

→ LOXWOOD CLAY PITS METHODOLOGY



Department
for Environment
Food & Rural Affairs

Damage Costs Appraisal Toolkit

Original Version: January 2019

Last Updated: March 2021

Queries and comments on this toolkit should be referred to:

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Notes for Users

The Detailed User Guide is published on the Defra Local Air Quality Management website:

<https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>

Macro Settings

EFT v10.1 uses macros to undertake the calculations. Please ensure that Macros are enabled.

When using Excel 2013, this can be found under: DEVELOPER > MACRO SECURITY > MACRO SETTINGS; for previous versions of Excel this can be found under: TOOLS > MACROS > SECURITY LEVEL > MEDIUM

Input Parameters	
SourceID	User defined name or reference for a road. Does not have to be unique, although if there are duplicate names and the data is to be used in detailed dispersion modelling, this may cause errors. Up to at least 25,000 road links can be entered, or up to 200,000 road links, dependent upon selected output options.
Road Type	<p>There are seven options to choose from.</p> <ol style="list-style-type: none"> 1. Urban (Not London) 2. Rural (Not London) 3. Motorway (Not London) 4. London - Central 5. London - Inner 6. London - Outer 7. London - Motorway <p>The urban categorisation relates to the DfT definition of an urban area with a population of 10,000 or more.</p> <p>The London road types are consistent with the area categories defined in the London Atmospheric Emissions Inventory (LAEI). 'Central' corresponds to the Ultra Low Emission Zone (ULEZ) area, whilst 'Motorway' denotes the M25 - other motorways in London should be defined as 'London - Inner' or 'London - Outer' as appropriate.</p>
Traffic Flow	The total traffic flow along a particular road for the time period of interest (from 1 to 24 hours).
%HDV	<p>Percentage of Heavy Duty Vehicles.</p> <p>Heavy Duty Vehicles encompasses Rigid and Artic Heavy Goods Vehicles and Buses / Coaches.</p> <p>All other vehicles, cars, vans and motorcycles are consider to be Light Duty Vehicles (LDVs).</p>
Speed (kph)	<p>Speed in kilometres per hour for the specified traffic flow. This may be average or specific speed relating to driving scenario being considered.</p> <p>The range of speeds is between 5kph and 140kph. The tool will calculate appropriate emissions depending on the maximum speed for certain vehicle types.</p>
No of Hours	Number of hours corresponding to the duration of the flow defined by the Traffic Flow.
Link Length (km)	The length of the road link. Only required if annual emissions are being calculated.

Output Options	
Air Quality Modelling	<p>Selecting this option provides outputs as total emissions as g/km/s for the pollutant(s) selected.</p> <p>This data format is suitable for inclusion in most detailed air quality models.</p>
Emission Rates	Selecting this option provides outputs as total emissions as g/km for the pollutant(s) selected.
Breakdown By Vehicle	<p>Selecting this option provides outputs for each pollutant and vehicle type on the road link. Emissions will be output in either g/km/s, g/km, kg/yr or tonnes/yr dependent upon the pollutants and other output options selected.</p> <p>If the Basic Split option is specified, then the emissions are based entirely on the vehicle fleet compositions embedded in the EFT.</p>
PM by Source	Selecting this option generates a separate output sheet showing particulate emissions from Exhaust, Brake, Tyre and Abrasion.
Annual Link Emissions	<p>Selecting this option generates emissions of each pollutant per year for each road link in kg/yr for all pollutant with the exception of Carbon Dioxide, which is in tonnes/yr.</p> <p>This option requires the length of each link to be specified.</p>
Source Apportionment	Selecting this option provides the relative percentage contribution from the specified vehicle types for the pollutant(s) selected.

% Gradient	<p>The gradient of the road link. Only required if HDV emissions on links with gradients are being considered.</p> <p>The range of gradients is between 0% and 30%. If left blank, a 0% gradient will be assumed.</p> <p>The tool will calculate appropriate HDV emissions depending on the gradient and flow direction entered.</p>
Flow Direction	<p>The direction of flow on the road link. Only required if HDV emissions on links with gradients are being considered.</p> <p>The direction of flow should be Up Hill, Down Hill or Two Way Traffic. If left blank, Two Way Traffic will be assumed with an equal flow Up Hill and Down Hill.</p> <p>The tool will calculate appropriate HDV emissions depending on the gradient and flow direction entered.</p>
% Load	<p>The load of HDVs on the road link. Only required if emissions on links with variable HDV loads are being considered.</p> <p>The load should be 0%, 50% or 100%. If left blank, 50% load will be assumed.</p> <p>The tool will calculate appropriate HDV emissions depending on the load entered.</p>

