PROPOSED NEW BASELINE AND MONITORING METHODOLOGY OR METHODOLOGICAL TOOL FORM FOR EMISSION REDUCTIONS ACTIVITIES
(Version 02.0)

INFORMATION TO BE COMPLETED BY THE SECRETARIAT AND METHODOLOGIES EXPERT PANEL	
Type of standard	Choose an item.
Unique reference number and title of the proposed new methodology or new methodological tool	>>
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[1] Format for footnotes.

SECTION A. Summary and applicability of the baseline and monitoring methodology or methodological tool

A.1. Title, submission date and version

Title: GHG emission reductions through shifting to a low-carbon navigation route for passenger vehicles

Submission date: 26/04/2026

Version: 01.0

A.2. If this methodology or methodological tool is based on a previous submission or an approved Article 6.4 mechanism methodology or methodological tool, please state the reference numbers here. Explain briefly the main differences and their rationale.

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This methodology is not based on a previous submission or an approved Article 6.4 mechanism methodology.

However, it is a revised version incorporating inputs and feedback from MEP, which completed its **Initial Assessment** on 25/03/2026.

A.3. Summary description of the methodology or methodological tool, including major baseline and monitoring methodological steps.

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This methodology applies to activities that establish and implement a low-carbon navigation mechanism for passenger vehicles, which identifies the low-carbon route within each navigation planning scheme and prompts such low-carbon route to facilitate drivers to adopt it in road transport. The mechanism is integrated into an existing navigation platform and comprises the new functionality of (1) identifying the low-carbon route within each navigation planning scheme, (2) prompting drivers with such low-carbon route, and (3) monitoring low-carbon route navigation compliance. The eligible vehicles under this methodology include the entire stock of passenger vehicles using petrol as the sole fuel, rather than being limited to a specific fleet. Under the activity scenario, they may choose to shift to low-carbon navigation routes on a voluntary basis.

Emission reductions are achieved by identifying and prompting low-carbon routes, enabling drivers to adopt the lowest-emission planned route (i.e. the low-carbon route) to complete a driving trip that would otherwise have been completed following the drivers' existing pattern of route adoption in the absence of the Article 6.4 activity.

The baseline scenario is the continuation of the pre-activity scenario, i.e. the drivers' existing pattern of route adoption in the absence of the proposed project. Baseline emissions are further subject to the downward adjustment in accordance with applicable provisions.

All parameters and information that are related to baseline and activity scenario are comprehensively addressed within the monitoring framework and are thoroughly accounted for in the subsequent sections.

SECTION B.	Proposed new baseline and monitoring methodology or methodological tool

1. Introduction

1. The following table presents a summary of the key elements of a methodology:

Table 1. Methodology key elements

Type of GHG mitigation measure(s)	☐ Fuel/feedstock switch ☐ Technology switch ☐ GHG destruction ☒ GHG formation avoidance ☐ Engineered carbon dioxide removal ☐ Nature based carbon dioxide removal
Types of mitigation outcomes achieved under this methodology	☒ Emission reductions ☐ Removals
Are the mitigation outcomes under this methodology at risk of reversal?	☐ Yes ☒ No
Typical projects eligible under the methodology	Typical projects eligible under this methodology involve establishing and implementing a low-carbon navigation mechanism for passenger vehicles, which is integrated into an existing navigation platform and includes new functionality of (1) identifying the low-carbon route within each navigation planning scheme, (2) prompting drivers with such low-carbon route, and (3) monitoring low-carbon route navigation compliance. The eligible vehicles under this methodology include the entire stock of passenger vehicles using petrol as the sole fuel, rather than being limited to a specific fleet. Under the activity scenario, they may choose to shift to low-carbon navigation routes on a voluntary basis.

2. Scope and entry into force

2.1. Scope

2. This methodology applies to activities that establish and implement a low-carbon navigation mechanism for passenger vehicles, which identifies and prompts the low-carbon route within each navigation planning scheme, enabling drivers to adopt such low-carbon route in road transport. The mechanism is integrated into an existing navigation platform and comprises the new functionality of (1) identifying the low-carbon route within each navigation planning scheme, (2) prompting drivers with such low-

carbon route, and (3) monitoring low-carbon route navigation compliance. The eligible vehicles under this methodology include the entire stock of passenger vehicles using petrol as the sole fuel, rather than being limited to a specific fleet. Under the activity scenario, they may choose to shift to low-carbon navigation routes on a voluntary basis.

2.2. Entry into force

[For the UNFCCC secretariat to complete - Leave blank]

2.3. Applicability of sectoral scopes

3. Designated operational entities validating and verifying Article 6.4 activities that use this methodology shall apply sectoral scope(s):

[For the UNFCCC secretariat to complete – leave blank]

3. Definitions

4. In addition to the definitions contained in the 'Article 6.4 mechanism Glossary of Terms', the following definitions apply for the purpose of this methodology:

(a) **Engine Displacement** – The total volume swept by all the pistons inside the cylinders of an internal combustion engine between the top dead centre (TDC) and bottom dead centre (BDC) positions during one complete engine cycle. It is typically expressed in liters (L) and is commonly used as an indicator of engine size and capacity.

(b) **WLTC (Worldwide harmonized Light vehicles Test Cycle)** – The standardized speed-time test cycle developed under the United Nations Economic Commission for Europe (UNECE) Regulation No. 154[2] / Global Technical Regulation No. 15 (GTR No. 15)[3]. It specifies the speed profile, duration, and load conditions for chassis dynamometer testing of light-duty vehicles, consisting of four phases (low, medium, high, extra-high speed). WLTC is the core test cycle within the WLTP framework.

(c) **WLTP (Worldwide harmonized Light vehicles Test Procedure)** – The full regulatory framework defined in UNECE GTR No. 15 and transposed into the regionally binding UN Regulation No. 154. It includes all test conditions and requirements for determining light-duty vehicle fuel consumption, CO_2 emissions, and pollutant emissions, including chassis dynamometer set-up, road load determination, test cycle execution (WLTC), data processing, and correction procedures.

(d) **WLTC Combined Fuel Consumption** – The weighted average fuel consumption of a light-duty vehicle powered solely by an internal combustion engine, measured over the complete WLTC test cycle (including low, medium, high, and extra-high speed phases) under the WLTP procedure. It is calculated according to the distance-based weighting factors specified in GTR No. 15 and expressed in litres per 100 kilometres (L/100 km) or equivalent units, representing the vehicle's fuel consumption performance under standardized laboratory conditions.

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2 https://unece.org/sites/default/files/2021-08/R154e.pdf

3 https://unece.org/sites/default/files/2022-06/ECE-TRANS-180a15am6e.pdf

(e) **Low-Carbon Route** – The planned route that generates lowest CO2 emissions among all planned routes within a navigation planning scheme through comparative calculation.

(f) **Navigation Planning Scheme** – A set of at least two planned routes from the departure point to the destination of a driving trip, generated and presented by the navigation platform to a driver in a single vehicle navigation service.

(g) **Navigation Platform** – A digital platform that provides route planning and guidance services to drivers based on geospatial data and real-time traffic information. It collects and processes location, routing, and travel behaviour data from drivers, generates planned routes, and presents these routes to drivers through a digital interface.

(h) **Passenger vehicle** – A small or micro vehicle designed to carry no more than nine persons, including the driver.

(i) **Planned route** – A route generated by the navigation platform within a navigation planning scheme, intended for a driver to complete a specific driving trip. Each planned route specifies the sequence of links from point of departure to destination and is associated with attributes such as distance, estimated travel time, and, where applicable, low-carbon prompt. A planned route serves as one of the options presented to the driver for route adoption during the navigation process.

(j) **Speed-Emission Factor** – The quantity of CO_2 emissions generated by a vehicle traveling one kilometre at a specific speed.

(k) **Vehicle Navigation Service** – A service using GIS-based electronic maps together with positioning and communication technologies, locates vehicles, identifies destinations, and determines the optimal driving route, and provides static or dynamic travel information and real-time route guidance to drivers.
Note: if a new route is presented to drivers during the journey, it shall be counted as a separate vehicle navigation service.

4. Normative references

5. This proposed baseline and monitoring methodology is based on the following proposed new methodologies and/or approved or consolidated methodologies:

(a) Not applicable.

6. This methodology also refers to the latest approved versions of the following methodological tools:

(a) Not applicable.

7. This methodology is based on the following sources of information:

(a) A6.4-STAN-METH-001 Standard: Application of the requirements of Chapter V.B (Methodologies) for the development and assessment of Article 6.4 mechanism methodologies, Version 01.1.

(b) A6.4-STAN-METH-003 Standard: Demonstration of additionality in mechanism methodologies, Version 01.2.

(c) A6.4-STAN-METH-004 Standard: Setting the baseline in mechanism methodologies, Version 01.0.

(d) A6.4-STAN-METH-005 Standard: Addressing leakage in mechanism methodologies, Version 01.0.

(e) A6.4-AMT-001 Methodological tool: Common practice analysis, Version 01.0.

(f) A6.4-AMT-002 Methodological tool: Investment analysis, Version 01.0.

5. Applicability

8. The methodology is applicable under the following conditions:

   (a) The methodology is applicable under the following conditions:

      (i) The activity shall add new functionality to an existing navigation platform, including (1) identifying the low-carbon route within each navigation planning scheme, (2) prompting drivers with such low-carbon route, and (3) monitoring low-carbon route navigation compliance. This applicability condition shall be demonstrated in the Project Design Document (PDD) and be assessed at the initial validation.

      (ii) The activity participant shall ensure that passenger vehicles powered by energy types other than petrol shall be excluded from calculation of emission reductions. This applicability condition shall be demonstrated in the Project Design Document (PDD) and be assessed at the initial validation.

   (b) The methodology is not applicable under the following condition:

      (i) The activities involving non-navigation-based interventions, such as replacement of or retrofit to vehicle parts, fuel switches, fuel efficiency improvement, etc.

9. The applicability conditions are defined according to the *Standard: Setting the baseline in mechanism methodologies (v.01.0)* and Section 1 of its Appendix, to clearly specify the circumstances under which the methodology may be applied. In addition, the point in time at which each applicability condition shall be assessed is explicitly stipulated to provide transparency and consistency in the application of the methodology.

6. Avoidance of double-counting

10. To avoid double counting of emission reductions, the activity must meet the following criteria:

   (a) An agreement shall be signed between the vehicle drivers and the activity participant, stipulating that the activity participant is entitled to all A6.4ERs generated from shifting to a low-carbon navigation route to complete a driving trip that would otherwise have been completed following the drivers' existing pattern of route adoption, and the vehicle drivers shall not claim A6.4ERs or carbon credits from any carbon crediting mechanisms.

   (b) The activity participant shall demonstrate that the emission reductions resulting from the adoption of low-carbon routes are not covered by, or credited under, any mandatory domestic mitigation schemes (e.g. emission trading systems). Where such overlap is identified, either (a) the affected portion of emission reductions shall be excluded from the calculation of A6.4ERs, or (b) appropriate measures (e.g. cancellation of allowances under the relevant emissions trading system) shall be undertaken prior to issuance of A6.4ERs to avoid double counting.

(c) The activity participant shall demonstrate that the mitigation outcomes generated from the adoption of low-carbon routes are not simultaneously claimed in other frameworks or environmental markets, except for outcomes not related to reducing greenhouse gases emissions.

11. The provisions of avoidance of double counting are considered based on Section 8 of the Appendix to the baseline standard to respectively address overlap with mandatory domestic mitigation schemes, and overlap with other frameworks or environmental markets.

7. Demonstration of alignment with the policies, options and implementation plans with regard to the NDC and LT-LEDS of the host Party and the long-term temperature goal of the Paris Agreement and long-term goals of the Paris Agreement

12. Activity participants shall provide to the DOE responsible to perform the validation of the Article 6.4 project an assessment, undertaken by the DNA of the host Party, of the activity's consistency with Decision 3/CMA.3 paragraph 40 (c) and paragraph 27 (a) as part of the host Party's approval.

8. Activity Boundary

13. The geographic extent of the activity boundary shall encompass all low-carbon routes adopted under the Article 6.4 activity to complete driving trips and the routes that would otherwise have been adopted to complete the same driving trips under the baseline scenario.

14. The spatial extent of activity boundary shall include drivers' passenger vehicles.

15. The activity boundary is defined at the activity level.

Table 2. Emissions sources and sinks included in or excluded from the activity boundary

	Source	GHG			Justification / Explanation
BASELINE	Emissions from passenger vehicles completing driving trips by following existing pattern of route adoption	CO_2	☒ Included ☐ Not included	☐ Controlled ☐ Related to ☒ Affected by	This is a major emission source associated with petrol-fuelled passenger vehicles used under the baseline scenario, where driving trips would have been completed following the existing pattern of route adoption.

	Source	GHG			Justification / Explanation
		CH_4	☐ Included ☒ Not included	☐ Controlled ☐ Related to ☐ Affected by	This is a minor emission source associated with petrol-fuelled passenger vehicles used under the baseline scenario, where driving trips would have been completed following the existing pattern of route adoption. Since the quantity of this emission source is also reduced under the activity scenario, excluding it from both baseline and activity scenarios is considered conservative.
		N_2O	☐ Included ☒ Not included	☐ Controlled ☐ Related to ☐ Affected by	This is a major emission source associated with petrol-fuelled passenger vehicles used under the baseline scenario, where driving trips would have been completed following the existing pattern of route adoption. Since the quantity of this emission source is also reduced under the activity scenario, excluding it from both baseline and activity scenarios is considered conservative.
ACTIVITY	Emissions from passenger vehicles completing driving trips by adopting the low-carbon route within a navigation planning scheme	CO_2	☒ Included ☐ Not included	☐ Controlled ☐ Related to ☒ Affected by	This is a major emission source associated with petrol-fuelled passenger vehicles used under the activity scenario, where driving trips are completed following the existing pattern of route adoption.
		CH_4	☐ Included ☒ Not included	☐ Controlled ☐ Related to ☐ Affected by	This is a minor emission source associated with petrol-fuelled passenger vehicles used under the activity scenario, where driving trips are completed following the existing pattern of route adoption. Since the quantity of this emission source is also reduced under the activity scenario, excluding it from both baseline and activity scenarios is considered conservative.

	Source	GHG			Justification / Explanation
		N_2O	☐ Included ☒ Not included	☐ Controlled ☐ Related to ☐ Affected by	This is a minor emission source associated with petrol-fuelled passenger vehicles used under the activity scenario, where driving trips are completed following the existing pattern of route adoption. Since the quantity of this emission source is also reduced under the activity scenario, excluding it from both baseline and activity scenarios is considered conservative.
LEAKAGE	No significant leakage is identified for the implementation of Article 6.4 activities under this methodology	CO_2	☐ Included ☒ Not included	☐ Controlled ☐ Related to ☐ Affected by	No significant leakage is identified for the implementation of Article 6.4 activities under this methodology
		CH_4	☐ Included ☒ Not included	☐ Controlled ☐ Related to ☐ Affected by	No significant leakage is identified for the implementation of Article 6.4 activities under this methodology
		N_2O	☐ Included ☒ Not included	☐ Controlled ☐ Related to ☐ Affected by	No significant leakage is identified for the implementation of Article 6.4 activities under this methodology

9. Demonstration of additionality

9.1. Regulatory analysis

16. The regulatory analysis must demonstrate that legal requirements do not:

    (a) Directly require the Article 6.4 activity, such as a law mandating low-carbon route identification and prompt through navigation platforms or mandating adoption of low-carbon route by driver.

    (b) Indirectly require it by prohibiting alternatives such as banning presentation of other routes within a navigation planning scheme generated by the navigation platforms.

    (c) Establish a support scheme that would achieve the same emission reductions, such as government programs for low-carbon guidance matching the Article 6.4 activity's mitigation outcomes.

17. The analysis shall be based on credible, current evidence and justified with references. Activity participants must:

    (a) Identify all applicable laws, regulations, or policies in the host Country related to transport, emissions, or digital navigation.

    (b) Assess if they require technological, performance, or management actions overlap with the activity.

18. If a relevant mandate takes effect during the crediting period, credits can only be claimed up to the date that mandate becomes legally effective.

19. The analysis must apply the assumption that all legal requirements are enforced, unless documented and credible evidence demonstrates non-enforcement is widespread.

20. The regulatory analysis shall be conducted at the time of PDD validation and at each renewal of the crediting period, or more frequently if required by the host Country or relevant Article 6.4 standards.

21. The methodology's terms are reasonably applicable as they fully conform to the requirements of the relevant Article 6.4 mechanism standards, while ensuring operability through clear, actionable steps that activity participants can implement with available data and resources. Specifically, the methodology specifies that the regulatory analysis shall be conducted in accordance with the additionality standard. This analysis must consider all relevant and published national, sub-national, and local laws and regulations, requiring activity participants to review national or local transport policies to ensure they do not directly or indirectly mandate low-carbon route identification and prompt through navigation platforms or adoption low-carbon route by drivers. Additionally, the analysis must take into account the equivalent mitigation outcomes expected under this methodology, ensuring that the activity's emission reductions are beyond what would occur under existing legal or regulatory frameworks.

