

Emission Assessment for Development Site Appraisal

Pilot Technical Guidelines (EMA-TG-1.1)

1 Introduction

- 1.1 Traditionally, the term [Air Quality Impact Assessment](#) has referred to an assessment focusing on concentrations, albeit with elements of exposure and emission assessment included. The Low Emission Partnership promotes an alternative more explicit terminology:
- [Emissions Assessment](#): used to quantify changes in bulk emissions as a result of the development and associated mitigation.
 - [Concentration Assessment](#): used to assess changes in ambient pollutant concentrations arising from development and the implications this has for meeting air quality objectives.
 - [Exposure Assessment](#): used to determine if future occupants of a development are likely to be exposed to unacceptable levels of air pollutants.
- 1.2 This note provides *technical guidelines for undertaking emissions assessment for a development site*. The method is designed to meet the evolving assessment needs of [Local Air Quality and Low Emission Planning Policies](#).
- 1.3 When applying the guidelines it is important to tailor their use, to reflect any specific requirements detailed in relevant local documents and in particular to take reference from the latter in relation to:
- [Triggers](#) for when an emission assessment is required.
 - Scope of anticipated mitigation and detailed choice of [measures](#)
 - Site [performance](#) indicators, benchmarks and targets
- 1.4 It is recommended that site assessment be approached in four stages (Scope, Specification, Assessment and Report) - subsequent sections of this note provide guidance on each:
- | | | |
|---|-------------------------------|--|
| 2 | Scope | assessment purpose, principles, work stages and expected outputs |
| 3 | Specification | inputs/outputs, methodology, mitigation options and data sources/tools |
| 4 | Assessment | base design, base fleet and mitigation |
| 5 | Report | content, format and review criteria |
- 1.5 Supporting information is provided as appendices
- A Standard [input variables](#) and [method variants](#)
 - B Standard [output indicators](#) and [metrics](#)
 - C Standard scope and structure of [emissions mitigation](#) for development sites
 - D Example presentation of [base fleet structure](#) and [mitigation impact factors](#)
 - E [Method Development Notes](#)
- 1.6 Low emission planning policies remain at a relatively early stage, especially with regards the standardisation of emissions assessment methodology. Evaluation and evidence gathering continues and these LEP guidelines will be updated periodically to reflect learning. The Partnership welcomes feedback and examples to support this process (please send to info@lowemissionhub.org).

2 Scope

- 2.1 The scoping stage provides an opportunity to confirm the **purpose**, **required work** and **expected outputs** for the assessment. These aspects are formally determined by local policy and guidance, though those in turn may reference wider documents or standards, such as those identified here
- 2.2 It is useful, though not essential, to formally document the site specific assessment scope before proceeding to the specification stage. At the least, it is prudent to identify and raise any associated queries or uncertainties informally with the LPA, including with regards to:
- **Policy** aims, processes and decision making principles
 - **Performance** metrics, indicators, benchmarks and targets
 - The nature, scale and balance of anticipated emissions **mitigation**
 - Standard or preferred **datasets**, technical **methodologies** and calculation **tools**
 - Preferred **format** for presentation of results
- 2.3 The box below provides a standard scope for site emission assessment, which may be useful either:
- to a local authority, as a reference within its own local documents, or
 - to a developer, as a starting point should local guidance provide less specific direction

Purpose	The aim of emission assessment is to inform the LPA's view as to whether the developers proposal, taking mitigation into account serves to <i>'reduce the emissions harm generated by the site in an appropriate manner and to an acceptable level.'</i>
Work	Described as three distinct stages:
Specification	<ul style="list-style-type: none"> - Confirm relevant reporting metrics, indicators, benchmarks and targets - Specify assessment method including inputs, outputs and method variants - Establish initial list of mitigation options and specify appraisal approach - Identify main data sources, and/or assessment tools - Specify report content and format
Assessment	<ul style="list-style-type: none"> - Identify and describe main features of design, which are relevant to traffic/emissions - Establish the base fleet sub-structure and estimate impacts (without mitigation) - Describe proposed mitigation & estimate the associated benefits and cost - Consider financial contribution for further compensatory measures
Report	<ul style="list-style-type: none"> - Present summary results, supported by a technical commentary
Outputs	
Impacts	The assessment will provide a view of site emissions performance with and without proposed mitigation, including reporting quantitatively, on an agreed set of indicators.
Mitigation	<p>The incorporated mitigation plan will propose mitigation that:</p> <ul style="list-style-type: none"> - Is commensurate with the nature and scale of base fleet emissions - Reflects mitigation hierarchy (i.e. trip redn > on-site technology > off-site contribution) - Recognises any wider AQ benefits, not captured by quantitative assessment (see app E).