Traffic Flow Format	
Basic Split	Assumes standard fleet composition for the selected road type. Only the % of HDVs is specified.
Detailed Option 1	Allows fleet input by %Car, %Taxi, %LGV, %HGV, %Bus and Coach, and %Motorcycle.
Detailed Option 2	Allows fleet input by %Car, %Taxi, %LGV, %Rigid HGV, %Articulated HGV, %Bus and Coach, and %Motorcycle.
Detailed Option 3	Allows fleet input by %Petrol Car, %Diesel Car, %Taxi, %LGV, %Rigid HGV, %Articulated HGV, %Bus and Coach, and %Motorcycle.
Alternative Technologies	Allows advanced users to input User Defined Alternative Technology proportions within the fleet. This data format is suitable for inclusion in most detailed air quality models.

Advanced Options: Input	
Euro Compositions	<p>Selecting this option allows Advanced Users to input User Defined Euro Classes and Size Distribution information.</p> <p>Available for all pollutants, i.e. NO_x, PM₁₀, PM_{2.5} and CO₂.</p> <p>This option is available for London and non-London areas.</p>
Simple Entry Euro Compositions	<p>Selecting this option allows Advanced Users to input User Defined Euro Classes in a simplified manner compared to the Euro Compositions Advanced option.</p> <p>The User Defined Euro Classes as entered are applied to all pollutants, i.e. NO_x, PM₁₀, PM_{2.5} and CO₂.</p> <p>Further changes to the User Defined Euro Classes and/or Size Distribution information can still be made prior to running through use of the Euro Compositions Advanced Option.</p> <p>This Advanced Option is presently unavailable for the London area.</p>

Advanced Options: Output	
Output % Contributions from Euro Classes	<p>Selecting this option provides outputs broken down into the percentage contribution from each Euro Class within each Vehicle Class, for the specified speed.</p> <p>Only available for pollutants NO_x, PM₁₀ and PM_{2.5}.</p>
Primary NO₂ Fraction	<p>Selecting this option allows the user to output the fraction of primary NO₂ emissions (f-NO₂) for the provided input data.</p> <p>Values are provided at the individual link level and also as a weighted average according to the contribution each vehicle type makes to total NO_x emissions from traffic associated with all links entered as input. Weighted averages are provided relative to the link lengths only if entered by the user for all links.</p>

Fleet Projection Tool	<p>Selecting this option allows Advanced Users to project their user defined Euro information for the Base Year (i.e. ANPR derived Euro fleet data) to a future Projection Year.</p> <p>The projection method assumes the future year Euro fleet composition has the same difference in Euro classes as observed between the default base year profile and the ANPR data.</p> <p>Once the Euro projection is complete, users can then transpose the projected fleet to the "SimpleUserEuro" sheet to be used as input for normal emissions calculations.</p> <p>This Advanced Option is presently unavailable for the London area.</p>
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NO_x Annual Emissions Euro Split	<p>Selecting this option provides annual NO_x emissions outputs aggregated for all links entered in the Input Data. Outputs are broken down into contributions from each Euro Class within each Vehicle Class, for each Road Type.</p> <p>Results are provided in tabular and graphical chart format.</p>
PM₁₀ Annual Emissions Euro Split	<p>Selecting this option provides annual PM₁₀ emissions outputs aggregated for all links entered in the Input Data. Outputs are broken down into contributions from each Euro Class within each Vehicle Class, for each Road Type.</p> <p>Results are provided in tabular and graphical chart format.</p>
PM_{2.5} Annual Emissions Euro Split	<p>Selecting this option provides annual PM_{2.5} emissions outputs aggregated for all links entered in the Input Data. Outputs are broken down into contributions from each Euro Class within each Vehicle Class, for each Road Type.</p> <p>Results are provided in tabular and graphical chart format.</p>

Emissions Factors Toolkit (Version 10.1)