9.2. Avoidance of locking-in the level of emissions

22. All Article 6.4 activities eligible under this methodology shall consist of behavioural or operational measures in the navigation platform, such as the identification and prompting of low-carbon navigation routes for passenger vehicles. Such activities do not lead to the adoption of, or prolong the lifetime of, technologies or practices that are incompatible with the long-term goals of the Paris Agreement, taking into account national circumstances, approaches and pathways. Therefore, all activities applying this methodology shall be deemed to comply with the requirement of paragraph 29(a) of the standard without lock-in risk.

23. The methodology primarily achieves emission reductions by facilitating drivers to adopt low-carbon navigation routes, ensuring that it does not extend the operational lifespan of vehicles, thereby avoiding the locking-in of emission levels.

24. In particular, the adoption of low-carbon navigation routes with existing petrol-fuelled vehicles does not create a risk of locking in emissions. It is a transitional, efficiency-enhancing measure that makes use of the existing vehicle fleet without extending the technical lifetime of petrol-fuelled vehicles.

25. By encouraging broader use of low-carbon navigation routes, the methodology also supports systemic behavioural changes, aligning with the long-term temperature goals of the Paris Agreement and contributing to low-emission development strategies.

9.3. Investment analysis, Barrier analysis and Common practice analysis

9.3.1. Investment analysis

26. Latest version of A6.4-AMT-002 Methodological tool: Investment analysis shall be applied for investment analysis under this methodology.

27. Step 1: Identify realistic and credible alternative scenarios

The realistic and credible alternative scenario under this methodology shall be the continuation of the pre-activity scenario, i.e. the drivers' existing pattern of route adoption in the absence of the proposed project.

28. Step 2: Determine appropriate analysis method

Article 6.4 activities may be implemented by either the activity participants or other entities.

(a) Option I – Simple cost analysis: Apply if the Article 6.4 activity generates no cost savings or revenues other than from A6.4ERs.

(b) Option II – Benchmark analysis: Apply if the activity generates cost savings or other revenues in addition to A6.4ERs.

29. Step 3: The assessment period for investment analysis shall be equivalent to the activity lifetime, but shall not be shorter than 10 years. Where there is no end date for the implemented activity, an assessment period equivalent to the crediting period shall be used for the analysis.

30. Step 4: Conduct investment analysis

The analysis shall be based on data and information available to the entity's decision-making management at the start date of the Article 6.4 activity, as defined in the "Standard: Article 6.4 activity standard for projects[4]". If the PDD is submitted for validation prior to the start date, the analysis shall be updated through the submission of a request for approval of post-registration changes in accordance with the procedure "Article 6.4 activity cycle procedure for projects" (A6.4-PROC-AC-002) or as part of the first verification of emission reductions, based on data and information available at the start date.

(a) Option I – Simple cost analysis

(i) Activity participants shall demonstrate that the implementation of an Article 6.4 activity incurs costs but does not generate any cost savings or revenues, except for revenues from A6.4ERs during the assessment period.

(ii) Activity participants shall demonstrate that the alternative scenario does not generate any cost savings or revenues during the assessment period.

(iii) If the public funding available to the Article 6.4 activity, expressed in grant equivalents, is larger than the expected revenues from A6.4ERs (e.g., based on common market prices for A6.4ERs for the type of Article 6.4 activity), activity participants shall demonstrate that public funding would not have filled the funding gap of the Article 6.4 activity (considering capital expenditure (CAPEX) and operational expenditure (OPEX)) in the absence of revenues from A6.4ERs,

(iv) Implementation costs shall not include any transaction costs associated with generating A6.4ERs (e.g. PDD preparation, validation, verification, UNFCCC fees).

(b) Option II – Benchmark analysis

[4] https://unfccc.int/process-and-meetings/bodies/constituted-bodies/article-64-supervisory-body/rules-and-regulations#Standards

(i) Activity participants shall select either equity or project internal rate of return (equity IRR or project IRR) for the analysis. The selected financial indicator shall be consistent with the cash flow basis used for the analysis.

(ii) The residual value of assets at the end of the assessment period shall be included in the analysis.

(iii) The financial benchmark shall be the more conservative of:

a) The benchmark used by the entity implementing the Article 6.4 activity; or

b) The market benchmark.

(iv) The analysis shall include all relevant costs (CAPEX, OPEX, monetized barriers) and all revenues and cost savings, including public funding/subsidies, where applicable.

(v) All parameters and assumptions used in the analysis shall be internally consistent. Cash flows must be expressed consistently with the chosen financial indicator in either real or nominal terms.

(vi) Activity participants shall demonstrate that public funding would not have filled the funding gap of the Article 6.4 activity (considering CAPEX and OPEX and any revenues other than A6.4ERs of the activity) to meet the benchmark in the absence of revenues from A6.4ERs, if the public funding available to the Article 6.4 activity, expressed in grant equivalents, is larger than the expected revenues from A6.4ERs (e.g., based on common market prices for A6.4ERs for the type of Article 6.4 activity).

(vii) Transaction costs of generating A6.4ERs shall be excluded from the financial viability analysis.

(viii) The investment analysis must be presented in a transparent manner with all assumptions and data provided (preferably in the PDD or annexes) to allow reproducibility. Justify assumptions so they can be validated by the DOE.

(ix) A sensitivity analysis must be conducted to test robustness of the conclusion to reasonable variations in key parameters and assumptions, including CAPEX, OPEX, revenues and cost savings, as applicable.

31. Step 5: Outcome of investment analysis

(a) Option I – Simple cost analysis

If the analysis outcome based on credible evidence demonstrates that the Article 6.4 activity incurs costs, and both the Article 6.4 activity and the alternative scenario generate no savings/revenues, the activity is considered additional.

(b) Option II – Benchmark analysis

If the Article 6.4 activity's financial indicator is less favourable than the benchmark, including after sensitivity analysis, and credible evidence demonstrates that the incentives from A6.4ERs enable the implementation of the Article 6.4 activity, the activity is not considered financially viable and is considered additional.

32. The methodology specifies that the latest version of A6.4-AMT-002 Methodological tool: Investment analysis shall be applied for investment analysis.

33. Based on the analysis conclusion of this methodology in section 10.4, which identifies only one plausible alternative—namely, the continuation of pre-activity existing patterns of route adoption by drivers without guidance for low-carbon routes—and taking into account the potential for the activity to generate or not generate revenues (including public funding or subsidies) or cost savings beyond A6.4ERs, the methodology provides two alternative options for conducting the investment analysis.

34. The methodology further specifies requirements for the assessment period, ensuring consistency between the assumptions, data, and parameters used and those submitted to the entity's decision-making body on the activity's start date. Additionally, it mandates the determination of appropriate benchmark values and requires the performance of a sensitivity analysis to confirm that the investment analysis fully complies with the additionality standard.

9.3.2. Barrier analysis

35. Not applicable.

36. The methodology adopts investment analysis approach in full accordance with the additionality standard.

9.3.3. Common practice analysis

37. Approach B of A6.4-AMT-001 Methodological tool: Common practice analysis (Version 01.0) shall be applied for common practice under this methodology.

38. The indicator used for common practice analysis is a count-based indicator measured as number of petrol-fuelled passenger vehicles.

39. A time-bound approach is used to assess common practice, taking the calendar year immediately prior to the start of the Article 6.4 activity as the reference period, or where such data is not available, taking the most recent calendar year prior to the start date of the Article 6.4 activity, provided that the year falls within the three calendar years immediately prior to the start date of the Article 6.4 activity.

40. The applicable geographical area for common practice analysis is the city where the Article 6.4 activity is implemented, because route availability, micro-traffic conditions (stop-start behaviour and congestion), traffic management policies (parking, curb access), and localized infrastructure (priority lanes), which are the primary determinants of route adoption and route-specific emissions, are highly city-specific.

41. The target market size P_{all} shall be defined as the total number of petrol-fuelled passenger vehicles in the city where the Article 6.4 activity is implemented, derived from credible sources like local transport statistics.

42. Similar activities are defined as activities that achieve emission reductions using measures similar to those of the proposed Article 6.4 activity, i.e. low-carbon route identification and prompt to enable drivers to adopt low-carbon route for driving trips.

43. Market share of similar activities P_{sim} shall be determined as number of petrol-fuelled passenger vehicles following the low-carbon route, where such adoption has been enabled by similar activities, in the calendar year immediately prior to the start of the Article 6.4 activity in the city where the Article 6.4 activity is implemented.

44. Calculate the common practice factor as the market share of the proposed measure within the target market, using the formula: $F = P_{sim} / P_{all}$

45. Compare the common practice factor F with the threshold F_{max}, which is 10%. If $F \geq F_{max}$, then the proposed activity shall be considered common practice and is therefore not additional. If $F < F_{max}$, then the proposed activity is “not common practice”.

46. The methodology specifies the requirements for conducting common practice analysis in accordance with the *A6.4-AMT-001 Methodological tool: Common practice analysis Version 01.0*.

47. Due to variations in road network density, structure, and pressure across different cities, as well as differences in urban road planning and vehicle density, the applicable geographical area for common practice analysis is defined as the city where the Article 6.4 activity is implemented.

48. The methodology clearly defines the calculation of the target market size, which activities are considered similar and calculation of market share of similar activities.

49. A time-bound approach is selected in the methodology, and the common practice threshold (F_{max}) is required to use 10%, ensuring a rigorous and conservative approach to demonstrating additionality.

Under the alternative scenario, where the drivers continue their existing pattern of route adoption, the transition to low-carbon routing remains hindered by a structural incentive misalignment: while drivers benefit from fuel savings, activity proponents, i.e. navigation platforms bear the R&D and operational costs without a direct monetization channel.

Setting the threshold at 10% is reasonably conservative for the following reasons:

Barrier to scaling: In the early stage of innovation diffusion (below 10%), the adoption is driven solely by “innovators” and “early adopters”. Without external carbon financing to bridge the value-capture gap for activity proponents, these behaviors cannot overcome the financial barriers required for mass-market penetration.

Regulatory and market gap: At less than 10% penetration, the technology has not yet become a “standard industry practice” or a regulatory requirement. Thus, any emission reductions achieved below this level are clearly incremental to the baseline.

Conservative safeguard: By selecting 10%, this methodology ensures that activities only receive credits when the technology is still in its high-risk, pre-mainstream phase.

Consequently, any activity operating below this 10% threshold inherently fulfills the additionality criteria, as its proliferation is demonstrably hindered by financial and market barriers that only carbon-related incentives can overcome.

10. Baseline scenario

10.1. Selection of the baseline approaches from paragraph 36 of the rules, modalities and procedures

50. The baseline scenario shall be identified based on the approach from paragraph 36(iii) of the RMPs, i.e. existing actual or historical emissions adjusted downwards to ensure alignment with paragraph 33 of the RMPs.

- ☐ Best available technologies that represent an economically feasible and environmentally sound course of action, where appropriate.
- ☐ An ambitious benchmark approach where the baseline is set at least at the average emission level of the best performing comparable activities providing similar outputs and services in a defined scope in similar social, economic, environmental and technological circumstances.

☒ An approach based on existing actual or historical emissions, adjusted downwards to ensure alignment with paragraph 33 of the RMP.

51. Activities under this methodology guide drivers to adopt low-carbon routes (the lowest-emission route within a navigation planning scheme) to complete driving trips, replacing trips that would have been completed following the existing pattern of route adoption. Due to the high spatial and temporal heterogeneity of urban traffic (e.g., city-specific road networks, traffic flow dynamics, and peak-hour congestion), route emissions vary significantly. Therefore, the baseline must be site-specific, representing the emissions that would occur in the absence of the activity under identical conditions. Consequently, the approach based on existing actual emissions is the most appropriate to capture the counterfactual scenario.

52. The first approach, based on best available technologies, is deemed unsuitable because this methodology does not involve the deployment or improvement of specific technologies (e.g., vehicle parts or fuel efficiency enhancements). Instead, it relies on guiding drivers to adopt low-carbon routes through adding new functionalities to the existing navigation platforms, altering behaviour without altering the underlying vehicle technology. Applying a technology-based baseline would be irrelevant and could lead to an inaccurate representation of emission reductions, as the activity's impact stems from shifting of driver behaviour rather than vehicle technological advancements.

53. The second approach, an ambitious benchmark, which sets the baseline at the average emission level of the best-performing comparable activities, is not feasible for this methodology. The calculation of emissions in this activity is highly dependent on real-time road conditions, such as traffic congestion, route length, and vehicle speed, which vary significantly across different cities. This variability makes it challenging to establish a uniform and ambitious benchmark that accurately reflects the diverse emission profiles of different routes nationwide or globally. A standardized benchmark could overestimate or underestimate reductions.

10.2. Application of the selected approach, prior to implementation of a downward adjustment

10.2.1. Procedure for the identification of the baseline scenario

54. The baseline scenario is identified as the continuation of the pre-activity scenario, i.e. the drivers’ existing pattern of route adoption in the absence of the proposed project.

55. In accordance with paragraph 60 of the baseline standard, the following alternatives are considered by the methodology proponent in determining the baseline scenario:

Alternative	Justification	Conclusion
(a) The continuation of the pre-activity scenario up to a certain point in time (for example, up to the time at which a retrofit would have occurred);	The pre-activity scenario is that drivers complete their driving trips following the existing pattern of route adoption, which would highly likely continue to occur in the absence of the Article 6.4 activity. Therefore, it is a plausible alternative.	Plausible
(b) A dynamic baseline scenario over time	As noted above, in the absence of the Article 6.4	Not plausible

(for example, if a gradual shift away from the pre-activity scenario is observed);	activity, drivers would continue to complete their driving trips following the existing pattern of route adoption and no shift in this behavior would occur without the implementation of comparable measures such as low-carbon route identification and prompt under the scope of this methodology. Therefore, this is not a plausible alternative.	
(c) The retrofit or replacement of equipment that has been used in the pre-activity scenario;	Since there is no fixed lifetime for vehicle navigation service, alternatives based on vehicle navigation service replacement are not plausible.	Not plausible
(d) The implementation of the Article 6.4 activity at a later point in time.	Given the additionality of the Article 6.4 activities (see Section 9), implementing the activity at a later time without support from crediting mechanisms is not feasible.	Not plausible

56. The methodology uses method (a) of section 6.3.3: Site-specific historical data. Baseline emissions shall be quantified by multiplying the baseline emission factor, by the distance travelled by drivers' passenger vehicles following the identified low-carbon route within a navigation planning scheme as monitored by the Article 6.4 activity navigation platform during the crediting period.

10.2.2. Calculation of baseline emissions prior to downward adjustment

57. Baseline emissions are calculated as follows:

$$BE_{history,y} = EF_{BL,y} \times L_{\hat{p},\hat{lc},y} \quad \textbf{Equation 1}$$

Where:

$BE_{history,y}$	=	Unadjusted existing historical net baseline emissions in year y of the crediting period (tCO_2/year)
$EF_{BL,y}$	=	Baseline emission factor in year y (tCO_2/km)
$L_{\hat{p},\hat{lc},y}$	=	Total length of links traversed on the low-carbon route $\hat{lc}$ predicted by the navigation platform under a navigation planning scheme, accumulated from the navigation starting point, in year y (km)
$\hat{p}$	=	Navigation planning scheme provided by the navigation platform to

		the driver before a driving trip during the crediting period
$\widehat{lc}$	=	Predicted low-carbon route within each navigation planning scheme $\hat{p}$ during the crediting period
y	=	Calendar year of the crediting period

Note: The calculation of $L_{\hat{p},\widehat{lc},y}$ shall comply with the requirements specified in paragraph 75. Only mileage accumulated on the low-carbon route predicted by the navigation platform shall be counted, provided that the route is voluntarily selected by the driver following project implementation. Participation in the project is open to all petrol-fuelled passenger vehicles registered in the host city.

58. Determination of baseline emission factor ($EF_{BL,y}$)

The activity participant shall determine the baseline emission factor ($EF_{BL,y}$) based on WLTC combined fuel consumption values and the distribution of petrol-fuelled passenger vehicles by engine displacement (k, in liters) across the host city, according to the following categories:

Engine displacement (k) categories:

Category
$k \leq 1.0L$
$1.0L < k \leq 1.6L$
$1.6L < k \leq 2.0L$
$k > 2.0L$

The baseline emission factor shall be updated annually and determined ex post.

<u>Step 1: Calculation of the representative WLTC combined fuel consumption per engine displacement category</u>

For each engine displacement category k, the representative WLTC combined fuel consumption $FC_{k,WLTC,y'}$ shall be calculated as the frequency-weighted average of all distinct WLTC combined fuel consumption values published by the government authorities for petrol-fuelled passenger vehicle model variants in category k over the three calendar years ending in year y', where each distinct value is weighted by the number of times it appears in the published records over that three-year period:

$$FC_{k,WLTC,y'} = \frac{\sum_j \left(fc_{j,k,(y'-2,y'-1,y')} \times n_{j,k,(y'-2,y'-1,y')}\right)}{\sum_j n_{j,k,(y'-2,y'-1,y')}} \quad \textbf{Equation 2}$$

Where:

$FC_{k,WLTC,y'}$	=	Representative WLTC combined fuel consumption of petrol-fuelled passenger vehicles in engine displacement category k in year y' (L/100 km)
$fc_{j,k,(y'-2,y'-1,y')}$	=	The j-th distinct WLTC combined fuel consumption value (or converted WLTC-equivalent value) published by the government authorities for a petrol-fuelled passenger vehicle model variant in

		engine displacement category k over the three calendar years ending in year y' (L/100 km)
$\mathrm{n}_{\mathrm{j,k,(y'-2,y'-1,y')}}$	=	Frequency count of the fuel consumption value $\mathrm{fc}_{\mathrm{j,k,(y'-2,y'-1,y')}}$ in the official government published records for engine displacement category k over the three calendar years ending in year y' (count)
k	=	Engine displacement category (in litres)
y'	=	The calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period

Note: Each entry in the official government fuel consumption database corresponds to a distinct vehicle model variant submitted for type-approval. The frequency weight $n_{j,\mathrm{k}}$ therefore reflects the number of model variants associated with a given fuel consumption level. This approach provides an objective, transparent and fully reproducible measure of the distribution of fuel consumption performance across marketed vehicle configurations within each engine displacement category, based solely on publicly available government records.

