

# Emission Assessment for Development Site Appraisal

## Technical Guidelines

### EMA-TG-2.0

## 1 Overview

- 1.1 This note provides *technical guidelines for undertaking emissions assessment for a development site*. The intention is both to clarify and streamline the process, and also to encourage consistency and transparency in its reporting.
- 1.2 Although the guidelines provide a standard methodology, it remains important to review local documents carefully and to consult the LPA in advance of undertaking an assessment where any uncertainty or local variation exists. This will reduce the risk of delays or re-working at a later stage.
- 1.3 Once established, the approach for a given assessment should be documented in the form of a concise **Method Statement**.
- 1.4 The **Assessment** itself comprises four parts:
  - **Design Description** establishes site context and identifies relevant design features
  - **Base Fleet** estimates the associated traffic generation and emissions harm (without mitigation case)
  - **Mitigation** proposes measures and estimates the associated benefits and cost (with mitigation case)
  - **Performance**: considers and draws conclusions regarding overall site performance and proposals
- 1.5 Standard submissions comprise a **summary report**, a set of **assessment tables** plus **supporting information**.
- 1.6 The **LEP emissions assessment report book** (EMA-RB-2.0) provides an excel template for easy collation of the assessment tables. The accompanying **summary report template** (EMA-SR-2.0) enables creation of a corresponding **summary report**
- 1.7 The developer is further encouraged to provide, as **supplementary information**, any further details regarding inputs, assumptions, method detail and results both to underpin and explain the main submissions and also, were it required, to replicate the assessment itself.
- 1.8 The LPA will consider the findings according to its own **Review and Decision Protocols**, however standard **Assessment Quality Criteria** include whether:
  - (i) Approach reflects relevant guidance; and report is concise, transparent and of good quality.
  - (ii) 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) 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

## 2 Assessment Principles

**Design Description** *Describe the site, emphasising features relevant to traffic/emissions*

- 2.1 Provide a summary of the site, emphasising features, which influence the nature and scale of traffic generation. These features should demonstrate good environmental design and seek to reduce traffic generation and associated emissions as far as possible (Notes: this includes standard provision and preparation for EV charging infrastructure, which as a contributor to the base fleet, design features does not therefore qualify as site mitigation).

**Base Fleet** *Establish a base fleet structure & estimate associated traffic and emissions harm*

- 2.2 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).
- 2.3 **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).
- 2.4 **Fleet activity** is estimated by the best available method, for example 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*

- 2.5 Proposed **on-site mitigation** is defined using the following (action) structure:
- |                             |   |
|-----------------------------|---|
| <u>Short title</u>          | concise header for easy identification and summary                      |
| <u>Physical description</u> | describes the practical intervention                                    |
| <u>Benefit description</u>  | describes the mechanism and scale of anticipated harm reduction         |
| <u>Impact factors</u>       | presents quantitative sub-fleet impact assumptions (see App E examples) |
| <u>Costs</u>                | estimates the marginal cost to the developer for implementation         |
| <u>Notes</u>                | Further information or observations                                     |
- 2.6 Combination of mitigation **Impact Factors** with **Base Fleet** data enables calculation of associated emission benefits in both mass and monetised terms.
- 2.7 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.
- 2.8 Iteration of the cycle (i.e. para's 2.5-2.7) enables optimisation of the **Mitigation Plan** against intended **Site Performance**. Appendix B provides a table of reporting indices. A sensible selection should be provided within the summary report, with full detail and granularity provided in the assessment tables.

### 3 Method Notes and Variants

- 3.1 The Low Emission Partnership continues work to capture evidence and strengthen the core methodology. Working topics and interim recommendations are listed below. It is sensible to pay particular attention to these areas and to consult the LPA to ensure that expectations are aligned.

#### Simplified Calculations

- 3.2 Section 2 lays out principles and terminology for a standard emissions assessment. Some authorities have adopted an approach reflecting one or more of the following simplifications: (i) single site average trip distance of 10km for all sites (ii) cost-based valuation of mitigation only (i.e. omit impact factors in para 2.5, and all of paras 2.6-7), (iii) whole site damage cost only (i.e. omit sub fleets, para 2.3 and report at site level in damage cost terms alone). Such assessments are supported by the Partnership's guidelines, though the adjustments should be noted clearly in the method statement.