The EFT allows for the calculation of vehicle emissions factors for NO_x, PM₁₀, PM_{2.5} and CO₂. Version 10 incorporates vehicle exhaust emission factors and fleet compositions, with the inclusion of Euro 6 subcategories. NO_x and PM Emissions Factors are taken from the European Monitoring and Evaluation Programme (EMEP) / European Environment Agency (EEA) Air Pollutant Emission Inventory Guidebook 2019 (Footnote 1), which is consistent with the EMISIA COPERT 5.3 emission calculation tool, released September 2019 (Footnote 2). Emissions Factors for CO₂ are those published by the Department for Transport on 29 June 2009 (Footnote 3). Emissions Factors have been combined with new information on Fleet Composition on different road types collected as part of the National Atmospheric Emissions Inventory (Footnote 4) and previous information from Transport for London prepared as part of the London Mayor's Transport Strategy (Footnote 5), to allow total emissions from a particular road link to be calculated. The QA sheet details all data sources used to produce the EFT.

In addition to the standard emissions outputs provided for Air Quality Modelling (g/km/s), Emissions Rates (g/km), or Annual Link Emissions (kg/yr or tonnes/yr), several 'Advanced Options' are available on the Input Data sheet. These allow Advanced Users to specify user defined Euro Compositions and fleet compositions for Alternative Technologies, and Output % Contributions from Euro Classes, plus the ability for users to output the fraction of primary NO₂ emissions (f-NO₂) for the provided input data using the Primary NO₂ Fraction Advanced Option. There are also NO_x, PM₁₀ and PM_{2.5} Annual Emissions Euro Split Advanced Options, which output emissions by kg/yr, broken down by vehicle type and Euro emission standard, with contributions from failed catalysts and Diesel Particulate Filters (DPFs) split out. 'Additional Outputs' are also available providing emissions Breakdown by Vehicle, Source Apportionment and PM by Source (Exhaust, Brake and Tyre Wear, and Road Abrasion).

Version 10 also allows users to input User Defined Euro Classes in a simplified manner through the Simple Entry Euro Compositions option, the User Defined Euro Classes of which are applied to all pollutants, i.e. NO_x, PM₁₀, PM_{2.5} and CO₂. Additionally, users can now project their user defined Euro information from a Base Year (i.e. ANPR derived Euro fleet data) to a future Projection Year, through the application of a revised projection methodology. Once the Euro projection is complete, users can then transpose the projected fleet to the 'SimpleUserEuro' sheet to be used as input for normal emissions calculations.

The following notes are provided to highlight some of the key assumptions and changes in EFT v10, however it is highly recommended that the user reads the EFT User Guide in entirety to ensure they are fully aware of all relevant details.

Version 10 includes the following changes:

- Adoption of COPERT 5.3 NO_x and PM emissions factors.
- Outside of London, updated default fleet assumptions, vehicle size distributions and Euro class compositions for 2018-2030 in line with DfT and NAEI projections.
- Updated fleet projection methodology and refinement of the user interface for the Advanced Option 'Fleet Projection Tool' that allows users to project their user defined Euro fleet information from a Base Year (i.e. ANPR derived Euro fleet data) to a future Projection Year.

Footnote 1: <https://www.eea.europa.eu/publications/emep-eea-guidebook-2019>

Footnote 2: <https://www.emisia.com/news/copert-5-3-available-for-download/>

Footnote 3: <https://www.gov.uk/government/publications/road-vehicle-emission-factors-2009>

Footnote 4: <https://naei.beis.gov.uk>

Footnote 5: <https://www.london.gov.uk/what-we-do/transport/our-vision-transport/mayors-transport-strategy-2018?intcmp=46686>

A User Guide for the EFT is available at: <https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>

If you require further information or support in using the EFT, then please contact the Local Air Quality Management Support Helpdesk:

Web: <https://laqm.defra.gov.uk>

Tel: +44 (0)800 032 7953

Email: LAQMHelpdesk@bureauveritas.com

The LAQM Support Helpdesk is operated by Bureau Veritas on behalf of Defra and the Devolved Administrations.

The EFT v10.1 has been developed on behalf of Defra and the Devolved Administrations by Bureau Veritas.