Where a petrol-fuelled vehicle model variant has been type-approved under a test procedure other than WLTC (e.g., NEDC or CLTC), its certified fuel consumption value shall be converted to its WLTC-equivalent value prior to use in Equation 2, as follows:

$$fc_{j,k,(\mathrm{y'-2,y'-1,y'})} = fc^{other}_{j,k,(\mathrm{y'-2,y'-1,y'})} \times CF_{other \to WLTC}$$ **Equation 3**

Where:

$fc_{j,k,(\mathrm{y'-2,y'-1,y'})}$	=	The j-th distinct WLTC combined fuel consumption value (or converted WLTC-equivalent value) published by the government authorities for a petrol-fuelled passenger vehicle model variant in engine displacement category k over the three calendar years ending in year y' (L/100 km)
$fc^{other}_{j,k,(\mathrm{y'-2,y'-1,y'})}$	=	The j-th distinct combined fuel consumption value certified under the original non-WLTC test procedure published by the government authorities for a petrol-fuelled passenger vehicle model variant in engine displacement category k over the three calendar years ending in year y' (L/100 km)
$CF_{other \to WLTC}$	=	Conversion factor from the original non-WLTC test procedure to the WLTC-equivalent combined fuel consumption
k	=	Engine displacement category (in litres)
y'	=	The calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the

crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period

The conversion factor $CF_{other \rightarrow WLTC}$ shall be sourced from conversion factors publicly disclosed by a government authority, a UNECE working group, or a peer-reviewed scientific source. The source, version, and numerical value of the applied conversion factor shall be documented in the PDD and monitoring reports. Where multiple conversion factors are available from qualifying sources, the value that results in the lower converted fuel consumption shall be selected.

Step 2: Calculation of average CO_2 emissions per kilometre per engine displacement category

For each engine displacement category k, the average CO_2 emissions per kilometre shall be calculated as:

$$\mathrm{E_{PKM,k,y'}} = \mathrm{EF_{CO2}} \times \mathrm{FC_{k,WLTC,y'}} \times \mathrm{NCV} \times \rho \times \frac{1}{100}$$ **Equation 4**

Where:

$\mathrm{E_{PKM,k,y'}}$	=	Average CO_2 emissions per kilometre of petrol-fuelled passenger vehicles in engine displacement category k in data year y' (tCO_2/km)
$\mathrm{EF_{CO2}}$	=	Emission factor of petrol (tCO_2/MJ)
$\mathrm{FC_{k,WLTC,y'}}$	=	Representative WLTC combined fuel consumption of petrol-fuelled passenger vehicles in engine displacement category k in year y' (L/100 km)
NCV	=	Net caloric value of petrol (MJ/ton)
ρ	=	Density of petrol (ton/L)
$\frac{1}{100}$	=	Unit conversion factor converting L/100km to L/km
y'	=	The calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period

Step 3: Calculation of the share of each engine displacement category

Since all petrol-fuelled passenger vehicles have been stratified into engine displacement category k, the share of each engine displacement category k in the total petrol-fuelled passenger vehicle stock of the host city shall be calculated as:

$$\mathrm{S_{k,y'}} = \frac{\mathrm{P_{k,y'}}}{\sum_{\mathrm{k}} \mathrm{P_{k,y'}}}$$ **Equation 5**

Where:

$S_{k,y'}$	=	Share of engine displacement category k in the entire petrol-fuelled passenger vehicle stock in year y' (%)
$P_{k,y'}$	=	Number of petrol-fuelled vehicles in engine displacement category k in year y'
k	=	Engine displacement category (in litres)
y'	=	The calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period

Step 4: Calculation of the baseline emission factor ($EF_{BL,y}$)

The baseline emission factor shall be calculated as the stock-share-weighted average of the average CO_2 emissions per kilometre across all engine displacement categories in the host city:

$$EF_{BL,y} = \sum_{k} \left(E_{PKM,k,y'} \times S_{k,y'}\right) \quad \textbf{Equation 6}$$

Where:

$EF_{BL,y}$	=	Baseline emission factor in year y (tCO_2/km)
$E_{PKM,k,y'}$	=	Average CO_2 emissions per kilometer of petrol-fuelled passenger vehicles in engine displacement category k in year y' (tCO_2/km)
$S_{k,y'}$	=	Share of engine displacement category k in the total petrol-fuelled passenger vehicle stock in year y' (%)
y'	=	The calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period
y	=	Calendar year of the crediting period

10.3. Calculation of the downward adjusted baseline

59. The data, parameters, assumptions and methods used for the calculation of net baseline emissions are conservatively determined, such that potential uncertainties are inherently addressed. Accordingly, no additional quantitative uncertainty adjustment is required. In the calendar year of the start date of the first crediting period, the downward adjustment shall be therefore limited to the minimum downward adjustment of baseline emissions as specified in paragraph 64(a)iii of the baseline standard as follows:

$$\mathrm{BE_{adj,min,y1}} = \mathrm{BE_{history,y1}} - \left(\mathrm{BE_{history,y1}} - \mathrm{AE_{y1}}\right) \times 0.1$$ **Equation 7**

Where:

$\mathrm{BE_{adj,min,y1}}$	=	Minimum downward adjusted baseline emissions in year y1 (tCO_2/year)
$\mathrm{BE_{history,y1}}$	=	Unadjusted existing historical net baseline emissions in year y1 of the crediting period (tCO_2/year)
$\mathrm{AE_{y1}}$	=	Activity emissions in year y1 of the crediting period (tCO_2/year)
y1	=	Calendar year of the start date of the first crediting period

$$\mathrm{BE_{adj,y1}} = \mathrm{BE_{adj,min,y1}}$$ **Equation 8**

Where:

$\mathrm{BE_{adj,y1}}$	=	Downward adjusted baseline emissions in year y1 of the crediting period (tCO_2/year)
$\mathrm{BE_{adj,min,y1}}$	=	Minimum downward adjusted baseline emissions in year y1 (tCO_2/year)
y1	=	Calendar year of the start date of the first crediting period

60. For subsequent calendar years following the calendar year of the start date of the first crediting period, the baseline emissions are subject to a downward adjustment based on an increase INDA of 1%[5].

$$\mathrm{BE_{adj,y}} = \mathrm{BE_{history,y}} - (\mathrm{DA_{y1}} + \mathrm{BE_{history,y}} \times \mathrm{INDA} \times (\mathrm{y} - \mathrm{y1}))$$ **Equation 9**

Where:

$\mathrm{BE_{adj,y}}$	=	Downward adjusted baseline emissions in year y (tCO_2/year)
$\mathrm{BE_{history,y}}$	=	Unadjusted baseline emissions in year y (tCO_2/year)
$\mathrm{DA_{y1}}$	=	Initial downward adjustment to the baseline emissions in year1 (tCO_2), determined as the difference between $\mathrm{BE_{adj,y1}}$ and $\mathrm{BE_{history,y1}}$
INDA	=	Increase in the downward adjustment in the subsequent years of the crediting period (%)
y1	=	Calendar year of the start date of the first crediting period

[5] As the baseline emission facto is updated annually based on WLTC combined fuel consumption (equivalent value) for new petrol-fuelled passenger vehicles marketed in the host Country, the impact of technological improvement in fuel efficiency has been fully and inherently reflected in the baseline emission factor.

y = Calendar year of the crediting period

61. Baseline emissions are calculated as the product of the baseline emission factor of petrol-fuelled passenger vehicles in the host city and the distance travelled on the predicted low-carbon routes by the navigation platform within navigation planning schemes during the crediting period, as described in Equation 1. This approach corresponds to the existing actual or historical emissions approach under paragraph 36(iii) of the RMPs, as applied pursuant to section 6.3.3(a) of the baseline standard, using city-level fleet statistics compiled from mandatory vehicle registration records as the basis for quantification. The baseline geographical reference area is the administrative boundary of the host city, which is appropriate given that the activity targets petrol-fuelled passenger vehicles registered and operating within the host city, and city-level fleet data are compiled and reported on this administrative basis.

Eligible vehicles under this methodology include the entire stock of petrol-fuelled passenger vehicles in the host city, rather than being limited to a specific fleet. Under the activity scenario, eligible vehicle drivers may voluntarily choose to adopt predicted low-carbon navigation routes. This open-participation design is consistent with the pre-activity scenario, in which all petrol-fuelled passenger vehicles in the host city are driven without low-carbon route guidance and follow conventional routing patterns as determined by drivers' existing route choice patterns.

The baseline emission factor shall be derived as the weighted average of CO_2 emissions per kilometre, based on WLTC combined fuel consumption values weighted by vehicle distribution across engine displacement categories (k, in litres). Vehicle stock weights are sourced from registration records maintained by the host city's traffic management authority, which constitute a comprehensive and authoritative census of the full in-use petrol-fuelled passenger vehicle population, consistent with the eligible vehicle scope defined under this methodology. As mandatory vehicle registration captures all petrol-fuelled passenger vehicles operating in the host city without omission, the fleet distribution data are free from sampling uncertainty. The baseline emission factor shall be updated annually and determined ex post.

The WLTC is the driving cycle prescribed under the Worldwide Harmonized Light Vehicles Test Procedure (WLTP), developed under the auspices of the United Nations Economic Commission for Europe (UNECE). The WLTP is the most widely adopted international type-approval test procedure for light-duty vehicles and covers the majority of major global automotive markets. WLTC combined fuel consumption values are derived from mandatory type-approval tests conducted by accredited entities and are published by government authorities — for example, for vehicles sold in China, values are accessible via the Ministry of Industry and Information Technology (MIIT) Fuel Consumption Query Platform[6]. These values therefore constitute test results following accepted international standards performed by accredited entities, as recognized under the data source requirements of the baseline standard. Where a petrol-fuelled vehicle model variant has been type-approved under a test procedure other than WLTC (e.g., NEDC or CLTC), its certified fuel consumption value shall be converted to its WLTC-equivalent value prior to use in Equation 2. The conversion factor shall be sourced from a publicly disclosed source as specified therein, and shall be selected in the conservative direction to ensure that the converted fuel consumption value is not overestimated, thereby preserving the structural conservativeness of the baseline emission factor.

This methodology is structurally conservative for two independent and directionally unambiguous reasons. First, WLTC combined fuel consumption values represent new-vehicle performance under standardized laboratory conditions and do not reflect the

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[6] https://yhgscx.miit.gov.cn/fuel-consumption-web/mainPage

systematic increase in fuel consumption arising from engine deterioration and other in-service ageing effects over the vehicle service life; actual in-use fuel consumption consistently exceeds type-approval values as vehicles age. Second, WLTC test conditions are generally less demanding than real-world driving conditions; empirical evidence consistently demonstrates that real-world fuel consumption exceeds type-approval values across vehicle categories and markets[7]. Together, these two structural sources of conservativeness ensure that the WLTC-based baseline emission factor is systematically lower than the actual average emissions per kilometer of the full in-use petrol-fuelled passenger vehicle fleet, and does not overestimate actual baseline emissions under any plausible scenario. Where non-WLTC certified values are converted to WLTC-equivalent values, the requirement to select the conversion factor in the conservative direction ensures that this structural conservativeness is preserved for all converted values.

62. In accordance with paragraph 13 of Appendix 1 to the baseline standard, all sources of uncertainty have been considered and are addressed. The data, parameters, assumptions and methods used for the calculation of unadjusted existing historical net baseline emissions are conservatively determined, such that potential uncertainties are inherently addressed and no additional quantitative uncertainty adjustment is required.

- For data, the primary measured parameter is the low-carbon route travel distance ($L_{\hat{p},\hat{lc},y}$) following project implementation. Three interlocking control mechanisms ensure that it is not overestimated and that no additional uncertainty adjustment is required. At the link-length level, link lengths are pre-calibrated based on government-approved map data and are not subject to real-time measurement variability, effectively eliminating measurement uncertainty at this level. At the trajectory-verification level, it is determined by accumulating only the lengths of links for which complete traversal is confirmed through positioning-based trajectories recorded on the navigation platform. The trajectory time interval shall not exceed 10 seconds. Where a vehicle's trajectory spans multiple links within a single interval, a link is credited as completely traversed only if both its entry and exit points are independently confirmed; where only one boundary point is confirmed, the link is excluded. Any inaccurate, inconsistent, or missing trajectory records are likewise excluded. No link is therefore credited on the basis of interpolated or inferred position. At the quality control level, an ex post verification process confirms that the predicted low-carbon route within each navigation planning scheme generates the lowest CO_2 emissions among all route options. Any scheme for which this condition is not satisfied is excluded from distance accumulation. These three levels of control collectively ensure that the parameter $L_{\hat{p},\hat{lc},y}$ is conservatively determined, and no additional uncertainty adjustment is required for this parameter.

- For parameters, the following sources and treatments apply. WLTC combined fuel consumption values ($fc_{j,k,(y'-2,y'-1,y')}$, $FC_{k,WLTC,y'}$) are sourced from official databases published by government authorities. As these values are derived from mandatory type-approval tests conducted by accredited entities, they are not subject to statistical uncertainty and no confidence interval adjustment is required. Where non-WLTC certified values are converted to WLTC-equivalent values, the conversion factor shall be sourced from a qualifying public source as specified therein and selected in the direction that does not overestimate the converted fuel consumption value, consistent with the conservativeness principle. Petrol-fuelled

[7] https://climate.ec.europa.eu/news-other-reads/news/publication-real-world-co2-emissions-and-fuel-consumption-cars-and-vans-collected-2022-2024-07-26_en;

https://www.mdpi.com/2624-8921/3/2/10

vehicle stock distribution by engine displacement category ($P_{k,y'}$) is sourced from mandatory vehicle registration records maintained by the host city's traffic management authority. As mandatory registration provides a comprehensive census of the full in-use petrol-fuelled passenger vehicle population without omission, this parameter is free from sampling or statistical uncertainty and no confidence interval adjustment is required. The net calorific value (NCV), CO_2 emission factor (EF_{CO_2}) and density (ρ) of petrol are determined according to the following order of preference: (i) locally representative values from government reports or statistics; (ii) values from peer-reviewed scientific literature most relevant to the context of the Article 6.4 activity; and (iii) a default value, which is specified as follows: for net calorific value (NCV), CO_2 emission factor (EF_{CO_2}): the most recent IPCC default values, applying the lower bound of the 95% confidence interval; for density (ρ): the typical value of motor gasoline specified in the IEA Energy Statistics Manual. Where values under Options (i) or (ii) are adopted, they shall be verified against the corresponding default value: for net calorific value (NCV), CO_2 emission factor (EF_{CO_2}): if the adopted value falls outside the IPCC uncertainty range, the Option (iii) value shall be used instead; for density (ρ): if the adopted value exceeds the Option (iii) typical value, the Option (iii) value shall be used instead. Taken together, parameter uncertainty is addressed at two levels: for fuel consumption and vehicle stock parameters, the use of mandatory administrative data sources eliminates statistical uncertainty entirely; for emission and energy parameters (NCV, EF_{CO_2}, ρ), the above verification rules and mandatory fallback to the conservative Option (iii) values ensure that any residual uncertainty is explicitly accounted for in a manner consistent with the conservativeness principle. For assumptions, the baseline scenario is determined in accordance with the baseline standard and is subject to downward adjustment in both the initial and subsequent calendar years. The assumption that city-level fleet data comprehensively represent all eligible petrol-fuelled passenger vehicles is robustly supported by the mandatory nature of vehicle registration, which captures the full in-use vehicle population without omission. The associated uncertainty is therefore fully addressed through the authoritative and exhaustive data source.

- For methods, baseline emissions are calculated using deterministic arithmetic formulas without recourse to simulation or statistical models. No model uncertainty is therefore introduced by the calculation method itself.

Accordingly, no additional quantitative uncertainty adjustment is required beyond the minimum downward adjustment of baseline emissions for the initial calendar year of the crediting period, as specified in Paragraph 64(a)iii of the baseline standard. For subsequent calendar years following the calendar year of the start date of the first crediting period, the baseline emissions are subject to an additional downward adjustment of 1%, applied on a cumulative basis. This adjustment reflects the ongoing improvement in fleet fuel efficiency driven by tightening type-approval standards and increasing penetration of more fuel-efficient vehicle models, as inherently captured through the annual update of the baseline emission factor based on WLTC combined fuel consumption values for newly marketed petrol-fuelled passenger vehicles. The 1% annual adjustment therefore represents a conservative and independently grounded downward correction that ensures the baseline does not overstate the counterfactual emissions trajectory over the crediting period.

