sampling may be applied.

5. Sample frequency

5. The survey is realized minimum once during the year 1 and 4 of the crediting period. The survey shall take place during an entire week. The selected week shall not correspond to a public holiday and shall be representative for the average demand for transport services in the considered year.

6. Sample size

6. The latest version of “Sampling and surveys for CDM project activities and programme of activities” and “Guidelines for sampling and surveys for CDM project activities and programme of activities” should be applied.

7. Selection method of the sample

7. It is necessary to ensure that the sample selection process is completely random and not affected by any variables such as age and gender. The selection of the sample will be performed according to the systematic sampling design and considering the following steps:

   (a) A random starting point is generated according to the statistics tables of uniform distribution between 1 and the average flow of passengers in the evaluation hour;

   (b) Systematic selection of passengers: every nth passenger using the taxi, hailing cars sharing or hitch-riding cars service, starting with the random number. In this way, if the random number is 10, the first passenger selected is the 10th that uses the booking service for taxis, hailing cars sharing or hitch-riding cars, the 2nd n+10 and thus successively every nth passenger. The number n, called selection interval, will be determined based on the passenger flow per hour and

the sample distribution of the specific measurement day. For the driver of hitch-riding cars, the similar approach may be applied.

8. Survey realization

8. The following principles are to be followed in the survey realization:

(a) Non-responses should be recorded;

(b) Record and store all original surveys;

(c) Surveys can be conducted through the ride-hailing app. The respondents should be numbered based on the survey date and time. It should be avoided to realize the survey with people de-boarding the cars as latter will not want to invest time in a survey thus potentially giving wrong answers.

9. The questionnaire can be sent to the target to be surveyed through the ride-hailing app. The following phase should be followed:

(a) Preparation phase

This phase is characterized by the development of all the activities previous to the execution of the survey realization and it is divided in:

(i) Determine the survey questionnaire, and draft the manual on information collection and basic concepts. The manual on information collection and basic concepts covers the questionnaire structure, the instructions and specifications for filling in the questionnaire, the definitions and basic concepts of the study and the instructions and formats used;

(ii) Relevant materials should be prepared including the explanation on the basic concepts, relevant instructions, and so on. The materials should be sent to the passengers through the project system platform before the investigation begins, so that the participants can understand the background, significance and requirements of the survey when they receive the questionnaire. Preliminary tests can be conducted prior to the actual survey to understand passenger acceptance of the questionnaire and to ensure that all the concepts are clearly defined and the questions are not ambiguously phrased and avoid interviewer errors. Interviewers may misread the question or twist the answers in their own words and thereby introduce bias. The pre-test has to detect and minimize this potential error;

(iii) The results of the pre-test will be documented and will be taken into consideration for the modification of the final instrument and for the preparation of the model of information collection;

(b) Validation process of the information:

(i) A supervisor should be used to carry out the survey verifications, guaranteeing the validity of the gathered information as well as the attained coverage. At least the questions on the default questionnaire included below is to be used. This questionnaire should be used by all projects except if valid arguments exist to change the questionnaire and to adapt it to local circumstances. The questionnaire shall be realized in the local

language. The questionnaire needs to be adapted to national or local circumstances, the wording needs to be checked locally and local test-runs should be performed to ensure that the questions are simple, easily understood, cannot be misinterpreted and lead to reliable results.

(c) Collection of the survey result:

(i) The result of the survey should be archived in time to avoid missing data.

Appendix 2. Default questionnaire

Date : ……

Time : …….

Location:

General Data of Interviewed Person

Age of interviewed person:

☐ 12-17 years
☐ 18-25 years
☐ 26-35 years
☐ 36-45 years
☐ 46-55 years
☐ 56-65 years
☐ over 65 years

Gender of the interviewed person

☐ Female ☐ Male

Details about the current trip
1. Starting point of the travelling:

2. Destination of the travelling:

3. Car booking model used to travel

☐ Booking taxi;
☐ Booking a ride with another passenger(s);
☐ Booking a ride driver (passenger);
☐ Hitch-riding cars' driver.

4. The frequency of your use (or plan to use) of taxi/hailing cars sharing/hitch-riding cars is:

Car booking model	**Frequency of usage**		
	Almost every day	**Occasionally**	**Rarely**
Booking taxi			
Booking a ride with another passenger(s)			
Booking a ride driver (passenger)			
Hitch-riding cars' driver			

5. If there is no taxi/hailing cars sharing/hitch-riding cars booking service, which way do you choose to arrive at your destination? (please choose one item)

☐ Bus;
☐ Private car
If you choose a private car: does your private car use renewable fuels? Yes ☐; No ☐;
☐ Taxi[1];
☐ Private motorcycles
If you choose a motorcycle: does your motorcycle use renewable fuels? Yes ☐; No ☐;
☐ Urban rail transit;
☐ Passenger tricycle;
☐ Bicycles;
☐ Walking;
☐ No travelling;
☐ Others

Note: The information on date, time, location and travel information can also be automatically recorded by the project system platform to reduce the content to be filled by the respondents and to improve the response ratio and the accuracy of information.

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Document information

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01.0	11 March 2019	MP 78, Annex 8 To be considered by the Board at EB 102.

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[1] Should not be an option for passengers booking a taxi using ride-hailing app