3 Specification

- 2.1 Detailed prior-specification of assessment work and outputs may be a requirement of local policy and guidance though is good practice even if not. Where it is a requirement, the developer will need to liaise with the LPA to gain associated prior approval before moving to the assessment stage.
- 2.2 The general aim for a specification document is to '*describe the detailed approach and methodology by which the assessment will be undertaken and reported*'. This should be presented in a simple concise format. The box below provides LEP checklist, standards and associated advice.

Indicators *Confirm reporting metrics, indicators, benchmarks and targets*

LEP Standards:*

NOX reduction	on-site reduction over base level	%mass
Monetised harm reduction	reduction of base monetised harm (total, trip/tech split)	%£
Residual monetised harm	residual monetised harm (after all on-site measures)	£value
Contribution	further compensatory (off-site) measures	£value
Total Mitigation Index	residual harm - contribution	£value

*Standard accumulation period for all indicators is the shorter of 5 years or the lifetime of the site

Method *Specify assessment method including inputs, outputs and method types*

- Section 4 explains the main stages of site assessment
- App's 1-2 layout standard inputs, outputs and associated method options/protocols

Mitigation *Establish initial list of mitigation options and specify appraisal approach*

Drawing on the broad scope of measures identified in the previous stage, an initial selection of measures should be identified and presented alongside specification of a suitable appraisal approach. These options form the *starting point* for mitigation design and benefit appraisal during the assessment stage (i.e. further iteration, extension or substitution may then be necessary in order to optimise the final package).

Data *Identify main data sources and assessment tools*

LEP Standards:*

- EFT: <https://www.gov.uk/air-quality-economic-analysis>
- IGCB: <http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>
- LET: http://www.lowemissionstrategies.org/les_toolkit.html

*Sources and assumptions for any Type II data inputs/methods should also be provided

Reporting *Specify report content and format*

- Section 5 lays out important requirements for presentation of results.
- The LEP report book (EMA-RB) provides a template for summary tables

4 Assessment

- 4.1 Assessment is usefully considered in three parts (notes below provide a general approach for each):
- **Base Design** establishes the general site context
 - **Base Fleet** projects associated traffic generation and emissions harm (without mitigation)
 - **Mitigation** proposes measures and estimates the associated benefits and cost (with mitigation)

Base Design *Describe the main features of site design, which are relevant to traffic/emissions*

- 4.2 Provide a concise summary of the main features within the core/base design, which influence the nature and scale of traffic generation. These features should demonstrate good **environmental design practice** and seek to reduce traffic generation and associated emissions as far as possible (NB this includes standard provision and preparation for **EV charging infrastructure**). As a contributor to the base fleet, these features will not qualify as site mitigation.

Base Fleet *Establish the base fleet sub-structure & estimate site emissions harm*

- 4.3 The Base fleet should include all traffic attributable to the base design, comprising journeys undertaken by vehicles based on the site (**origin trips**) and onto or stimulated by it (**destination trips**).
- 4.4 **Sub-fleets** are defined as combinations of land-use type, vehicle categories (e.g. car, van, truck, bus) and journey type (e.g. resident, staff, public access, service, on-site managed fleet). Selecting an appropriate sub-fleet structure helps provide an informative description of base fleet activity, and also facilitates assessment of mitigation options (see appendix D for examples).
- 4.5 **Fleet activity** is estimated by the best available method, usually through the combination of average trip rates and trip distances at sub-fleet level. These are then combined with appropriate Fleet composition and emission factors to derive **emission impacts**, and then Damage cost factors to estimate **monetised harm**.

Mitigation *Define on-site mitigation & estimate the associated benefits and developer costs
Consider financial contribution for further compensatory measures*

- 4.6 Proposed **on-site mitigation** may be defined using the following structure:
- | | |
|-----------------------------|---|
| Short title | concise header for easy identification and summary |
| Physical description | describes the practical intervention |
| Benefit description | describes the mechanism and scale of anticipated harm reduction |
| Impact factors | presents quantitative sub-fleet impact assumptions (see App D examples) |
| Costs | estimates marginal cost to the developer for implementation |
- 4.7 Combination of mitigation **Impact Factors** with **Base Fleet** data enables calculation of associated emission benefits in both mass and monetised terms.
- 4.8 Calculation of the **Residual Emissions** and the associated **Residual Monetised Harm**, multiplied up over the agreed **Benefits Period** provides a basis for considering a **financial contribution** for further (off-site) compensatory measures.
- 4.9 Iteration of the cycle (i.e. para's 4.6-4.8) enables optimisation of the **mitigation plan** against the intended **site performance** defined through scoping and specification.