10.4. Identification of the conservative BAU scenario

63. The conservative BAU scenario is identified as the continuation of the pre-activity scenario, i.e. drivers' existing pattern of route adoption to complete driving trips. The conservative BAU scenario and the baseline scenario are conceptually aligned in this methodology.

64. Activity participants shall assess the identified BAU scenario against relevant national or sub-national instruments that may influence travel patterns within the crediting period. The BAU scenario shall be adjusted, and conservative BAU emissions shall be recalculated following the adjusted BAU scenario, to reflect travel patterns consistent with such instruments, in accordance with the following provisions:

a) Legally binding policies: Policies that are in force or have an official effective date within the crediting period and that mandate low-carbon route identification and prompt or low-carbon route adoption, or restrict presenting other navigation routes shall be deemed enforced, unless credible and documented evidence demonstrates that non-enforcement is widespread. Policies that explicitly refer to or formally integrate the Article 6.4 mechanism as an implementation instrument shall not be considered for BAU adjustment.

b) Quantified targets: National or sub-national targets that specify an equivalent level of emission reductions by comparable measures of low-carbon route identification and prompt, shall be considered for BAU adjustment only if they are supported by a concrete policy framework for implementation. Aspirational or general goals without sector- or activity-specific quantification shall not be considered.

65. In accordance with paragraph 60 of the baseline standard, the following alternatives are considered by the methodology proponent in determining the baseline scenario:

Alternative	Justification	Conclusion
(a) Continuation of the historical situation (pre-activity scenario);	The continuation of the pre-activity scenario, i.e. drivers' existing pattern of route adoption to complete driving trips is plausible. Therefore, it is a plausible alternative.	Plausible
(b) Establishment of an economically viable technology and/or practice;	Administrative and policy interventions to promote the adoption of low-carbon routes, such as introducing functionality of low-carbon route identification and prompting, may be undertaken by government authorities to reduce urban travel emissions. The purpose of such measures is to achieve broader societal benefits rather than to generate revenues. Accordingly, while such measures may benefit drivers through fuel cost savings, they do not constitute an "economically viable" technology or practice from the perspective of the activity participant, as required under section 6.1.3 and paragraph 73(b).	Not plausible
(c) A scenario combining (a) for the remaining lifetime of the existing equipment and/or practice, followed afterwards by (b); or	Since there is no fixed lifetime for any planned routes within a navigation planning scheme, alternatives based on the replacement of equipment and/or practice are not feasible.	Not plausible
(d) Only when it is justified that the previous alternatives are not suitable, another relevant scenario in line	There is already a suitable alternative, i.e. alternative (a).	Not plausible

with the applicable principles and requirements set out in this standard.		

As per paragraph 74 of the baseline standard, where several scenarios are plausible, the most conservative scenario shall be chosen as the BAU scenario. According to the above identification, there is only one plausible BAU scenario, so it is considered as the conservative BAU scenario.

66. To ensure consistency with paragraph 76 of the baseline standard, assessment of the identified BAU scenario against (i) policies active or scheduled to take effect within the crediting period and (ii) sector-specific national or sub-national targets supported by policy frameworks is required. This approach ensures that BAU emissions reflect relevant regulatory and policy developments over time, while maintaining a conservative approach.

10.4.1. Calculation of the conservative BAU emissions

67. BAU emissions are calculated as follows:

$$\mathrm{BAU_y} = \mathrm{EF_{BAU,y}} \times \mathrm{L_{\hat{p},\widehat{lc},y}}$$ **Equation 10**

Where:

$\mathrm{BAU_y}$	=	Most likely net BAU baseline emissions in year y (tCO_2/year)
$\mathrm{EF_{BAU,y}}$	=	BAU emission factor (tCO_2/km)
$\mathrm{L_{\hat{p},\widehat{lc},y}}$	=	Total length of links traversed on the low-carbon route $\widehat{\mathrm{lc}}$ predicted by the navigation platform under a navigation planning scheme, accumulated from the navigation starting point, in year y (km)
$\hat{\mathrm{p}}$	=	Navigation planning scheme provided by the navigation platform to the driver before a driving trip during the crediting period
$\widehat{\mathrm{lc}}$	=	Predicted low-carbon route within each navigation planning scheme $\hat{\mathrm{p}}$ during the crediting period
y	=	Relevant year or period

Note: The calculation of $L_{\hat{p},\widehat{lc},y}$ shall comply with the requirements specified in paragraph 75. Only mileage accumulated on the low-carbon route predicted by the navigation platform shall be counted, provided that the route is voluntarily selected by the driver following project implementation. Participation in the project is open to all petrol-fuelled passenger vehicles registered in the host city.

68. Determination of BAU emission factor ($\mathrm{EF_{BAU,y}}$)

The calculation method is consistent with the baseline emission factor $\mathrm{EF_{BL,y}}$. Refer to *10.2.2. Calculation of baseline emissions prior to downward adjustment* for details.

69. Conservative BAU emissions

The data, parameters, assumptions and methods used for the calculation of net BAU baseline emissions are conservatively determined following the same approach as for the net baseline emissions, such that potential uncertainties are inherently addressed. Accordingly, no additional quantitative uncertainty adjustment is required. The conservative adjustment during the first crediting period is therefore limited to the minimum conservative value of the BAU emissions as specified in paragraph 77(a)iii of the baseline standard as follows:

$$\mathrm{BAU_{cons,min,y}} = \mathrm{BAU_y} - \left(\mathrm{BAU_y} - \mathrm{AE_y}\right) \times 0.1$$ **Equation 11**

Where:

$\mathrm{BAU_{cons,min,y}}$	=	Minimum conservative BAU baseline emissions in year y (tCO_2/year)
$\mathrm{BAU_y}$	=	Most likely net BAU baseline emissions in year y (tCO_2/year)
$\mathrm{AE_y}$	=	Activity emissions in year y (tCO_2/year)
y	=	Relevant year or period

$$\mathrm{BAU_{cons,y}} = \mathrm{BAU_{cons,min,y}}$$ **Equation 12**

Where:

$\mathrm{BAU_{cons,y}}$	=	Conservative BAU baseline emissions in year y (tCO_2/year)
$\mathrm{BAU_{cons,min,y}}$	=	Minimum conservative BAU baseline emissions in year y (tCO_2/year)
y	=	Relevant year or period

70. For the ex-post quantification of the BAU baseline emissions, the BAU emission factor $EF_{BAU,y}$ shall be updated for each calendar year during the crediting period, and the distance travelled following low-carbon route $L_{\hat{p},\widehat{lc},y}$ shall be updated for each verification period.

71. BAU emissions are calculated as the product of the BAU emission factor of petrol-fuelled passenger vehicles in the host city and the distance travelled on the predicted low-carbon routes by the navigation platform within navigation planning schemes during the crediting period, as described in Equation 10. The BAU emission factor shall be determined following the same approach as the baseline emission factor and ex post updated annually. This approach ensures that BAU emissions are not overestimated.

72. In accordance with paragraph 13 of Appendix 1 to the baseline standard, all causes of uncertainty have been considered and are addressed. The data, parameters, assumptions and methods used for the calculation of net BAU emissions are conservatively determined, such that potential uncertainties are inherently addressed and no additional quantitative uncertainty adjustment is required.

- For data, the primary measured parameter is the low-carbon route travel distance ($\mathrm{L_{\hat{p},\widehat{lc},y}}$) following project implementation. Three interlocking control mechanisms ensure that is not overestimated and that no additional uncertainty adjustment is required. At the link-length level, link lengths are pre-calibrated based on government-approved map data and are not subject to real-time measurement variability, effectively eliminating measurement uncertainty at this level. At the trajectory-verification level, it is determined by accumulating only the lengths of links for which complete traversal is confirmed through positioning-based trajectories recorded on the navigation platform. The trajectory time interval shall not exceed 10 seconds. Where a vehicle's trajectory spans multiple links within a single interval, a link is credited as completely traversed only if both its entry and exit points are independently confirmed; where only one boundary point is confirmed, the link is excluded. Any inaccurate, inconsistent, or missing trajectory records are likewise excluded. No link is therefore credited on the basis of interpolated or inferred position. At the quality control level, an ex post verification process confirms that the predicted low-carbon route within each navigation planning scheme generates the lowest CO_2 emissions among all route options. Any scheme for which this condition is not satisfied is excluded from distance accumulation. These three levels of control collectively ensure that the parameter $L_{\hat{p},\hat{lc},y}$ is conservatively determined, and no additional uncertainty adjustment is required for this parameter.

- For parameters, the following sources and treatments apply. WLTC combined fuel consumption values ($fc_{j,k,(y'-2,y'-1,y')}$, $FC_{k,WLTC,y'}$) are sourced from official databases published by government authorities. As these values are derived from mandatory type-approval tests conducted by accredited entities, they are not subject to statistical uncertainty and no confidence interval adjustment is required. Where non-WLTC certified values are converted to WLTC-equivalent values, the conversion factor shall be sourced from a qualifying public source as specified therein and selected in the direction that does not overestimate the converted fuel consumption value, consistent with the conservativeness principle. Petrol-fuelled vehicle stock distribution by engine displacement category ($P_{k,y'}$) is sourced from mandatory vehicle registration records maintained by the host city's traffic management authority. As mandatory registration provides a comprehensive census of the full in-use petrol-fuelled passenger vehicle population without omission, this parameter is free from sampling or statistical uncertainty and no confidence interval adjustment is required. The net calorific value (NCV), CO2 emission factor (EF_{CO_2}) and density (ρ) of petrol are determined according to the following order of preference: (i) locally representative values from government reports or statistics; (ii) values from peer-reviewed scientific literature most relevant to the context of the Article 6.4 activity; and (iii) a default value, which is specified as follows: for net calorific value (NCV), CO_2 emission factor (EF_{CO_2}) : the most recent IPCC default values, applying the lower bound of the 95% confidence interval; for density (ρ): the typical value of motor gasoline specified in the IEA Energy Statistics Manual. Where values under Options (i) or (ii) are adopted, they shall be verified against the corresponding default value: for net calorific value (NCV), CO_2 emission factor (EF_{CO_2}): if the adopted value falls outside the IPCC uncertainty range, the Option (iii) value shall be used instead; for density (ρ): if the adopted value exceeds the Option (iii) typical value, the Option (iii) value shall be used instead.. Taken together, parameter uncertainty is addressed at two levels: for fuel consumption and vehicle stock parameters, the use of mandatory administrative data sources eliminates statistical uncertainty entirely; for emission and energy parameters (NCV, EF_{CO_2}, ρ), the above verification rules and mandatory fallback to the conservative Option (iii) values ensure that any residual uncertainty is explicitly accounted for in a manner consistent with the conservativeness principle. Parameter uncertainty is therefore fully addressed across all inputs.

- For assumptions, the BAU scenario is determined in accordance with the baseline standard and is subject to downward adjustment in both the initial and subsequent calendar years. The assumption that city-level fleet data comprehensively represent all eligible petrol-fuelled passenger vehicles is robustly supported by the mandatory nature of vehicle registration, which captures the full in-use vehicle population without omission. The associated uncertainty is therefore fully addressed through the authoritative and exhaustive data source.

- For methods, BAU emissions are calculated using deterministic arithmetic formulas without recourse to simulation or statistical models. No model uncertainty is therefore introduced by the calculation method itself.

Accordingly, no additional quantitative uncertainty adjustment is required beyond the minimum minimum conservative value of the BAU emissions during the first crediting period, as specified in Paragraph 77(a)iii of the baseline standard.

10.5. Comparison of the downward adjusted baseline and the conservative business-as-usual baseline

73. The activity participant shall undertake the following comparisons.

Ex-ante comparison

The activity participant shall compare, ex-ante in the PDD, the following two baselines:

(a) The downward adjusted baseline as determined in section 10.3; and

(b) The conservative BAU baseline as determined in section 10.4.1.

If the ex-ante conservative BAU baseline emissions are lower than the ex-ante downward adjusted baseline for any calendar year or cumulatively over the crediting period, the activity participant must return to section 10.3 and revise the quantitative methods and factors to determine the downward adjustment. This ensures that the downward adjusted baseline remains lower than the conservative BAU baseline for each calendar year and cumulatively for the crediting period.

Ex-post comparison

The activity participant shall, in monitoring reports, compare the ex-post calculated downward-adjusted baseline and the ex-post calculated conservative BAU baseline for each calendar year of the crediting period. The downward-adjusted baseline must be lower than the conservative BAU baseline of the same year. If this condition is not met for a given year, the conservative BAU baseline shall be used for that year.

The baseline emissions of the year y during the crediting period shall be:

$$BE_y = \min\left(BAU_{cons,y}, BE_{adj,y}\right) \quad \textbf{Equation 13}$$

Where:

BE_y	=	Baseline emissions in year y (tCO_2/year)
$BAU_{cons,y}$	=	Conservative BAU baseline emissions in year y (tCO_2/year)
$BE_{adj,y}$	=	Downward adjusted baseline emissions in year y (tCO_2/year)
y	=	Relevant year or period

74. Comparison of the downward adjusted baseline and the conservative business-as-usual baseline and selection of crediting baseline is in full compliance with the procedures specified in section 9 of the baseline standard.

11. Activity scenario

11.1. Calculation of activity emissions

75. Activity emissions are calculated as follows:

$$AE_y = EF_{AE,y} \times L_{\hat{p},\widehat{lc},y}$$ **Equation 14**

Where:

AE_y	=	Activity emissions in year y (tCO_2/year)
$EF_{AE,y}$	=	Activity emission factor in year y (tCO_2/km)
$L_{\hat{p},\widehat{lc},y}$	=	Total length of links traversed on the low-carbon route $\widehat{lc}$ predicted by the navigation platform under a navigation planning scheme, accumulated from the navigation starting point, in year y (km)
$\hat{p}$	=	Navigation planning scheme provided by the navigation platform to the driver before a driving trip during the crediting period
$\widehat{lc}$	=	Predicted low-carbon route within each navigation planning scheme $\hat{p}$ during the crediting period
y	=	Calendar year of the crediting period

Note: The calculation of $L_{\hat{p},\widehat{lc},y}$ shall comply with the following requirements.

- $L_{\hat{p},\widehat{lc},y}$ shall be determined by accumulating the pre-calibrated lengths of individual links completely traversed by the vehicle on the predicted low-carbon route $\widehat{lc}$ by the navigation platform, as confirmed through positioning-based travel trajectories recorded on the navigation platform in year y. Link lengths shall be defined and measured in advance by the navigation platform based on government-approved map data, and not subject to real-time measurement variability. A link shall be included in the distance accumulation only if complete traversal is confirmed by trajectory data; any link for which complete traversal cannot be confirmed shall be excluded.
- Distance accumulation shall commence from the starting link, defined as the link on the predicted low-carbon route $\widehat{lc}$ within which the navigation starting point is located. Where the navigation starting point cannot be precisely located via trajectory data, the first link that can be precisely verified via trajectory data shall be used as the starting link. No distance shall be counted for links prior to this verified starting link, ensuring no overestimation of travel distance.
- Distance accumulation shall cease when the vehicle's trajectory deviates from the predicted low-carbon route $\widehat{lc}$, defined as the occurrence of a trajectory point that cannot be matched to the next expected link on $\widehat{lc}$. Links traversed after such deviation shall not contribute to $L_{\hat{p},\widehat{lc},y}$.
- During a trip, where the navigation platform issues a rerouting instruction that modifies the sequence of links remaining in the active route, the ongoing accumulation of link lengths shall cease and the new route plan shall be treated as a separate navigation planning scheme. Recalculation that does not alter the sequence of remaining links shall not constitute a new navigation planning scheme

and shall not interrupt distance accumulation. The navigation platform shall maintain a timestamped log of all rerouting events occurring during each trip to support ex post verification of scheme boundaries.