#### Tailored Calculations

- 3.3 Appendix A identifies a set of standardised inputs and assumptions for undertaking emission calculations. These are termed **type I calculations**. They provide a simple calculation route and generate mutually consistent results.
- 3.4 Appendix A also outlines options for using more tailored inputs, resulting in **type II calculations**. Where tailoring is used, it is important to provide a clear audit trail, ideally making use of the standardised (type I) calculation as an established reference point.
- 3.5 Where local policies allow or require factoring of **prior use** (i.e. grandfathered emission rights) and/or **linked/diverted trips** as off-sets to base fleet and base emission calculations, these should be treated as tailoring under para 3.4 (i.e. these subtractions need to be done transparently and ideally with reference to the standard data-set to allow for easy interpretation and comparison)

#### Use of Data from Transport Assessment

- 3.6 Transport assessment (TA) may provide useful site specific traffic data to support emissions assessment, particularly if this aim is built into it from the outset. Problems can arise however, for example if the TA concentrates on a worst case rather than best estimate traffic scenario. It is therefore important, where TA data is used, to ensure both that it is appropriate to do so and also that full data sources and assumptions are provided.

#### Classifying trip and technology measures

- 3.7 Measures should be grouped as 'broadly trip reduction' or 'broadly on-site technology'. However the use of correspondingly resolved impact factors allows measures to achieve elements of both, so the distinction need not be absolute.

#### Design Credit

- 3.8 The assessment methodology ensures that direct emission effects are taken into account – both in the base fleet 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. In order to recognise and encourage such wider benefits, and at their discretion, the planning authority may award **Design Credit** for AQ benefits not otherwise captured as part of the core methodology. Any such benefits must be *well described, realistic and clearly additional both to (i) good environmental design and (ii) the quantified mitigation benefits.*

## 4 Key Terms

Terms here are those defined and used in a specific way within this document

Assessment Quality Criteria	A standard set of quality criteria for emissions assessments performed under LEP guidelines (see para 1.8)
Assessment Tables	Tables which collate the detailed assessment information upon which the summary report is based. They provide accessible drill down to expand upon and provide context for the headline conclusions.
Base Fleet	The vehicles and traffic associated with the occupation and use of a development site.
Construction Measures	Typically requiring adoption of a 'construction environmental management plan' which covers issues such as construction vehicle emission standards, construction staff travel planning and delivery arrangements and control of fugitive dust emissions.
Design Description	A summary of the site emphasising features, which influence the nature and scale of traffic generation – including in relation to location, access and facilities.
Emissions Assessment	Estimate of bulk emissions arising as a result of the development with and without associated mitigation. Results are reported as tonnes of individual pollutants and are also monetised as social damage
Emissions Impacts	Emissions generated by fleet or sub-fleet activity (expressed as mass)
EV Infrastructure Measures	Aimed at encouraging the uptake of electric vehicles. Generally requires ground work for and/or installation of recharging infrastructure for electric vehicles (Note that a standard level of provision is expected as part of basic site design and therefore is not considered part of base mitigation. Well targeted investment beyond the standard provision may however be considered part of further mitigation).
Fleet/Sub-Fleet Activity	Distance travelled by the corresponding fleet or sub-fleet.
Method Statement	Description of the emissions assessment methodology employed for a given site, including the general technical approach, source of input data, basis for assumptions, identity of any inventory or calculation tools employed and choice/justification of reporting structure/format.
Financial contribution	Where the emission impact can't be fully mitigated by measures on, or in close proximity, to a development a financial contribution may be proposed or requested towards wider measures.
Impact/Benefits Period	Period over which site impacts and mitigation benefits are considered for the purposes of emissions assessment.
Impact Factor	Mitigation Impact Factors provide quantitative impact and benefit assumptions for proposed mitigation measures (see appendix D)
Emissions Mitigation	Measures selected and designed to reduce the emission impacts of a development site – through construction, occupation and use.
Mitigation Plan	A statement of proposed mitigation supported by a work programme and timetable for its implementation.
Monetised Harm	Emissions impacts expressed as monetised damage costs

<a href="#">On-Site technology Measures</a>	Aimed at reducing emissions from individual vehicle trips that arise even after full trip reduction. Typically include measures to encourage emission reduction technologies for existing vehicles or by enabling and promoting the uptake of newer or alternatively fuelled ones.
<a href="#">Site Indices</a>	Indices for quantifying aspects of site performance.
<a href="#">Site Performance</a>	Performance of the site in emissions terms
<a href="#">Reduced Format</a>	Assessment and reporting of emissions information at site level only.
<a href="#">Residual Emissions</a>	Emission impacts remaining after on-site mitigation has been applied
<a href="#">Residual Monetised Harm</a>	Value of residual emissions monetised as pollution damage cost
<a href="#">Review and Decision Protocols</a>	The protocols by which an LPA reviews and interprets the results of an emissions assessment, alongside other assessments and evidence.
<a href="#">Standardised Inputs</a>	A set of standardised inputs published and periodically updated by the LEP, which enable an easy rapid standardised emissions assessment, without the need to generate more site specific data.
<a href="#">Sub Fleet</a>	A component of the base fleet, defined by vehicle type, journey type and/or land-use component.
<a href="#">Summary Report</a>	Short report presenting key information relating to the emissions assessment, its findings and associated proposals.
<a href="#">Supporting Information</a>	Supplementary technical information, which further supports the summary report and assessment tables.
<a href="#">Tailored inputs</a>	Use of inputs tailored to a specific site or situation, in place of the standardised inputs (explained above)
<a href="#">Trip Reduction</a>	<p>The first element in the emission reduction hierarchy – it is important that sites minimise trips initially through good design and then through effective mitigation. Requirements are usually established <i>via</i> the separate transport assessment process and packaged in the form of a site travel plan.</p> <p>All proposed trip reduction measures, including those contained within a site travel plan, should be included under the heading Trip Reduction Plan (above). This is to ensure that the emissions assessment can take the associated emission benefits into account. (Note that in practice some measures may span both trip and tech categories, eg low emission car club, and the assessment method accommodates this).</p>