5 Report

Present summary results, supported by a technical commentary

- 5.1 Reporting should be tailored to any specific local requirements identified in the scoping stage and according to the format defined in the work specification. LEP Standard is summarised below.
- 5.2 The relatively simple and sequential nature of site emissions assessment supports transparency. It is important that reporting takes full advantage of this, enabling efficient review, query, iteration (where necessary) and ultimate decisions. The recommended format is a combination of [summary tables](#), supported by a [technical commentary](#).
- 5.3 The [LEP emissions assessment report book](#) (EMA-RB-1.1) provides a template to structure and present summary information, comprising individual tabs for: Base Design, Base Fleet, Mitigation (measures), Mitigation (sub fleets), Mitigation (site) and Site Headlines. Further guidance is provided within the document itself. Taken together, the tables provide a concise snapshot of the assessment overall. The headlines table is a particularly important submission.
- 5.4 The technical commentary, should *provide: ‘all relevant information, inputs, assumptions, method detail and references both to underpin and explain the summary information and also, were it needed, to replicate the assessment itself.’* Documentation from the scoping and specification stages can usefully provide a building block for its preparation.
- 5.5 The LPA will be able to advise on the detail of its own [review and decision processes](#), however, [standard considerations](#) include whether:
 - (i) Approach reflects relevant guidance; and report is concise, transparent and of good quality.
 - (ii) Base design is well described and reflects good environmental design principles
 - (iii) Estimated fleet activity and impacts are based on reasonable and realistic assumptions
 - (iv) Appropriate effort has been made to identify, assess and propose mitigation
 - (v) The balance of mitigation reflects the mitigation hierarchy and also local site characteristics
 - (vi) Scale of mitigation (including any financial contribution) is commensurate to the emissions harm

Appendix A – Standard Inputs and Method Options

Input Parameter		Type I [Basic Assessment]	Type I+ [Simple Variants]	Type II+ [Tailored Assessment]
Site	Pollutants	NOx, PMex and PMnx ¹		CO2
	Base Year	First year of occupation / operation	break assessment into phases	
	Impact/Benefit period	5 years	site life time (if < 5yr)	
	Scope of Sub-Fleets	Staff, Public, Service, On-site Fleets	exclusion of negligible sub-fleets further sub-divisions (e.g. Taxis)	
	Scope of Vehicle Types	M-cycle, Cars, Van, Trucks, Bus	exclusion of negligible vehicle types further sub-divisions (e.g. Taxis)	
Traffic & Emissions	Trip Rates	LET defaults ²	TA/TP derived data ³	alternatively derived trip rates reductions for linked trips ³ reductions for grandfathered emissions ³
	Trip Distance	LET defaults ²		alternatively derived trip distance
	Vehicle Speed	Single speed (48 kph)	banded speeds (urban, rural, mixed)	alternative choice of vehicle speed
	Fleet Composition	EFT (fleet composition) with best available HGV% est		alternative fleet composition
	Emission Factors	EFT (emission factors)		
Damage	Damage Cost Factors	IGCB (national mid-range average)	IGCB (location adjusted values)	
	Damage cost accumulation	Base Year x Benefit Period (i.e. simple linear accumulation)		

Method options and protocols for method variation are as follows:

- Type I (basic assessment) provides a simple standard approach for site assessment
- Type I+ variants, provide adjustments for simple tuning
- Type II+ variants are more involved allowing for a more tailored assessment.
- The LPA may require specific type I and/or II variants to be adopted for all or for specific types of sites.
- Otherwise, the developer may choose the options they feel to be the most appropriate, providing:
 - (1) All variants are clearly flagged and justified within the assessment submission
 - (2) Type II variants are discussed with and approved by the LPA in advance
 - (3) A summary level basic type I calculation is also included as a reference point and aid to transparency

Table Notes

[1] PMnx = tyre, brake wear & abrasion

[2] See LET Report:
http://www.lowemissionstrategies.org/downloads/Jan15/LET_MethodsDatav1.pdf