76. Prediction of low-carbon route within a navigation planning scheme under the activity scenario

Low-carbon route prediction involves calculating the CO_2 emissions for each planned route within a navigation planning scheme provided to drivers by the navigation platform prior to a driving trip, based on the predicted speed of each link. The route with the lowest CO_2 emissions is prompted as the low-carbon route. The calculation method is as follows:

$$E_{\hat{p},\hat{q}} = \sum_{r_{\hat{q}}} \left(L_{\hat{p},r_{\hat{q}}} \times EF_{CO_2 \hat{v}_{\hat{T}_{r_{\hat{q}}}}} \right)$$ **Equation 15**

$$\widehat{lc} = \left\{ \hat{q} | E_{\hat{p},\hat{q}} = \min_{\hat{q}} E_{\hat{p},\hat{q}} \right\}$$ **Equation 16**

Where:

$\hat{p}$	=	Navigation planning scheme provided by the navigation platform to the driver before a driving trip during the crediting period
$\hat{q}$	=	Planned route in navigation planning scheme $\hat{p}$
$E_{\hat{p},\hat{q}}$	=	Predicted CO_2 emissions generated by passenger vehicle driving along planned route $\hat{q}$ in navigation planning schemes $\hat{p}$ (tCO_2)
$L_{\hat{p},r_{\hat{q}}}$	=	Length of link $r_{\hat{q}}$ of planned route $\hat{q}$ in navigation planning scheme $\hat{p}$ (km)
$r_{\hat{q}}$	=	Link $r_{\hat{q}}$ of planned route $\hat{q}$ in navigation planning scheme $\hat{p}$
$\hat{v}_{\hat{T}_{r_{\hat{q}}}}$	=	Predicted speed of link $r_{\hat{q}}$ of planned route $\hat{q}$ in navigation planning scheme $\hat{p}$ at time $\hat{T}_{r_{\hat{q}}}$ (km/h)
$\widehat{lc}$	=	Predicted low-carbon route within each navigation planning scheme $\hat{p}$ during the crediting period
$\hat{T}_{r_{\hat{q}}}$	=	Predicted time at which the driver's passenger vehicle would reach link $r_{\hat{q}}$, determined in accordance with Equation 29
$EF_{CO_2 \hat{v}_{\hat{T}_{r_{\hat{q}}}}}$	=	Weighted speed-emission factor at speed $\hat{v}_{T_{r_{\hat{q}}}}$ for the total petrol-fuelled passenger vehicle stock in the host city (tCO_2/km)

Ex-post verification of the predicted low-carbon route planned prior to each driving trip shall be conducted on all relevant navigation planning schemes occurring during the verification period. The following measures shall be applied to ensure no overestimation of low-carbon route travel distance or baseline emissions.

(1) Any predicted low-carbon route that is verified ex post as not generating the lowest CO_2 emissions among all route options within the navigation planning scheme shall be documented. The distance accumulated under such navigation planning

schemes shall be excluded from $L_{\hat{p},\widehat{lc},y}$, ensuring no over-estimation of low-carbon route travel distance.

(2) In addition to the exclusion of distance accumulation under (1), a conservative emissions deduction shall be applied to account for cases where the incorrectly predicted route generates higher CO_2 emissions than the corresponding baseline emissions. The deduction shall be calculated as follows:

$$\Delta E_{deduct,y} = (\overline{EF}_{wrong,y} - EF_{BL,y}) \times D_{wrong,y}$$ **Equation 17**

$$\overline{EF}_{wrong,y} = \frac{\sum_{i \in wrong,y} E_{i,y}}{D_{wrong,y}}$$ **Equation 18**

$$D_{wrong,y} = \sum_{i \in wrong,y} d_{i,y}$$ **Equation 19**

Where:

$\Delta E_{deduct,y}$	=	Emission deductions due to predicted low-carbon route verified ex post as not generating the lowest CO_2 emissions among all route options within the navigation planning scheme in year y (tCO_2/year)
$\overline{EF}_{wrong,y}$	=	Average CO_2 emissions per kilometer of incorrectly predicted routes in year y (tCO_2/km)
$EF_{BL,y}$	=	Baseline emission factor in year y, calculated as per Equation 6 (tCO_2/km)
$D_{wrong,y}$	=	Total travel distance accumulated on incorrectly predicted routes in year y (km)
$E_{i,y}$	=	Actual CO_2 emissions of incorrectly predicted route i in year y (tCO_2)
$d_{i,y}$	=	Actual travel distance of incorrectly predicted route i in year y (km)
i	=	Predicted low-carbon route verified as not generating the lowest CO_2 emissions among all route options within the navigation planning scheme in year y, as per ex post verification outcome, i.e. incorrectly predicted route
y	=	Calendar year of the crediting period

- When $\overline{EF}_{wrong,y} \leq EF_{BL,y}$, $\Delta E_{deduct,y}$ shall be set to zero. In this case, the incorrectly predicted routes do not generate emissions above the baseline level; the exclusion of their distance under measure (1) is sufficient to ensure no overestimation of emission reductions, and no further deduction is required. Setting the deduction to zero rather than applying a negative adjustment ensures conservativeness by avoiding any upward adjustment to the claimed emission reductions.

- When $\overline{EF}_{wrong,y} > EF_{BL,y}$, $\Delta E_{deduct,y}$ shall be subtracted from the emission reductions calculated as per Equation 34. This deduction reflects the excess CO_2 emissions attributable to incorrectly predicted routes above the baseline level, which would otherwise result in an overstatement of net emission reductions. By explicitly quantifying and deducting this excess, the methodology ensures that only emission reductions genuinely attributable to correct low-carbon route guidance are claimed, thereby preserving the conservativeness and environmental integrity of the calculated emission reductions.

77. Determination of activity emission factor ($\mathrm{EF_{AE,y}}$)

Step 1: Navigation planning scheme sampling in year y

(a) Spatiotemporal stratification: Activity participants shall stratify all navigation planning schemes within the activity boundary in year y' based on the combined time-spatial dimension, which integrates time and spatial characteristics to form exclusive spatiotemporal strata. Year y' refers to the calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period.

(i) Stratification by Time Dimension: A calendar year shall be divided into several categories of characteristic days (i), with each category further subdivided into characteristic time periods (j). Characteristic day categories include weekdays, weekends, and holidays, and characteristic time periods, depending on characteristic day categories, are classified into peak and off-peak periods. Typically, morning peak period is from 7:00 to 9:00, evening peak period is from 17:00 to 19:00, and all other hours of the day are defined as off-peak periods. Specific peak periods may be adjusted to reflect local typical commuting period.

(ii) Stratification by Spatial Dimension: The geographic boundary of the activity shall be divided into multiple non-overlapping sub-regions. These sub-regions can be delineated according to administrative divisions, traffic zones, or a grid system. The spatial attribute is characterized by trip origin-destination (od) pairs of the sub-regions. Spatial stratification may be omitted where the geographic boundary of the activity covers only a single indivisible administrative unit.

(b) Spatiotemporal sampling

The sampling process shall be conducted as follows:

(i) Statistically compile the total number of petrol-fuelled passenger vehicle navigation planning schemes in each spatiotemporal stratum (i, j, od) $\mathrm{TP_{i,j,od,y'}}$;

Note: If the sub-region of departure and the sub-region of destination are the same, this indicates trips within the same sub-region.

(ii) Taking total number of navigation planning schemes $\mathrm{TP_{i,j,od,y'}}$ as the population, a simple random sampling method shall be adopted to extract the sample of navigation planning schemes in each spatiotemporal stratum (i, j, od) $A_{i,j,od,y'}$. The sample size calculation shall comply with the requirement of a minimum confidence level of 95% and a margin of error not exceeding ±5%. The stratum-level sample size is calculated as follows:

$$A_{i,j,od,y'} = \frac{TP_{i,j,od,y'} \cdot z^2 \cdot V_{i,j,od,lc,y'}}{(TP_{i,j,od,y'} - 1) \cdot e^2 + z^2 \cdot V_{i,j,od,lc,y'}}$$ **Equation 20**

Where:

$TP_{i,j,od,y'}$	=	Population of petrol-fuelled passenger vehicle navigation planning schemes in each spatiotemporal stratum (i, j, od) in year y’
$A_{i,j,od,y'}$	=	Sample size of petrol-fuelled passenger vehicle navigation planning schemes in each spatiotemporal stratum (i, j, od) in year y’
z	=	z-score corresponding to a 95% confidence level, 1.96
$V_{i,j,od,lc,y'}$	=	Square of the coefficient of variation of $E_{PKM,p,lc,y'}$, within stratum (i, j, od)
e	=	Allowable margin of error, 0.05
y’	=	The calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period

$$V_{i,j,od,y'} = \left(\frac{SD^{Exante}_{i,j,od,lc,y'}}{\overline{E}^{Exante}_{PKM,i,j,od,lc,y'}}\right)^2$$ **Equation 21**

Where:

$V_{i,j,od,lc,y'}$	=	Square of the coefficient of variation of $E_{PKM,p,lc,x}$, within stratum (i, j, od)
$SD^{Exante}_{i,j,od,lc,y'}$	=	Expected deviation of $E_{PKM,p,lc,x}$ for low-carbon route lc in spatiotemporal stratum (i, j, od) in year y’
$\overline{E}^{Exante}_{PKM,i,j,od,lc,y'}$	=	Expected mean of $E_{PKM,p,lc,x}$ for low-carbon route lc in spatiotemporal stratum (i, j, od) in year y’
y’	=	The calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period

For sample size calculation in the PDD, a conservative default value of $V_{i,j,od,lc,y'}$ = 0.25 shall be applied, which corresponds to a coefficient of variation (CV) of 0.5, i.e. $V = CV^2 = 0.5^2 = 0.25$. This default is intended to ensure that the sample size is not underestimated.

For sample size calculation in the monitoring reports, the sample mean and variance obtained in the most recent prior sampling round shall be used as the ex-ante estimates for determining the sample size of the current round, replacing the default value.

Where a spatiotemporal stratum did not exist in the prior sampling round and therefore has no historical data available, the default value of $V_{i,j,od,lc,y'}$ = 0.25 shall be applied for that stratum in the current round. Once sampling data for that stratum are obtained, the stratum shall enter the iterative update cycle in subsequent rounds.

Where a spatiotemporal stratum from the prior round is no longer present or has an insufficient population in the current year, it shall be merged with an adjacent stratum in accordance with the merging rules specified in the PDD. The merged stratum shall be treated as a single stratum for sample size calculation purposes, using the combined population and variance.

The sample mean and variance obtained for each stratum in each sampling round shall be recorded in the monitoring report in a dedicated table, which serves as the input for the following round. The DOE shall verify, during each verification, that the sample size for each stratum has been determined using the parameters recorded in the immediately preceding monitoring report, ensuring full traceability across crediting period years.

(iii) The total sample size of petrol-fuelled passenger vehicle navigation planning schemes for the entire activity boundary $\mathrm{A}_{y'}$ in year y' is calculated as the sum of stratum-level sample sizes across all spatiotemporal strata (i, j, od) in year y', with the formula as follows:

$$\mathrm{A}_{y'} = \sum_{i,j,od} \mathrm{A}_{i,j,od,y'}$$ **Equation 22**

Where:

$\mathrm{A}_{y'}$	=	Total sample size of petrol-fuelled passenger vehicle navigation planning schemes in year y'
$\mathrm{A}_{i,j,od,y'}$	=	Stratum-level sample size for spatiotemporal stratum (i, j, od) in year y'
y'	=	The calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period

Where the achieved margin of error exceeds ±5% for any spatiotemporal stratum, the activity participant shall apply one of the following remedial measures:

(a) Increase the sample size for the affected stratum and re-conduct sampling until the ±5% margin of error requirement is met; or

(b) Accept the achieved margin of error for the affected stratum and apply the upper bound of the actual 95% confidence interval of the stratum-level emission factor estimate, which corresponds to an upward adjustment larger than would apply under the ±5% criterion, thereby ensuring conservativeness.

Under option (b), the achieved margin of error for the affected stratum shall be explicitly documented in the monitoring report, together with a justification for why option (a) was not applied. The DOE shall verify that the conservative bound has been correctly calculated and applied based on the actual sample data.

The achieved margin of error for each stratum shall be calculated as:

$$MOE_{i,j,od,lc,y'} = \frac{\mathrm{z} \times SE_{i,j,od,lc,y'}}{\overline{E}_{PKM,i,j,od,lc,y'}} \times 100\%$$ **Equation 23**

Where:

$MOE_{i,j,od,lc,y'}$	=	Achieved margin of error for low-carbon route lc in spatiotemporal stratum (i,j,od) in year y' (%)
z	=	z-score corresponding to a 95% confidence level, 1.96
$SE_{i,j,od,lc,y'}$	=	Stratum-level standard error of the estimated average CO_2 emissions per kilometer generated by vehicles driving along low-carbon route lc in spatiotemporal stratum (i,j,od) in year y' (tCO_2/km)
$\overline{E}_{PKM,i,j,od,lc,y'}$	=	Sample mean of $E_{PKM,p,lc,y'}$ for low-carbon route lc in spatiotemporal stratum (i,j,od) in year y', refer to Equation 33
y'	=	The calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period

<u>Step 2: Calculation of average CO_2 emissions per kilometer of low-carbon route lc in sample p</u>

The activity emission factor $EF_{AE,y}$ is determined from the set of sampled navigation planning schemes p obtained in year y', with total sample size $A_{y'}$, as described in *Step 1: Navigation planning scheme sampling in year y*.

For each sampled navigation planning scheme p, the low-carbon route lc shall be identified following the identical procedure set out in *Paragraph 76. Prediction of low-carbon route within a navigation planning scheme under the activity scenario*, with the sole distinction that the identification of the low-carbon route lc within a sampled navigation planning scheme constitutes an ex post calculation based on actual average speed of links, whereas the prediction of the low-carbon route $\widehat{lc}$ within a navigation planning scheme under the activity scenario constitutes an ex ante calculation based on predicted average speed of links. The emissions for each low-carbon route lc shall be calculated as:

$$E_{p,lc,y'} = \sum\nolimits_{r_{lc}} \left(L_{r_{lc}} \times EF_{CO_2,v_{T_{r_{lc},y'}}} \right) \qquad \textbf{Equation 24}$$

Where:

$E_{p,lc,y'}$	=	CO_2 emissions generated by passenger vehicle driving along low-carbon route lc in sample p in year y' (tCO_2)
lc	=	Low-carbon route in sample p
r_{lc}	=	Link of low-carbon route lc in sample p
$L_{r_{lc}}$	=	Length of link r_{lc} of low-carbon route lc in sample p (km)
$T_{r_{lc},y'}$	=	Time at which the driver's passenger vehicle reaches link r_{lc} in year y', determined in accordance with Equation 29
$v_{T_{r_{lc},y'}}$	=	Actual average speed of each link at time $T_{r_{lc},y'}$ when the

		driver's passenger vehicle would have reached link r_{lc} in year y' (km/h)
$EF_{CO_2,v_{T_{r_{lc},y'}}}$	=	Weighted speed-emission factor at speed $v_{T_{r_{lc},y'}}$ for the total petrol-fuelled passenger vehicle stock in the host city (tCO_2/km)
y'	=	The calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period

- Determination of $EF_{CO_2,v}$

City-level $EF_{CO_2,v}$ at speed v shall be calculated as the weighted average of speed-emission factor at speed v of each vehicle category c. Vehicle category c shall be established by stratifying the petrol-fuelled vehicle population in the host city according to engine displacement k (in liters) and vehicle age t (in years), based on the following classification:

Engine displacement (k) categories		**Vehicle age (t) categories**	
Category	Range	Category	Range
k_1	$k \leq 1.0L$	t_1	0–6 years
k_2	$1.0L < k \leq 1.6L$	t_2	7–10 years
k_3	$1.6L < k \leq 2.0L$	t_3	>10 years
k_4	$k > 2.0L$	/	

Each vehicle category c is defined as a unique combination (k_s, t_s), resulting in a maximum of 12 categories.

For each vehicle category c, the speed-emission factor $EF_{CO_2,v,c}$ shall be determined according to the following order of priority. $EF_{CO_2,v,c}$ shall be updated no less than once every three years during the crediting period and at each renewal of the crediting period. The reference year of the $EF_{CO_2,v,c}$ values in use shall be documented in each monitoring report.

(1) Publicly credible statistical data, such as sector-specific statistics, values from national standards, or research data from relevant industry associations. Where a range of values is available, the value corresponding to the upper bound of the 95% confidence interval shall be selected to ensure that $EF_{CO_2,v,c}$ is not underestimated.

(2) Where credible publicly available data as described in (1) are not available, measurements shall be conducted by a qualified and independent institution according to the following methods and procedures:

a) Measure driving cycles for roads at different grades within the activity boundary;

b) Measure emission factors for each vehicle category c under the driving cycles determined in (a);

c) Calculate region-specific vehicle speed-emission factors with relative uncertainties at a 95% confidence level using appropriate and internationally recognized models (e.g. MOVES). The upper bound of the 95% confidence interval shall be applied to ensure that $EF_{CO_2,v,c}$ is not underestimated.

$\mathrm{EF}_{\mathrm{co_2,v}}$ shall be calculated as the weighted average of $EF_{CO_2,v,c}$.

$$\mathrm{EF}_{\mathrm{CO_2,v}} = \sum_{c} (EF_{CO_2,v,c} \times S_{c,y'})$$ **Equation 25**

Where:

$\mathrm{EF}_{\mathrm{CO_2,v}}$	=	Weighted speed-emission factor at speed v for the total petrol-fuelled passenger vehicle stock in the host city (tCO_2/km)
$EF_{CO_2,v,c}$	=	Speed-emission factor at speed v for vehicle category c (tCO_2/km)
$S_{c,y'}$	=	Share of vehicle category c in the total petrol-fuelled passenger vehicle stock in year y' (%)
c	=	Vehicle category established according to engine displacement k (in liters) and vehicle age t (in years)
y'	=	The calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period

Since all petrol-fuelled passenger vehicles have been stratified into vehicle category c, the share of each category c in the entire petrol-fuelled passenger vehicle stock of the host city shall be calculated as:

$$S_{c,y'} = \frac{P_{c,y'}}{\sum_c P_{c,y'}}$$ **Equation 26**

Where:

$S_{c,y'}$	=	Share of vehicle category c in the entire petrol-fuelled passenger vehicle stock in year y' (%)
$P_{c,y'}$	=	Number of petrol-fuelled vehicles in vehicle category c in year y'
c	=	Vehicle category established according to engine displacement k (in liters) and vehicle age t (in years)
y'	=	The calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period

- Determination of vehicle age (where applicable)

Where vehicle age data disaggregated by engine displacement category are not directly available from the government traffic management authority's vehicle registry records, the number of surviving vehicles with engine displacement k aged t in year y′ shall be estimated using the vehicle survival function and registration data of new vehicles, as follows.