EFT v10.1 released August 2020

Background Information

A user guide for the EFT v10.1 is available at: <https://lagm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>

Emissions Generation

The following documents the calculation procedure for generating the vehicle emissions in g/km, g/km/s and kg/year or tonnes/year (please see the User Guide for more information)

NOx COPERT 5.3

Vehicle Type	x	Emissions	x	Constants	x	Degradation [#]	x	Fuel	x	Euro Composition	x	Road Type	=	g/km
Vehicle Type	x	Emissions	x	Constants	x	Degradation [#]	x	Fuel	x	Euro Composition	x	Road Type	/	(3600 x hours) = g/km/s
Vehicle Type	x	Emissions	x	Constants	x	Degradation [#]	x	Fuel	x	Euro Composition	x	Road Type	/	(3600 x hours) x link length (km) x (3600x8760) / 1000 = kg/year

[#] Degradation in emissions due to accumulated mileage only calculated for some petrol cars and petrol LGVs.

NOx and PM COPERT 5.3

Vehicle Type	x	Emissions	x	Constants	x	Fuel	x	Euro Composition	x	Road Type	=	g/km
Vehicle Type	x	Emissions	x	Constants	x	Fuel	x	Euro Composition	x	Road Type	/	(3600 x hours) = g/km/s
Vehicle Type	x	Emissions	x	Constants	x	Fuel	x	Euro Composition	x	Road Type	/	(3600 x hours) x link length (km) x (3600x8760) / 1000 = kg/year

CO₂ TRL/DIT

Vehicle Type	x	Emissions	x	Constants	x	Fuel	x	Euro Composition	x	Road Type	=	g/km
Vehicle Type	x	Emissions	x	Constants	x	Fuel	x	Euro Composition	x	Road Type	/	(3600 x hours) = g/km/s
Vehicle Type	x	Emissions	x	Constants	x	Fuel	x	Euro Composition	x	Road Type	/	(3600 x hours) x link length (km) x (3600x8760) / 1,000,000 = tonnes/year

The following documents the calculation procedure for generating the brake, tyre wear and road abrasion emissions for PM₁₀ and PM_{2.5} in g/km and g/km/s.

PM₁₀

Vehicle Type	x	Brake Wear	Emissions	x	Constants	x	Euro Composition	x	Road Type	=	g/km
Vehicle Type	x	Tyre Wear	Emissions	x	Constants	x	Euro Composition	x	Road Type	=	g/km
Vehicle Type	x	Road Abrasion	Emissions	x	Constants	x	Euro Composition	x	Road Type	=	g/km
Vehicle Type	x	Brake Wear	Emissions	x	Constants	x	Euro Composition	x	Road Type	/	(3600 x hours) = g/km/s
Vehicle Type	x	Tyre Wear	Emissions	x	Constants	x	Euro Composition	x	Road Type	/	(3600 x hours) = g/km/s
Vehicle Type	x	Road Abrasion	Emissions	x	Constants	x	Euro Composition	x	Road Type	/	(3600 x hours) = g/km/s
Vehicle Type	x	Brake Wear	Emissions	x	Constants	x	Euro Composition	x	Road Type	/	(3600 x hours) x link length (km) x (3600x8760) / 1000 = kg/year
Vehicle Type	x	Tyre Wear	Emissions	x	Constants	x	Euro Composition	x	Road Type	/	(3600 x hours) x link length (km) x (3600x8760) / 1000 = kg/year
Vehicle Type	x	Road Abrasion	Emissions	x	Constants	x	Euro Composition	x	Road Type	/	(3600 x hours) x link length (km) x (3600x8760) / 1000 = kg/year

PM_{2.5}

PM ₁₀ Exhaust	Emissions	x	1 = PM _{2.5} g/km
PM ₁₀ Brake Wear	Emissions	x	0.4 = PM _{2.5} g/km
PM ₁₀ Tyre Emissions	Emissions	x	0.7 = PM _{2.5} g/km
PM ₁₀ Road Abrasion	Emissions	x	0.54 = PM _{2.5} g/km