[3] See Appendix E for further discussion

Appendix B – Standard Indicators and Metrics

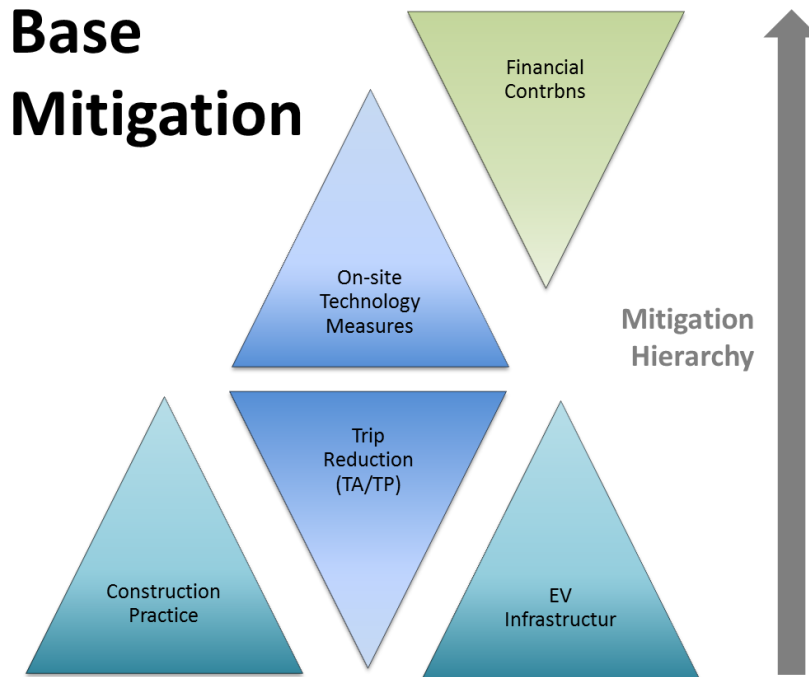
Indicator	Description	Metric ^{1,2,3}	Emissions (kg-cum)	Emissions (%base)	Damage (£-cum)	%base (%base)	Marginal Cost (£)	Marginal Cost (%base)
Base Harm	Site fleet under base design assumptions without mitigation	Base Harm	kg-base		£-base			
Site Mitigation	Benefits/costs of mitigation	On-site Measures						
	Benefits/costs from trip reduction	- Trip Reduction						
	Benefits/costs from tech measures	- Tech Improvement						
Residual Harm	[Base Harm] minus [On-Site Mitigation]	Residual Harm						
Contribution	Value of contribution for off-site measures	Contribution						
Total Mitigation	Contribution + Mitigation	Total Mitigation						

Table provides broad scope of standard indicators. Scope and specification stages will establish associated reporting requirements, which should include: *'an agreed headline set plus detailed supporting tables giving a break down by pollutants, sub-fleets and individual measures (or logical packages thereof)'.*

Table Notes

- [1] Emission metrics to be broken down by specified pollutant.
- [2] Damage metrics to be presented by pollutant and also as a combined sum.
- [3] Further break down may also be required/presented in terms of: (i) vehicle types, (ii) sub-fleets and (ii) specific measures or packages

Appendix C – Standard Scope and Structure of Emissions Mitigation



Breakdown of Main Measures

Trip Reduction	Technology Measures	Financial Contributions
<p>Active travel</p> <ul style="list-style-type: none"> - footpaths, bridges, road crossing points - cycling infrastructure - cycle storage facilities - changing and drying facilities for cyclists - cycle hire schemes - Incentives to purchase bikes <p>Public Transport</p> <ul style="list-style-type: none"> - bus lanes, bus stops, bus information - incentives to use public transport** - new bus services - support / upgrading of existing services <p>Car use</p> <ul style="list-style-type: none"> - car clubs and /or car sharing schemes - restricted or zero parking standards <p>Communication & Management</p> <ul style="list-style-type: none"> - provision of travel advice & information - travel plan management & reporting 	<p>Parking</p> <ul style="list-style-type: none"> - priority for low emission vehicles - graduated charges <p>Emission Standards</p> <ul style="list-style-type: none"> - access controls - service vehicles <p>Low Emission Vehicles</p> <ul style="list-style-type: none"> - buses to service the site - refuse collection vehicles - social transport - school minibuses <p>Car and Electric bikes</p> <ul style="list-style-type: none"> - low emission taxi ranks - low emission car clubs - electric bike charging facilities <p>Other</p> <ul style="list-style-type: none"> - Food waste segregation and used for use in anaerobic digestion 	<p>Investment in Local Fleets</p> <ul style="list-style-type: none"> - buses - refuse collection vehicles - social transport - school transport <p>Investment in Local Infrastructure</p> <ul style="list-style-type: none"> - BM/CNG refuelling - strategic EV charging networks (including rapid charge) - freight transhipment / consolidation <p>Road network improvements</p> <p>Communication & Management</p> <ul style="list-style-type: none"> - Operation and maintenance of air quality monitoring equipment