The share of vehicles aged t that have been scrapped in the total number of vehicles originally registered at age t is given by:

$$S(t) = \exp(-\exp(1.798 - 0.137(t)))^{8}$$ **Equation 27**

Where:

$S(t)$	=	Share of vehicles that have been scrapped and are aged t in the total number of vehicles aged t (%)
t	=	Vehicle age in completed years, with a maximum of 15 years

Number of surviving vehicles with engine displacement k aged t in year y' shall be then calculated as:

$$P_{k,t} = (1 - S(t)) \times N_{k,y'-t}$$ **Equation 28**

Where:

$P_{k,t}$	=	Number of surviving petrol-fuelled vehicles with engine displacement k aged t
$S(t)$	=	Share of vehicles that have been scrapped and are aged t in the total number of vehicles aged t (%)
$N_{k,y'-t}$	=	Total number of newly registered petrol-fuelled vehicles with engine displacement k in year y'−t
t	=	Vehicle age in completed years, with a maximum of 15 years
k	=	Engine displacement (in liters)
y'	=	The calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period

- Determination of T_r, applicable to $\widehat{T}_{r_{\hat{q}}}$ and $T_{r_{lc},y'}$

$$T_r = \begin{cases} T_{depart} & r = 1 \\ T_{r-1} + L_{r-1}/v_{T_{r-1}} & r > 1 \end{cases}$$ **Equation 29**

Where:

[8] Sourced from 2006 IPCC Volume 2 Chapter 3 Box 3.2.3

T_{depart}	=	Time at which the driver's passenger vehicle departs from the navigation starting point
$r-1$	=	The link preceding link r of low-carbon route lc
T_{r-1}	=	Time at which the driver's passenger vehicle reaches preceding link $r-1$
L_{r-1}	=	Length of preceding link $r-1$ (km)
$v_{T_{r-1}}$	=	Average speed of preceding link $r-1$ at time T_{r-1} (km/h)

- Determination of $E_{PKM,p,lc,y'}$

$$E_{PKM,p,lc,y'} = \frac{E_{p,lc,y'}}{\sum_{r_{lc}} L_{r_{lc}}}$$ **Equation 30**

Where:

$E_{PKM,p,lc,y'}$	=	Average CO_2 emissions per kilometer generated by vehicles driving along low-carbon route lc in sample p in year y' (tCO_2/km)
lc	=	Low-carbon route in sample p
$E_{p,lc,y'}$	=	CO_2 emissions generated by passenger vehicle driving along low-carbon route lc in sample p in year y' (tCO_2)
$L_{r_{lc}}$	=	Length of link r_{lc} of low-carbon route lc in sample p (km)
y'	=	The calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period

Step 3: Determination of activity emission factor ($EF_{AE,y}$)

$$EF_{AE,y} = \sum_{i,j,od} W_{i,j,od,y'} \times \overline{E}_{PKM,i,j,od,lc,y'}$$ **Equation 31**

$$W_{i,j,od,y'} = \frac{TP_{i,j,od,y'}}{\sum TP_{i,j,od,y'}}$$ **Equation 32**

$$\overline{E}_{PKM,i,j,od,lc,y'} = \frac{\sum_{p\in(i,j,od)} E_{PKM,p,lc,y'}}{A_{i,j,od,y'}}$$ **Equation 33**

Where:

$EF_{AE,y}$	=	Activity emission factor in year y (tCO_2/km)
p	=	Sampled navigation planning scheme
lc	=	Low-carbon route in sample p

$E_{PKM,p,lc,y'}$	=	Average CO_2 emissions per kilometer generated by vehicles driving along low-carbon route lc in sample p in year y' (tCO_2/km)
$A_{y'}$	=	Total sample size of petrol-fuelled passenger vehicle navigation planning schemes in year y'
$TP_{i,j,od,y'}$	=	Population of petrol-fuelled passenger vehicle navigation planning schemes in each spatiotemporal stratum (i,j,od) in year y'
$A_{i,j,od,y'}$	=	Sample size of petrol-fuelled passenger vehicle navigation planning schemes in each spatiotemporal stratum (i,j,od) in year y'
$W_{i,j,od,y'}$	=	Weight of spatiotemporal stratum (i,j,od) in year y'
$\overline{E}_{PKM,i,j,od,lc,y'}$	=	Sample mean of $E_{PKM,p,lc,y'}$ for low-carbon route lc in spatiotemporal stratum (i,j,od) in year y'
y'	=	The calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period
y	=	Calendar year of the crediting period

78. It shall be noted that $L_{\hat{p},\widehat{lc},y}$ and $EF_{AE,y}$ are derived from two independent calculation chains and do not share a common dataset. $L_{\hat{p},\widehat{lc},y}$ represents the accumulated total distance travelled on the predicted low-carbon route $\widehat{lc}$ within navigation planning scheme $\hat{p}$ by drivers who voluntarily selected such routes during the crediting period. It is subject to ex-post quality control: navigation planning schemes for which the predicted low-carbon route $\widehat{lc}$ is verified as not generating the lowest CO_2 emissions within the scheme shall be excluded from distance accumulation, ensuring that $L_{\hat{p},\widehat{lc},y}$ is not overestimated. $EF_{AE,y}$ is independently determined through stratified random sampling of navigation planning schemes occurring in year y', based entirely on ex-post observed average speeds of each link at specific time. Its determination is not contingent on whether any individual navigation planning scheme was included in or excluded from $L_{\hat{p},\widehat{lc},y}$. The independence of the two parameters ensures that quality control applied to one parameter does not affect the determination of the other, and that no inconsistency is introduced into Equation 14 through their multiplicative combination.

79. Activity emissions are calculated as the product of the activity emission factor of petrol-fuelled passenger vehicles and the distance travelled on predicted low-carbon route $\widehat{lc}$ within navigation planning scheme $\hat{p}$ during the crediting period, as described in Equation 14. The activity emission factor ($EF_{AE,y}$) and the low-carbon route travel distance ($L_{\hat{p},\widehat{lc},y}$) are derived from two independent calculation chains and do not share a common dataset. The conservativeness of each parameter is ensured through separate measures, as described below.

Low-carbon route travel distance ($L_{\hat{p},\widehat{lc},y}$)

$L_{\hat{p},\widehat{lc},y}$ is determined by accumulating the pre-calibrated lengths of individual links completely traversed by the vehicle on the predicted low-carbon route $\widehat{lc}$, as confirmed through positioning-based travel trajectories recorded on the navigation platform. Three interlocking control mechanisms ensure that $L_{\hat{p},\widehat{lc},y}$ is not overestimated and that no additional uncertainty adjustment is required.

At the link-length level, link lengths are defined and measured in advance by the navigation platform based on government-approved map data and are not subject to real-time measurement variability. Measurement uncertainty is therefore effectively eliminated at this level.

At the trajectory-verification level, a link shall be included in the distance accumulation only if complete traversal is confirmed by trajectory data. The time interval between two adjacent trajectory points shall not exceed 10 seconds. Where a vehicle's trajectory spans multiple links within a single interval, a link shall only be credited as completely traversed if both its entry and exit points are independently confirmed by trajectory data; where only one boundary point is confirmed, the link shall be excluded. Any inaccurate, inconsistent, or missing trajectory records are likewise excluded. No link is therefore credited on the basis of interpolated or inferred position, and measurement uncertainty is conservatively bounded at this level.

At the quality control level, an ex post verification process confirms that the predicted low-carbon route $\widehat{lc}$ within each navigation planning scheme generates the lowest CO_2 emissions among all route options within the scheme. Any navigation planning scheme for which this condition is not satisfied shall be documented and excluded from distance accumulation, ensuring no overestimation of low-carbon route travel distance.

These three levels of control collectively ensure that $L_{\hat{p},\widehat{lc},y}$ is conservatively determined. No additional uncertainty adjustment is therefore required for this parameter.

Activity emission factor ($EF_{AE,y}$)

The activity emission factor $EF_{AE,y}$ is independently derived from stratified random sampling of navigation planning schemes in year y', based on ex-post observed traffic speeds, and is not contingent on the dataset used to determine $L_{\hat{p},\widehat{lc},y}$. The sampling is conducted on an annual basis, reflecting the most recent traffic conditions of the host city, and is considered appropriate and accurate. The sampling design requires a minimum confidence level of 95% and a margin of error not exceeding ±5%. Where this margin of error is exceeded for any spatiotemporal stratum, the upper bound of the 95% confidence interval of the stratum-level emission factor estimate shall be applied, ensuring that the activity emission factor is not underestimated.

The eligible vehicles under this methodology include the entire stock of passenger vehicles using petrol as the sole fuel, rather than being limited to a specific fleet. The activity emission factor is calculated using speed-emission factors determined as the weighted average across vehicle categories defined by engine displacement and vehicle age, thereby enabling full coverage of the host city's fleet and ensuring comparability between activity emission factors and baseline emission factors. Fleet composition data, including engine displacement distribution and vehicle age structure, shall be updated at the same frequency as the activity emission factor sampling cycle, with both drawing from the immediately preceding calendar year y', ensuring temporal alignment between the two datasets and preserving the representativeness of the weighted calculation results.

$EF_{AE,y}$ is independently derived from stratified random sampling of navigation planning schemes in year y', based entirely on ex post observed average speeds of each link at specific time, and is not contingent on the dataset used to determine $L_{\hat{p},\widehat{lc},y}$. The sampling is conducted annually, reflecting the most recent traffic conditions of the host city.

The eligible vehicle scope covers the entire stock of petrol-fuelled passenger vehicles in the host city, consistent with the baseline emission factor calculation, which is likewise derived from the full in-use petrol-fuelled passenger vehicle population. To ensure full fleet coverage, $EF_{AE,y}$ is calculated as the weighted average of speed-emission factors across vehicle categories jointly defined by engine displacement and vehicle age, with weights derived from the fleet composition of the full in-use petrol-fuelled passenger vehicle stock in the host city. This weighting structure ensures that the contribution of each vehicle category to $EF_{AE,y}$ is proportional to its share in the actual fleet, thereby preserving representativeness across the full population. Fleet composition data, including engine displacement distribution and vehicle age structure, are sourced from mandatory vehicle registration records maintained by the host city's traffic management authority, which constitute a comprehensive census of the full in-use petrol-fuelled passenger vehicle population. This alignment ensures that activity emissions and baseline emissions are calculated on a consistent fleet basis, preserving the comparability of the two quantities in the net emission reduction calculation.

Fleet composition data, including engine displacement distribution and vehicle age structure, shall be updated at the same frequency as the $EF_{AE,y}$ sampling cycle, with both drawing from the immediately preceding calendar year y', ensuring temporal alignment between the two datasets.

The sampling design requires a minimum confidence level of 95% and a margin of error not exceeding ±5%. This requirement is met at the overall sample level. Where the margin of error is exceeded for any individual spatiotemporal stratum, the upper bound of the 95% confidence interval of that stratum-level emission factor estimate shall be applied. This targeted application of the confidence interval upper bound ensures that $EF_{AE,y}$ is not underestimated while avoiding over-adjustment in strata where sampling precision is sufficient. No additional uncertainty adjustment beyond this mechanism is therefore required for this parameter.

12. Leakage

12.1. Identification of leakage emission sources

80. No significant leakage is expected to occur in these types of activities. Therefore, leakage is considered as zero under this methodology.

81. For this methodology, the proponent evaluated all relevant sources of leakage, and no material leakage sources were identified:

(a) Baseline equipment transfer: Not applicable, as the activity does not involve replacing or transferring any equipment (e.g., no vehicle parts change).

(b) Competition for resource use: Not applicable, as the activity does not increase consumption of limited resources (e.g., no diversion of fuels or materials).

(c) Diversion of existing production processes or outputs: Not applicable, as the activity maintains the same type of output (vehicle travel) and level of service (equivalent driving trips) as the baseline, with no changes leading to increased emissions outside the boundary.

(d) Increases in release of GHGs from the environment: Not applicable, as the activity is behavioural and does not affect natural ecosystems or environmental releases.

12.2. Avoidance or minimization of leakage

82. No significant leakage is expected to occur in these types of activities. Therefore, leakage is considered as zero under this methodology.

83. No significant leakage is expected to occur in these types of activities.

12.3. Addressing leakage emissions

84. No significant leakage is expected to occur in these types of activities. Therefore, leakage is considered as zero under this methodology.

85. No significant leakage is expected to occur in these types of activities.

13. Emission reductions

86. Emission reductions are calculated as follows:

$$ER_y = BE_y - AE_y \quad \textbf{Equation 34}$$

Where:

ER_y	=	Emission reductions in year y (tCO_2/year)
BE_y	=	Baseline emissions in year y (tCO_2/year)
AE_y	=	Activity emissions in year y (tCO_2/year)

87. Emissions reductions are calculated by subtracting activity emissions from baseline emissions.

14. Data and parameters not monitored

Data/parameter	**>>** NCV
Description	>> Net caloric value of petrol
Data unit	>> MJ/ton
Equations referred	>> 4
Purpose of data	☒ Baseline emissions ☐ Project emissions ☐ Leakage emissions
Value(s) applied	>>
Source of data	☐ Measured ☒ Other sources
Choice of data or measurement methods and procedures	>>Data shall be applied in the following order of priority: 1. Locally representative measurements obtained from authoritative institutes; 2. Values reported in peer-reviewed scientific literature most relevant to the context of the activity; 3. The latest IPCC default values, applying the lower bound of the 95% confidence interval
Treatment of uncertainty	>> Uncertainty has been addressed by employing data from authoritative sources and applying the following rules: Values obtained under Options 1 and 2 shall be verified against the uncertainty range of the latest IPCC default values. If such values fall below this range, Option 3 shall be used.
Additional comments	>>/

Data/parameter	**>>** EF_{CO2}
Description	>> Emission factor of petrol
Data unit	>> tCO_2/MJ
Equations referred	>> 4
Purpose of data	☒ Baseline emissions ☐ Project emissions ☐ Leakage emissions
Value(s) applied	>>
Source of data	☐ Measured ☒ Other sources
Choice of data or measurement methods and procedures	>> Data shall be applied in the following order of priority: 1. Locally representative measurements obtained from authoritative institutes; 2. Values reported in peer-reviewed scientific literature most relevant to the context of the activity; 3. The latest IPCC default values, applying the lower bound of the 95% confidence interval
Treatment of uncertainty	>> Uncertainty has been addressed by employing data from authoritative sources and applying the following rules: Values obtained under Options 1 and 2 shall be verified against the uncertainty range of the latest IPCC default values. If such values fall below this range, Option 3 shall be used.
Additional comments	>> /

Data/parameter	**>>** ρ
Description	>> Density of petrol
Data unit	>> ton/L
Equations referred	>> 4
Purpose of data	☒ Baseline emissions ☐ Project emissions ☐ Leakage emissions
Value(s) applied	>>
Source of data	☐ Measured ☒ Other sources
Choice of data or measurement methods and procedures	>> Data shall be applied in the following order of priority: 1. Locally representative measurements obtained from authoritative institutes; 2. Values reported in peer-reviewed scientific literature most relevant to the context of the activity 3. Typical density of motor petrol (motor gasoline) 0.0007407 ton/L as specified in the Energy Statistics Manual[9] issued by the International Energy Agency (IEA)
Treatment of uncertainty	>> Uncertainty has been addressed by employing data from authoritative sources. Where values from Option 1 or 2 are adopted, they shall be compared against the value specified in Option 3, and the lower of the two values shall be applied.
Additional comments	>> /

[9] https://iea.blob.core.windows.net/assets/67fb0049-ec99-470d-8412-1ed9201e576f/EnergyStatisticsManual.pdf

Data/parameter	>> INDA
Description	>> Increase in the downward adjustment in the subsequent years of the crediting period
Data unit	>> %
Equations referred	>> 9
Purpose of data	☒ Baseline emissions ☐ Project emissions ☐ Leakage emissions
Value(s) applied	>>1
Source of data	☐ Measured ☒ Other sources
Choice of data or measurement methods and procedures	>> /
Treatment of uncertainty	>> /
Additional comments	>> /

Data/parameter	>> $CF_{other \rightarrow WLTC}$
Description	>> Conversion factor from the original non-WLTC test procedure to the WLTC-equivalent combined fuel consumption
Data unit	>> /
Equations referred	>> *3*
Purpose of data	☒ Baseline emissions ☐ Project emissions ☐ Leakage emissions
Value(s) applied	>>/
Source of data	☐ Measured ☒ Other sources
Choice of data or measurement methods and procedures	>> Publicly disclosed by a government authority, a UNECE working group, or a peer-reviewed source
Treatment of uncertainty	>> Where multiple conversion factors are available from qualifying sources, the value that results in the lower converted WLTC-equivalent fuel consumption shall be selected.
Additional comments	>> The source, version, and numerical value of the conversion factor applied shall be documented in the PDD and monitoring reports.