Data Sources

Data Sources	See User Guide
Ricardo-E&E Fleet and Euro Compositions (non-London) Fleet and Euro Compositions (London) Constants (Size Distributions and EGR/SCR Ratios) (non-London) Constants (Size Distributions and EGR/SCR Ratios) (London) Treatment of Failed Catalytic Convertors (non-London) Treatment of Failed Catalytic Convertors (London) NO _x Fuel Scaling Rates PM Fuel Scaling Rates PM ₁₀ to PM _{2.5} Conversion Assumption all PM emissions shown in EFT are PM ₁₀ Alternative Technology assumption: Primary NO ₂ Emission Factors for Road Transport	rtp_fleet_projection_NAEI_2017_Base_2019r_v1.1 (with PHEV).xls; (new) rtp_fleet_projection_TIL_London_data_2018.xls; rtp_fleet_projection_NAEI_2017_Base_2019r_v1.1 (with PHEV).xls; (new) rtp_fleet_projection_TIL_London_data_2018.xls; rtp_fleet_projection_NAEI_2017_Base_2019r_v1.1 (with PHEV).xls; (new) rtp_fleet_projection_TIL_London_data_2018.xls; NAEI_Fuel_scaling_factors_2014.xlsx Fuel_scaling_factors_2018.xls; - - NAEI_Emission_factors_for_alternative_vehicle_technologies_Final_Feb_13.pc PrimaryNO2_factors_NAEIBase_2020_v2.xlsx
EMEP/EEA/EMISIA NO _x and PM COPERT 5.3 speed emission factors equations	1.A.3.b.i-iv Road Transport Appendix 4 Emission Factors 2019.xlsx Developed by EMISIA (September 2019)
TIL Alternative Vehicle CO ₂ Scaling Factors	20160603_BV_Information.xlsx Developed for LAEI (June 2016)
TRL C vehicle emissions Mileage Rates (used in degradation calculations)	regulated.xls fuelscaling.xls DfT Website 07/08/09 DfT Website 07/08/09

Change Control

Change Control	Date	Issue	Description of Change	See User Guide
EFT 10.1	Released August 2020	1 Primary NO ₂ Fraction 2 Primary NO _x Fraction	Updated Primary NO ₂ factors to match the latest factors published on the NAE Bug fix on calculation of primary NO _x fraction	
EFT 10.0	Released August 2020	1 Default Fleet Split (non-London) 2 Default Vehicle Size Distributions (non-London) 3 Default Euro Class Compositions (non-London) 4 NO _x and PM Emissions Factors 5 Fleet Projection Tool 6 Primary NO ₂ Fraction	Default fleet assumptions for 2018-2030 updated in line with DfT (2019) and NAEI projections Default vehicle size distributions for 2018-2030 updated in line with DfT (2019) and NAEI projections Default Euro class compositions for 2018-2030 updated in line with DfT (2019) and NAEI projections (inclusive of Euro 6 subcategories) Adoption of COPERT 5.3 emissions factors Updated fleet projection methodology and refinement of the user interface for the Advanced Option 'Fleet Projection Tool' Bug fix on calculation of primary NO ₂ fraction	

Select Pollutants	Select Outputs	Additional Outputs	Advanced Options	Click the button to:
<input checked="" type="checkbox"/> NOx <input type="checkbox"/> CO2 <input checked="" type="checkbox"/> PM10 <input checked="" type="checkbox"/> PM2.5	<input checked="" type="checkbox"/> Air Quality Modelling (g/km/s) <input type="checkbox"/> Breakdown by Vehicle <input checked="" type="checkbox"/> Emissions Rates (g/km) <input type="checkbox"/> Source Apportionment <input checked="" type="checkbox"/> Annual Link Emissions <input type="checkbox"/> PM by Source	<input type="checkbox"/> Euro Compositions <input type="checkbox"/> NOx Annual Emissions Euro Split <input type="checkbox"/> Simple Entry Euro Compositions <input type="checkbox"/> PM10 Annual Emissions Euro Split <input type="checkbox"/> Output % Contributions from Euro Classes <input type="checkbox"/> PM2.5 Annual Emissions Euro Split <input type="checkbox"/> Primary NO2 Fraction <input type="checkbox"/> Fleet Projection Tool	<input type="button" value="Run EFT"/> <input type="button" value="Clear Input Data"/>	
Please Select from the Following Options:				
Area <input type="text" value="England (not London)"/>		Export Outputs <input type="checkbox"/> Save Output to New Workbook		
Year <input type="text" value="2021"/>		File Name: <input type="text" value="Lowwood Clay Pts Ltd"/>		
Traffic Format <input type="text" value="Basic Split"/>		<input type="text" value=""/>		
<small>Select 'Basic Split' or 'Detailed Option 1 to 3' of 'Alternative Technologies' above</small>				

SourceID	Road Type	Traffic Flow	% HDV	Speed(kph)	No of Hours	Link Length (km)	% Gradient	Flow Direction	% Load
Lowwood Road	Rural (not London)	54	78	50	10	10	3.5	Two Way Traffic	50