## Appendix A – Standard Inputs and Method Options

Input Parameter		Type I [Standardised inputs]	Type II [Tailored Inputs]
Site	Pollutants	NOx, PMex and PMnx <sup>1</sup>	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	LEP Trip Rate Calculator <sup>2</sup>	TA/TP derived data <sup>3</sup> alternatively derived trip rates reductions for linked trips <sup>3</sup> reductions for grandfathered emissions <sup>3</sup>
	Trip Distance	LEP Trip Rate Calculator <sup>2</sup>	alternatively derived trip distance
	Vehicle Speed	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)	alternative 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 is considered the starting point for standard calculations
- Type II variants, provide adjustments for tuning. These adjustments should be noted clearly and justified.
- The extent to which tailoring is accepted or, indeed encouraged, will vary by authority, type of site and nature of the adjustments.
- Where tailoring is used, it is vital that all variation from the standard calculation is noted and justified clearly. (It is helpful, if feasible, to provide a corresponding standard calculation and audit trail which tracks to it from the tailored result).

**Table Notes**

- [1] PMnx = tyre, brake wear & abrasion
- [2] See LET Trip Data calculator
- [3] See Appendix D for further discussion

## Appendix B – Site Indices

Indices <sup>1,2,3</sup>	Description	Emissions (kg-cum)	Emissions (%base)	Damage (£-cum)	%base (%base)	Marginal Cost (£)	Marginal Cost (%base)
<b>Base Harm</b>	Site fleet under base design assumptions without mitigation	kg-base		£-base			
<b>On-site Measures</b>	Benefits/costs of mitigation	X	X	X	X	X	X
<b>Residual Harm</b>	[Base Harm] minus [On-Site Mitigation]	X	X	X	X		
<b>Contribution</b>	Value of contribution for off-site measures			X	X		
<b>Design Credit</b>	Value credited for design features			X	X		
<b>Total Mitigation</b>	Contribution + Mitigation			X	X		

Table provides scope of standard indices. A sensible selection should be provided within the summary report, with full granulation provided as part of the assessment tables.

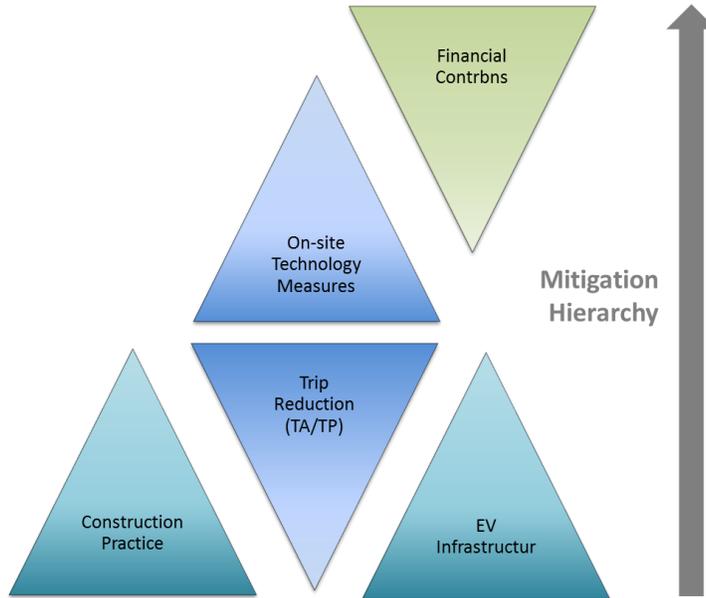
The Low Emission Partnership Emissions Assessment Report Book (EMA-RB-2.0) includes an excel template to accommodate detailed tables for easy collation and presentation.

### Table Notes (Extended Format)

- [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] Headlines to be presented at site level, supplemented by drill-down tables giving resolved information relating to (i) vehicle types, (ii) sub-fleets and (iii) specific measures or packages

## Appendix C – Standard Scope and Structure of Emissions Mitigation

### Mitigation



### Breakdown of Main Measures

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

## 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** encapsulate 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