Data/parameter	>> ***k***
Description	>> Engine displacement category (in liters)
Data unit	>> /
Equations referred	>> *5,6*
Purpose of data	☒ Baseline emissions ☐ Project emissions ☐ Leakage emissions
Value(s) applied	>>/
Source of data	☐ Measured ☒ Other sources
Choice of data or measurement methods and procedures	>> Engine displacement (k) categories: Category

	$k \leq 1.0L$ $1.0L < k \leq 1.6L$ $1.6L < k \leq 2.0L$ $k > 2.0L$
Treatment of uncertainty	>> /
Additional comments	>> /

Data/parameter	>> ***c***
Description	>> Vehicle category established according to engine displacement k (in liters) and vehicle age t (in years)
Data unit	>> /
Equations referred	>> 25,26
Purpose of data	☐ Baseline emissions ☒ Project emissions ☐ Leakage emissions
Value(s) applied	>>/
Source of data	☐ Measured ☒ Other sources
Choice of data or measurement methods and procedures	>> c is defined as a unique combination (k_s, t_s) (see table below)
Treatment of uncertainty	>> /
Additional comments	>> /

Engine displacement (k) categories		**Vehicle age (t) categories**	
Category	Range	Category	Range
k_1	$k \leq 1.0L$	t_1	0–6 years
k_2	$1.0L < k \leq 1.6L$	t_2	7–10 years
k_3	$1.6L < k \leq 2.0L$	t_3	>10 years
k_4	$k > 2.0L$	/	

Data/parameter	>> ***t***
Description	>> Vehicle age in completed years, with a maximum of 15 years
Data unit	>> /
Equations referred	>> 27,28
Purpose of data	☐ Baseline emissions ☒ Project emissions ☐ Leakage emissions
Value(s) applied	>>/
Source of data	☐ Measured ☒ Other sources
Choice of data or measurement methods and procedures	>> Vehicle age t is expressed in completed years from the year of first registration, capped at 15 years. Where vehicle-age data cannot be directly obtained from government traffic management department's vehicle registry

	records, the surviving vehicle stock by age shall be estimated using Equations 27 and 28.
Treatment of uncertainty	>> /
Additional comments	>> Used to determine number of surviving vehicles with engine displacement k aged t in case such data cannot be directly obtained from government traffic management department's vehicle registry records

15. Data and parameters monitored

88. Annual Sampling Provisions

Under this methodology, sampling shall be conducted annually throughout the crediting period to determine the activity emission factor ($EF_{AE,y}$) for each year y of the crediting period.

For each year y of the crediting period, the sampling frame includes all navigation planning schemes from year y' which is defined as:

- The calendar year immediately prior to year y; or
- The most recent calendar year prior to year y for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period.

The activity participant shall conduct spatiotemporal sampling of all navigation planning schemes in each calendar year of the crediting period, following the procedure specified in Step 1: Navigation planning scheme sampling in year y for Determination of activity emission factor ($\mathrm{EF_{AE,y}}$), to obtain:

- The set of sampled navigation planning schemes p, with total sample size $A_{y'}$
- For each sampled navigation planning scheme p: the identified low-carbon route lc

(1) Sampling design requirements

Each annual sampling shall meet the following statistical requirements:

- Minimum confidence level: 95%
- Maximum margin of error: ±5%
- Sampling method: simple random sampling within each spatiotemporal stratum (i, j, od)
- Sample size formula: Equation 20

(2) Documentation and verification requirements

For each calendar year y of the crediting period, the activity participant shall document in the monitoring report:

Item	Requirement
Sampling year y'	Identified sampling year

Spatiotemporal stratification scheme	Stratification criteria applied
Total population $TP_{i,j,od}$	By each spatiotemporal stratum
Sample size $A_{i,j,od}$ and $A_{y'}$	Calculated per Equation 20 and 22
Achieved confidence level and margin of error	Verification of 95%/±5% criterion
Sampled navigation planning schemes p	Records of all sampled p

The DOE shall verify, during each verification, that the annual sampling has been conducted in accordance with these provisions and that the required 95%/±5% reliability criterion has been met.

(3) Failure to achieve sampling reliability

Where the achieved margin of error exceeds ±5% for any spatiotemporal stratum, the activity participant shall apply one of the following remedial measures:

(a) Increase the sample size for the affected stratum and re-conduct sampling until the ±5% margin of error requirement is met; or

(b) Accept the achieved margin of error for the affected stratum and apply the upper bound of the actual 95% confidence interval of the stratum-level emission factor estimate, which corresponds to an upward adjustment larger than would apply under the ±5% criterion, thereby ensuring conservativeness.

Under option (b), the achieved margin of error for the affected stratum shall be explicitly documented in the monitoring report, together with a justification for why option (a) was not applied. The DOE shall verify that the conservative bound has been correctly calculated and applied based on the actual sample data.

The achieved margin of error for each stratum shall be calculated as per Equation 23.

Data/parameter	**>>** $\mathrm{fc}_{j,k,(y'-2,y'-1,y')}$	
Description	>> The j-th distinct WLTC combined fuel consumption value (or converted WLTC-equivalent value) published by the government authorities for a petrol-fuelled passenger vehicle model variant in engine displacement category k over the three calendar years ending in year y'	
Data unit	>>L/100 km	
Equations referred	>> 2	
Purpose of data	☒ Baseline emissions ☐ Project emissions ☐ Leakage emissions	
Measurement and updating frequency	>> Annually	
Measurement methods and procedures	>> WLTC combined fuel consumption value (or converted WLTC-equivalent value) published by the government authorities	
Entity/person responsible for the measurement	>> Activity participant	
Measuring instrument(s)	*Type of instrument*	>> /

	Accuracy class	>> /
	Calibration requirements	>> /
	Location	>> /
QA/QC procedures	>> /	
Treatment of uncertainty	>> Uncertainty has been addressed by employing data disclosed by the government authorities	
Additional comment	>> y' refers to the calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period	

Data/parameter	**>>** $fc_{j,k,(y'-2,y'-1,y')}^{other}$	
Description	>> The j-th distinct WLTC combined fuel consumption value (or converted WLTC-equivalent value) published by the government authorities for a petrol-fuelled passenger vehicle model variant in engine displacement category k over the three calendar years ending in year y'	
Data unit	>>L/100 km	
Equations referred	>> *3*	
Purpose of data	☒ Baseline emissions ☐ Project emissions ☐ Leakage emissions	
Measurement and updating frequency	>> Annually	
Measurement methods and procedures	>> Combined fuel consumption value certified under the original non-WLTC test procedure published by the government authorities	
Entity/person responsible for the measurement	>> Activity participant	
Measuring instrument(s)	*Type of instrument*	>> /
	Accuracy class	>> /
	Calibration requirements	>> /
	Location	>> /
QA/QC procedures	>> /	
Treatment of uncertainty	>> Where a non-WLTC certified value is converted to a WLTC-equivalent value, the conversion factor applied and the resulting converted value shall be documented in the monitoring report. The DOE shall verify that the conversion factor has been sourced from a qualifying public source and applied in the conservative direction.	
Additional comment	>> y' refers to the calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period	

Data/parameter	**>>** $n_{j,k,(y'-2,y'-1,y')}$	
Description	>> Frequency count of the fuel consumption value $fc_{j,k,(y'-2,y'-1,y')}$ in the official government published records for engine displacement category k over the three calendar years ending in year y'	
Data unit	>> count	
Equations referred	>> *2*	
Purpose of data	☒ Baseline emissions ☐ Project emissions ☐ Leakage emissions	
Measurement and updating frequency	>> Annually	
Measurement methods and procedures	>> WLTC combined fuel consumption value (or converted WLTC-equivalent value) published by the government authorities	
Entity/person responsible for the measurement	>> Activity participant	
Measuring instrument(s)	*Type of instrument*	>> /
	Accuracy class	>> /
	Calibration requirements	>> /
	Location	>> /
QA/QC procedures	>> /	
Treatment of uncertainty	>> Uncertainty has been addressed by employing data disclosed by the government authorities	
Additional comment	>> y' refers to the calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period	

Data/parameter	**>>** $P_{k,y'}$	
Description	>> Number of petrol-fuelled vehicles in engine displacement category k in year y'	
Data unit	>> Vehicle	
Equations referred	>> 5	
Purpose of data	☒ Baseline emissions ☐ Project emissions ☐ Leakage emissions	
Measurement and updating frequency	>> Annually	
Measurement methods and procedures	>> Government traffic management department's vehicle registry records	
Entity/person responsible for the measurement	>> Activity participant	
Measuring instrument(s)	*Type of instrument*	>> /

	Accuracy class	>> /
	Calibration requirements	>> /
	Location	>> /
QA/QC procedures	>> The activity participant shall demonstrate that the vehicle stock data are sourced from the official vehicle registration records for the reference year y' and cover the full in-use petrol-fuelled passenger vehicle population within the host city's administrative boundary.	
Treatment of uncertainty	>> /	
Additional comment	>> y' refers to the calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period	

Data/parameter	**>>** $P_{c,y'}$	
Description	>> Number of petrol-fuelled vehicles in vehicle category c in year y'	
Data unit	>> Vehicle	
Equations referred	>>26	
Purpose of data	☐ Baseline emissions ☒ Project emissions ☐ Leakage emissions	
Measurement and updating frequency	>> Annually	
Measurement methods and procedures	>> Government traffic management department's vehicle registry records	
Entity/person responsible for the measurement	>> Activity participant	
Measuring instrument(s)	*Type of instrument*	>> /
	Accuracy class	>> /
	Calibration requirements	>> /
	Location	>> /
QA/QC procedures	>> The activity participant shall demonstrate that the vehicle stock data are sourced from the official vehicle registration records for the reference year y' and cover the full in-use petrol-fuelled passenger vehicle population within the host city's administrative boundary.	
Treatment of uncertainty	>> /	
Additional comment	>> y' refers to the calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period	

Data/parameter	>> $N_{k,y'-t}$	
Description	>> Total number of newly registered petrol-fuelled vehicles with engine displacement k in year y'-t	
Data unit	>>Vehicle	
Equations referred	>> *28*	
Purpose of data	☐ Baseline emissions ☒ Project emissions ☐ Leakage emissions	
Measurement and updating frequency	>> Annually	
Measurement methods and procedures	>> Government traffic management department's vehicle registry records	
Entity/person responsible for the measurement	>> Activity participant	
Measuring instrument(s)	*Type of instrument*	>> /
	Accuracy class	>> /
	Calibration requirements	>> /
	Location	>> /
QA/QC procedures	>> /	
Treatment of uncertainty	>> Uncertainty has been addressed by employing data from government traffic management department's vehicle registry records	
Additional comment	>> y' refers to the calendar year immediately prior to year y of the crediting period, or the most recent calendar year prior to year y of the crediting period for which the required data are available, provided that such year falls within the three calendar years immediately prior to year y of the crediting period	

Data/parameter	>> $\boldsymbol{p}$
Description	>> Sampled navigation planning scheme, comprising: a) Latitude and longitude of navigation starting point and navigation end point, driver's departure time; b) A set of at least two planned routes, each containing the sequence of route links from navigation starting point to navigation end point, along with road attribute information such as link lengths
Data unit	>>/
Equations referred	>> *24,29,30,33*
Purpose of data	☐ Baseline emissions ☒ Project emissions ☐ Leakage emissions
Measurement and updating frequency	>> Annually
Measurement methods and procedures	>> Sampling shall be conducted in accordance with the Annual Sampling Provisions as specified in Paragraph 88
Entity/person	>> Activity participant

responsible for the measurement		
Measuring instrument(s)	*Type of instrument*	>> /
	Accuracy class	>> /
	Calibration requirements	>> /
	Location	>> /
QA/QC procedures	>> The achieved margin of error shall be calculated. Where the achieved margin of error exceeds ±5% for any spatiotemporal stratum, the activity participant shall apply one of the following remedial measures: (a) Increase the sample size for the affected stratum and re-conduct sampling until the ±5% margin of error requirement is met; or (b) Accept the achieved margin of error for the affected stratum and apply the upper bound of the actual 95% confidence interval of the stratum-level emission factor estimate, which corresponds to an upward adjustment larger than would apply under the ±5% criterion, thereby ensuring conservativeness. Under option (b), the achieved margin of error for the affected stratum shall be explicitly documented in the monitoring report, together with a justification for why option (a) was not applied. The DOE shall verify that the conservative bound has been correctly calculated and applied based on the actual sample data.	
Treatment of uncertainty	>> Sampling uncertainty has been addressed in the QA/QC procedures	
Additional comment	>> The parameters $lc,$ $\mathrm{r_{lc}}$ and $L_{r_{lc}}$, $T_{depart}\ (applicable\ to\ T_{r_{lc},y'})$ are included in $\boldsymbol{p}$. 1. For each sample p collected, the low-carbon route lc shall be identified following the identical procedure set out in *Paragraph 76. Prediction of low-carbon route within a navigation planning scheme under the activity scenario*. 2. $\mathrm{r_{lc}}$ refers to link of low-carbon route lc in sample p 3. $L_{r_{lc}}$ refers to length of link $\mathrm{r_{lc}}$ of low-carbon route lc in sample p (km), which is defined and measured in advance by the navigation platform based on government-approved map data, and are not subject to real-time measurement variability 4. $\mathrm{T_{depart,p}}$ refers to the time (accurate to the second) at which the driver's passenger vehicle departs from the navigation starting point, which is determined by the trajectory timestamp recorded by the navigation platform	

Data/parameter	**>>** $v_{T_{r_{lc}},y'}$
Description	>> Actual average speed of each link at time $T_{r_{lc},y'}$ when the driver's passenger vehicle would have reached link $\mathrm{r_{lc}}$ in year y'
Data unit	>>km/h
Equations referred	>> *24*
Purpose of data	☐ Baseline emissions ☒ Project emissions ☐ Leakage emissions
Measurement and updating frequency	>> Continuously
Measurement methods and	>> The actual average speed of each link is calculated as the ratio of the pre-calibrated link length to the actual traversal time recorded by GNSS-

procedures	enabled devices: $v = \text{link length}/\text{actual traversal time}$	
Entity/person responsible for the measurement	>> Activity participant	
Measuring instrument(s)	*Type of instrument*	>> GNSS-enabled devices
	Accuracy class	>> /
	Calibration requirements	>> /
	Location	>> On-board the voluntarily participating vehicles
QA/QC procedures	>> Validity criteria applied to each link-level speed record: **(1) Spatial completeness:** GNSS trajectory must be successfully map-matched to both the entry node and exit node of the target link. Records failing map-matching are discarded. **(2) Temporal continuity:** The maximum time gap between any two consecutive GNSS points within the time window between the entry node and exit node of the target link must not exceed 60 seconds. Records exceeding this threshold are discarded. **(3) Speed plausibility:** The resulting link-level speed must satisfy regulatory local speed limit, e.g. 0 < link-level speed ≤ 120 km/h in China. Outliers are discarded. A link-level speed record is accepted for emission calculation only when all criteria above are satisfied.	
Treatment of uncertainty	>> – Link lengths shall be defined and measured in advance by the navigation platform based on government-approved map data, and not subject to real-time measurement variability, eliminating measurement variability in the numerator of the speed formula. – The 60-second maximum gap criterion prevents systematic overestimation of traversal time caused by data dropout, thereby avoiding underestimation of link speed. – The validity criteria (1)–(3) collectively ensure that only verified speed records contribute to emission calculations.	
Additional comment	>>The statistical aggregation interval for the link-level speed shall not exceed 5 minutes.	

Data/parameter	**>>** $EF_{CO_2,v,c}$
Description	>> Speed-emission factor at speed v for vehicle category c
Data unit	>>tCO_2/km
Equations referred	>> *25*
Purpose of data	☐ Baseline emissions ☒ Project emissions ☐ Leakage emissions
Measurement and updating frequency	>> At least once every three years during the crediting period and at each renewal of the crediting period
Measurement methods and procedures	>> (1) Publicly credible statistical data, such as sector-specific statistics, values from national standards, or research data from relevant industry associations. Where a range of values is available, the value corresponding to the upper bound of the 95% confidence interval shall be selected to ensure that $\mathrm{EF}_{\mathrm{CO_2},v,c}$ is not underestimated.