Appendix D – Fleet Structure and Mitigation Impact factors

Fleet Structure

- D1 **Sub-fleets** are defined as combinations of land-use type, vehicle categories (e.g. car, van, truck, bus) and journey type (e.g. resident, staff, public access, service, on-site managed fleet). Selecting an appropriate sub-fleet structure provides an informative description of base fleet activity, and also facilitates assessment of mitigation options.

The example below shows structure for a mixed used development comprising 9 principle sub-fleets:

ID	Landuse Component	Fleet Component	Journey Type
1	Residential (mixed housing)	Cars	Domestic
2	Employment (office)	Cars	Commuting staff
3	Employment (office)	Cars	Business
4	Employment (warehousing)	HGVs	Heavy fleet
5	Employment (warehousing)	Cars	Business
6	Health (nursing home)	Cars	Public access
7	Health (nursing home)	HGVs	Heavy fleet
8	Retail (Non-food)	HGVs	Heavy fleet
9	Retail (Food)	HGVs	Heavy fleet

Mitigation Impact Factors

- D2 **Mitigation Impact Factors** presents quantitative sub-fleet impact assumptions. Combination with **Base Fleet Data** enables calculation of associated emission benefits.

Dist%	I-NOx%	I-PMex%	I-PMnx%
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Dist% Reduction in total distance travelled
I-NOx% NOx emission factor improvement
I-PMex% PMex emission factor improvement
I-PMnx% PMnx emission factor improvement

Example Calculation

NOx Reduction = Base NOx X (Dist% + I-NOx%)

NOx Residual = Base NOx – NOx Reduction

Appendix E – Method Development Notes

- E1 The Low Emission Partnership continues work to capture evidence and strengthen the core methodology. Working topics and interim recommendations are listed below.

Site Performance Benchmarks

- E2 The Partnership is collecting examples and evidence with a view to establishing performance benchmarks for a range of site types and locations, Once available these will help to supplement and refine the output criteria of section 2.

Trip Rate Adjustments

- E3 Some local policies may make allowance for factoring prior use (i.e. grandfathered emission rights) and/or linked/diverted trips as an off-set to base fleet and base emission calculations. The LEP position on this is currently under review, however where such adjustments are supported by local policy, the following principles apply:

- Where grand-fathered emission rights are claimed for prior site use, the assumptions underpinning this subtraction must be transparent, including at least a summary level type I calculation for full site emissions, without deduction of grandfathered emissions.
- Similarly, where deductions are made to reflect linked or diverted trips , the assumptions underpinning this subtraction must be transparent , including at least a summary level type I calculation for fully allocated emissions without any linked/diverted trip adjustments.

Use of Data from Transport Assessment

- E5 Transport assessment (TA) may provide useful site specific traffic data to support emissions assessment, particularly if this aim is built into the TA. Problems can arise however, for example if the TA concentrates on a worst case rather than best estimate traffic scenario. Therefore, *where TA data is used, it is important to ensure that (i) it is appropriate to do so and (ii) full data sources/assumptions are included in the emissions assessment report.*

Classifying trip and technology measures

- E6 Measures should be grouped as 'broadly trip reduction' or 'broadly on-site technology' (however sub-fleet impact factors allow measures to achieve elements of both, so the distinction need not be absolute.

Credit for Wider AQ benefits

- E4 The standard LEP methodology ensures that direct emission effects are taken into account – both in the base design and through mitigation. Some wider AQ benefits may however be missed, not least strategic interventions which encourage system or behaviour transformation over the longer term. The LEP position on how best to recognise and encourage such wider benefits is under review. For the meantime, the following principles apply:

- At the discretion of the planning authority mitigation credit may be awarded for wider AQ benefits not captured as part of the core methodology, *providing* the benefits are well described, realistic and clearly additional both to (i) good environmental design and (ii) the quantified mitigation benefits.