	(2) Where credible publicly available data as described in (1) are not available, measurements shall be conducted by a qualified and independent institution according to the following methods and procedures: a) Measure driving cycles for roads at different grades within the activity boundary; b) Measure emission factors for each vehicle category c under the driving cycles determined in (a); c) Calculate region-specific vehicle speed-emission factors with relative uncertainties at a 95% confidence level using appropriate and internationally recognized models (e.g. MOVES). The upper bound of the 95% confidence interval shall be applied to ensure that $EF_{CO_2,v,c}$ is not underestimated.	
Entity/person responsible for the measurement	>> Activity participant	
Measuring instrument(s)	*Type of instrument*	>> /
	Accuracy class	>> /
	Calibration requirements	>> /
	Location	>> /
QA/QC procedures	>> Where option (2) is applied, measurements shall be conducted by a qualified and independent institution. The institution's qualifications and the measurement methodology applied shall be documented in the monitoring report and verified by the DOE.	
Treatment of uncertainty	>> Upper bound of 95% confidence interval shall be applied.	
Additional comment	>> /	

Data/parameter	**>>** $\hat{v}_{\hat{T}_{r_{\hat{q}}}}$	
Description	>> Predicted speed of link $r_{\hat{q}}$ of planned route $\hat{q}$ in navigation planning scheme $\hat{p}$ at time $\hat{T}_{r_{\hat{q}}}$	
Data unit	>> km/h	
Equations referred	>> 15	
Purpose of data	☐ Baseline emissions ☒ Project emissions ☐ Leakage emissions	
Measurement and updating frequency	>> Continuously	
Measurement methods and procedures	>> Predicted speed of each link is calculated as the ratio of the pre-calibrated link length to the traversal time predicted by the navigation platform: $v = \text{link length}/\text{predicted traversal time}$	
Entity/person responsible for the measurement	>> Activity participant	
Measuring instrument(s)	*Type of instrument*	>> /
	Accuracy	>> /

	Accuracy class	
	Calibration requirements	>> /
	Location	>> /
QA/QC procedures	>> Link lengths used in the predicted speed calculation shall be defined and measured in advance based on government-approved map data and are not subject to real-time variability. The predicted low-carbon route $\widehat{lc}$ determined using $\hat{v}_{\hat{T}_{r_{\hat{q}}}}$ shall be subject to ex post quality control verification as specified in the QA/QC procedures for $L_{\hat{p},\widehat{lc},y}$.	
Treatment of uncertainty	>> Uncertainty associated with predicted speeds is addressed through ex post quality control: navigation planning schemes for which the predicted low-carbon route is verified as not generating the lowest CO_2 emissions shall be excluded from distance accumulation, and a conservative emissions deduction shall be applied where applicable.	
Additional comment	>> /	

Data/parameter	**>>** $\hat{p}$	
Description	>> Navigation planning scheme provided by the navigation platform to the driver before a driving trip during the crediting period, including: a) The latitude and longitude of the navigation starting point, the latitude and longitude of the navigation endpoint, and the departure time; b) A set of navigation routes, with minimum of two routes. Each route includes a sequence of links from the navigation starting point to the navigation endpoint, along with road attribute information such as link lengths, and an indication of whether it is a low-carbon route.	
Data unit	>> /	
Equations referred	>> *1,10,14,*15,16	
Purpose of data	☒ Baseline emissions ☒ Project emissions ☐ Leakage emissions	
Measurement and updating frequency	>> Continuously	
Measurement methods and procedures	>> Planned by navigation platform	
Entity/person responsible for the measurement	>> Activity participant	
Measuring instrument(s)	*Type of instrument*	>> /
	Accuracy class	>> /
	Calibration requirements	>> /
	Location	>> /
QA/QC procedures	>> /	
Treatment of uncertainty	>> /	
Additional comment	>> The parameters $\hat{q}$, $\widehat{lc}$, $r_{\hat{q}}$ and $L_{r_{\hat{q}}}$, T_{depart} (applicable to $\hat{T}_{r_{\hat{q}}}$) are included in	

	$\hat{p}$. 1. $\hat{q}$ refers to planned route in navigation planning schemes $\hat{p}$ 2. $\widehat{lc}$ refers to predicted low-carbon route within each navigation planning scheme $\hat{p}$ during the crediting period identified following the procedure set out in *Paragraph 76. Prediction of low-carbon route within a navigation planning scheme under the activity scenario*. 3. $r_{\hat{q}}$ refers to planned route $\hat{q}$ in navigation planning schemes $\hat{p}$ 4. $L_{r_{\hat{q}}}$ refers to length of link $r_{\hat{q}}$ of planned route $\hat{q}$ in navigation planning schemes $\hat{p}$ (km), which is defined and measured in advance by the navigation platform based on government-approved map data, and are not subject to real-time measurement variability 5. $T_{depart,\hat{p}}$ refers to the time (accurate to the second) at which the driver's passenger vehicle departs from the navigation starting point, which is determined by the trajectory timestamp recorded by the navigation platform

Data/parameter	>> $traj$	
Description	>> The driving trajectory sequence of an driver's passenger vehicle, including time, location latitude and longitude, and instantaneous speed.	
Data unit	>> /	
Equations referred	>> /	
Purpose of data	☒ Baseline emissions ☒ Project emissions ☐ Leakage emissions	
Measurement and updating frequency	>> Continuously	
Measurement methods and procedures	>> Collected via GNSS-enabled devices, with trajectory data processed and recorded by the navigation platform. All trajectory data are timestamped and stored in the platform's database, providing a complete audit trail.	
Entity/person responsible for the measurement	>> Activity participant	
Measuring instrument(s)	*Type of instrument*	>> GNSS-enabled devices
	Accuracy class	>> /
	Calibration requirements	>> /
	Location	>> On-board the voluntarily participating vehicles
QA/QC procedures	>> Validity criteria applied to trajectory data: (1) Invalid records (inaccurate, inconsistent, or missing trajectory data) are excluded from dataset. (2) The time interval between two adjacent latitude and longitude points in the driver's driving trajectory shall not exceed 10 seconds. *(3)* A link is only credited as fully traversed if both its entry and exit points are independently confirmed by trajectory data; otherwise, it is excluded from distance accumulation. These QA/QC rules ensure that no link is credited based solely on interpolated or inferred positions, maintaining conservativeness.	
Treatment of uncertainty	>> Uncertainty has been addressed in the QA/QC procedures	
Additional comment	>> Travel trajectories are used to verify whether each link has been	

	completely traversed by the vehicle; only links for which complete traversal is confirmed are included in the distance accumulation.

Data/parameter	>> $\mathbf{L_{\hat{p},\widehat{lc},y}}$
Description	>> Total length of links traversed on the low-carbon route $\widehat{lc}$ predicted by the navigation platform under a navigation planning scheme, accumulated from the navigation starting point, in year y
Data unit	>> km
Equations referred	>> 1,10,14
Purpose of data	☒ Baseline emissions ☒ Project emissions ☐ Leakage emissions
Measurement and updating frequency	>> Continuously
Measurement methods and procedures	>> $L_{\hat{p},\widehat{lc},y}$ is determined by accumulating the pre-calibrated lengths of individual links for which complete traversal is confirmed through positioning-based travel trajectories recorded on the navigation platform in year y.
Entity/person responsible for the measurement	>> Activity participant
Measuring instrument(s)	*Type of instrument*: >> / *Accuracy class*: >> / *Calibration requirements*: >> / *Location*: >> /
QA/QC procedures	>> • $L_{\hat{p},\widehat{lc},y}$ shall be determined by accumulating the pre-calibrated lengths of individual road links completely traversed by the vehicle on the predicted low-carbon route $\widehat{lc}$ by the navigation platform, as confirmed through positioning-based travel trajectories recorded on the navigation platform in year y. Link lengths shall be defined and measured in advance by the navigation platform based on government-approved map data, and not subject to real-time measurement variability. A link shall be included in the distance accumulation only if complete traversal is confirmed by trajectory data; any link for which complete traversal cannot be confirmed shall be excluded. • Distance accumulation shall commence from the starting link, defined as the link on the predicted low-carbon route $\widehat{lc}$ within which the navigation starting point is located. Where the navigation starting point cannot be precisely located via trajectory data, the first link that can be precisely verified via trajectory data shall be used as the starting link. No distance shall be counted for links prior to this verified starting link, ensuring no overestimation of travel distance. • Distance accumulation shall cease when the vehicle's trajectory deviates from the predicted low-carbon route $\widehat{lc}$, defined as the occurrence of a trajectory point that cannot be matched to the next expected link on $\widehat{lc}$. Links traversed after such deviation shall not contribute to $L_{\hat{p},\widehat{lc},y}$.

	• During a trip, where the navigation platform issues a rerouting instruction that modifies the sequence of links remaining in the active route, the ongoing accumulation of link lengths shall cease and the new route plan shall be treated as a separate navigation planning scheme. Recalculation that does not alter the sequence of remaining links shall not constitute a new navigation planning scheme and shall not interrupt distance accumulation. The navigation platform shall maintain a timestamped log of all rerouting events occurring during each trip to support ex post verification of scheme boundaries. • Ex-post verification of the predicted low-carbon route planned prior to a driving trip shall be conducted on all low-carbon route driving navigation planning schemes occurring during the verification period. Those for which the predicted low-carbon route is verified as not generating the lowest CO2 emissions within the navigation planning scheme shall be documented and their distance accumulation shall be excluded from $L_{\hat{p},\widehat{lc},y}$.
Treatment of uncertainty	>> Uncertainty has been addressed in the QA/QC procedures
Additional comment	>> /

Data/parameter	**>>** i	
Description	>> Predicted low-carbon route verified as not generating the lowest CO2 emissions among all route options within the navigation planning scheme in year y, as per ex post verification outcome, i.e. incorrectly predicted route	
Data unit	>> /	
Equations referred	>> 18,19	
Purpose of data	☐ Baseline emissions ☒ Project emissions ☐ Leakage emissions	
Measurement and updating frequency	>> Annually	
Measurement methods and procedures	>> As per ex post verification outcome Ex post verification of the predicted low-carbon route planned prior to a driving trip shall be conducted on all low-carbon route driving navigation planning schemes occurring during the verification period to identify those for which the predicted low-carbon route is verified as not generating the lowest CO2 emissions within the navigation planning scheme	
Entity/person responsible for the measurement	>> Activity participant	
Measuring instrument(s)	*Type of instrument*	>> /
	Accuracy class	>> /
	Calibration requirements	>> /
	Location	>> /
QA/QC procedures	>> /	
Treatment of uncertainty	>> This parameter is used in ex post verification of the predicted low-carbon route planned prior to a driving trip conducted on all low-carbon route driving navigation planning schemes occurring during the verification period. Relevant uncertainty has been addressed in the QA/QC procedures of	

	actual average link-level speed.
Additional comment	>> /

Data/parameter	**>>** $E_{i,y}$	
Description	>> Actual CO_2 emissions incorrectly predicted route i in year y (tCO2)	
Data unit	>> tCO_2	
Equations referred	>> 18	
Purpose of data	☐ Baseline emissions ☒ Project emissions ☐ Leakage emissions	
Measurement and updating frequency	>> Annually	
Measurement methods and procedures	>> Actual CO_2 emissions of incorrectly predicted route i in year y shall be calculated in accordance with Equation 15, using ex post observed link-level speeds recorded by the navigation platform.	
Entity/person responsible for the measurement	>> Activity participant	
Measuring instrument(s)	*Type of instrument*	>> /
	Accuracy class	>> /
	Calibration requirements	>> /
	Location	>> /
QA/QC procedures	>> /	
Treatment of uncertainty	>> This parameter is used in ex post verification of the predicted low-carbon route planned prior to a driving trip conducted on all low-carbon route driving navigation planning schemes occurring during the verification period. Relevant uncertainty has been addressed in the QA/QC procedures of actual average link-level speed.	
Additional comment	>> As per ex post verification outcome on whether the predicted low-carbon route planned prior to a driving trip actually generates the lowest CO_2 emissions within the navigation planning scheme	

Data/parameter	**>>** $d_{i,y}$
Description	>> Actual travel distance of incorrectly predicted route i in year y
Data unit	>> km
Equations referred	>> 19
Purpose of data	☐ Baseline emissions ☒ Project emissions ☐ Leakage emissions
Measurement and updating frequency	>> Annually
Measurement methods and procedures	>> The actual travel distance of incorrectly predicted route i shall be determined by accumulating the pre-calibrated lengths of all links comprising route i that are confirmed as completely traversed by the vehicle, based on government-approved map data, consistent with the link traversal verification rules applied to $L_{\hat{p},\widehat{lc},y}$.
Entity/person	>> Activity participant

responsible for the measurement		
Measuring instrument(s)	*Type of instrument*	>> /
	Accuracy class	>> /
	Calibration requirements	>> /
	Location	>> /
QA/QC procedures	>> /	
Treatment of uncertainty	>> Link lengths shall be defined and measured in advance by the navigation platform based on government-approved map data, and not subject to real-time measurement variability. Therefore, uncertainty has been addressed accordingly.	
Additional comment	>> As per ex post verification outcome on whether the predicted low-carbon route planned prior to a driving trip actually generates the lowest CO_2 emissions within the navigation planning scheme	

Data/parameter	**>>** DA_{y1}	
Description	>> Initial downward adjustment to the baseline emissions in year1	
Data unit	>> tCO_2	
Equations referred	>> 9	
Purpose of data	☒ Baseline emissions ☐ Project emissions ☐ Leakage emissions	
Measurement and updating frequency	>> Once for year1 of the first crediting period	
Measurement methods and procedures	>> Determined as the difference between $BE_{adj,y1}$ and $BE_{history,y1}$	
Entity/person responsible for the measurement	>> Activity participant	
Measuring instrument(s)	*Type of instrument*	>> /
	Accuracy class	>> /
	Calibration requirements	>> /
	Location	>> /
QA/QC procedures	>> /	
Treatment of uncertainty	>> /	
Additional comment	>> y1 refers to calendar year of the start date of the first crediting period	

16. Methodologies principles

16.1. Encouraging ambition over time

89. The methodology establishes a framework where the baseline emission factor is updated on an annual basis to reflect vehicle fuel efficiency technology progress and the baseline emissions are progressively reduced in line with the principle of encouraging ambition over time. The low-carbon navigation mechanism contributes to this progressive ambition through the following elements:

    (a) Behavioural Shifts: Realization of prompting low-carbon navigation routes enables individuals to prioritize routes with lowest emissions. Repeated adoption reinforces this behavioural change, fostering a long-term culture of sustainable urban travel aligned with tightening emission reduction targets.

    (b) Dynamic Adjustment of Baseline: The methodology provides for an annual downward adjustment of baseline emissions to reflect increasing ambition and policy tightening.

    (c) Promotion of Scalable Solutions: By enabling the adoption of innovative navigation technologies and practices (e.g., real-time low-carbon route prediction), the mechanism accelerates the diffusion of replicable solutions that reduce current emissions and establish systemic conditions for higher ambition.

90. This systemic approach amplifies the effect of individual behavioural shifts, supporting a city-wide trajectory toward low-carbon urban mobility. In accordance with paragraph 28 and section 7 of the methodologies standard, the methodology ensures ambition is progressively strengthened through dynamic baseline reductions, resulting in decrease of claimed emission reductions over time, reinforcement of behavioural change, promotion of scalable solutions, and integration with long-term policy targets.

16.2. Contributing to the equitable sharing of mitigation benefits between participating Parties

91. The mechanism ensures voluntary participation without requiring drivers to surrender resources or rights, thereby safeguarding fairness and the right of choice. By guiding individuals to increasingly adopt low-carbon navigation routes, the activity generates emission reductions that extend beyond the crediting period, delivering long-term benefits to the host country.

92. Activity participants are required to apply the A6.4 SD Tool to demonstrate alignment with sustainable development goals, ensuring transparent accounting of mitigation outcomes. This provision facilitates equitable sharing of benefits among cooperating Parties.

16.3. Encouraging broad participation

93. The methodology is adaptable across diverse geographic and socio-economic contexts, including cities of varying sizes and capacities, thereby facilitating engagement in carbon market mechanisms. By transparently quantifying emission reductions from behavioural changes in route adoption, the mechanism ensures accountability and fosters widespread adoption, amplifying collective mitigation benefits.

16.4. Attributability of emission reductions or net removals to the Article 6.4 activity

94. The methodology ensures that emission reductions are solely attributable to the Article 6.4 activity by applying the following provisions:

a) Conservative baseline scenario identification: The baseline scenario is established in a conservative manner and adjusted to account for mandatory policies and quantified targets supported by policy frameworks that are active or scheduled to take effect during the crediting period. This prevents attribution of reductions that would occur independently of the activity.

b) Activity-specific monitoring: Only distance travelled along the predicted low-carbon routes provided by the navigation platform is credited. This ensures that reductions result directly from the Article 6.4 activity.

c) Conservative parameters: Emission factors and activity data are selected from official statistics, peer-reviewed sources, or IPCC defaults, prioritizing conservative values. Downward adjustments are applied to baseline emissions in line with the baseline standard to ensure conservativeness.

d) Avoidance of double counting: Emission reductions are credited only within the activity boundary and are not attributed to other projects, programs, or mechanisms, thereby avoiding overlap or double counting.

Through these measures, the methodology ensures that only reductions directly induced by the Article 6.4 mechanism are credited.

16.5. Potential perverse incentives

95. The Article 6.4 activity under this methodology identifies and prompts low-carbon routes for driving trips that drivers would undertake regardless of the Article 6.4 activity. It does not induce new driving trips or increase the overall level of travel demand. Therefore, the methodology does not give rise to perverse incentives that could increase total emissions.

16.6. Rebound effects

16.7. Rebound effects typically arise when reduced travel costs lead to additional trips or increased travel demand. Under this methodology, the use of low-carbon routes may reduce fuel consumption per trip, but it does not lower the cost of undertaking new trips. The methodology only influences the choice of route for trips that drivers would have taken in the absence of the project. Accordingly, no rebound effects are expected, and the credited emission reductions are not overstated.

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Document information

Version	*Date*	*Description*
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