Source Name	Pollutant Name	All Vehicles (g/km/s)	All LDVs (g/km/s)	All HDVs (g/km/s)	All Vehicles (g/km)	All LDVs (g/km)	All HDVs (g/km)	All Vehicles (Annual Emissions (kg/yr except CO2 tonnes/yr))	All LDVs (Annual Emissions (kg/yr except CO2 tonnes/yr))	All HDVs (Annual Emissions (kg/yr except CO2 tonnes/yr))
Loxwood Road	NOx	0.00117	0.00009	0.00108	42.10110	3.18717	38.91393	368.80562	27.91958	340.88604
Loxwood Road	PM2.5	0.00007	0.00000	0.00007	2.68481	0.16847	2.51634	23.51891	1.47578	22.04313
Loxwood Road	PM10	0.00013	0.00001	0.00012	4.55014	0.27879	4.27135	39.85926	2.44222	37.41704



Department for Environment Food & Rural Affairs

This toolkit allows appraisers to calculate the economic impact of policies which affect air quality, using the damage cost approach.

This tool is designed to be used in conjunction with the Air Quality Damage Costs Guidance: <https://www.gov.uk/government/publications/assess-the-impact-of-air-quality>

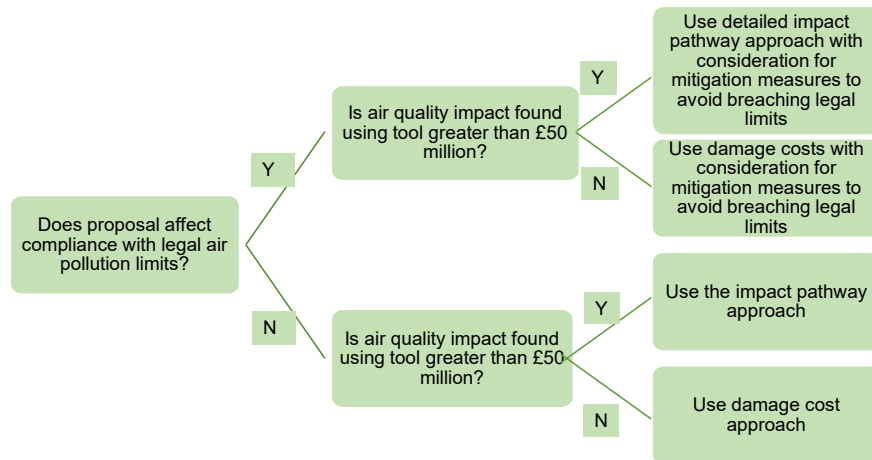
It is only appropriate for small air quality impacts (below £50 million).

Proposals with impacts over £50 million should be assessed using the impact pathway approach. In these cases Defra should be contacted for advice.

Proposals that affect compliance should use the damage cost (small air quality impacts) or the impact pathway approach (large air quality impacts) and ensure any breach of legal limits is mitigated against within the scheme design

The tool calculates a central present value along with high and low sensitivity values for up to 5 pollutants (NO_x, SO₂, PM_{2.5}, VOC and NH₃).




All adjustments are automated in this tool - no extra calculations are necessary unless PM is being used - in which case please use the conversion factors provided in the Assumptions sheet



The appraisal is calculated with the following steps:

- 1) Complete the input boxes (Start Year, End Year, Price Base Year and Number of Pollutants) in the **Control Panel** tab
- 2) Select the pollutants to be assessed in the **Damage Costs User Interface** tab and then fill in the change in emissions expected for each appraisal year
- 3) View outputs in **Outputs** tab

Cell Type Key:

	For user input
	Automated values
	Automated output

Control Panel

Start Year	<input type="text" value="2020"/>	Please type the year at which the policy will start from, the start year is also the discount year
End Year	<input type="text" value="2029"/>	Please type the year at which the appraisal will end
Appraisal Period	<input type="text" value="10"/>	Autofills the number of years for which the policy is reviewed for
Price Base Year	<input type="text" value="2017"/>	Please type the price base year for your appraisal
Number of pollutants	<input type="text" value="2"/>	Please type the number of pollutants to be assessed

Note: if you are assessing PM10 impacts, please convert these to PM2.5 using conversion factors found in the Assumptions sheet

<u>Key assumptions:</u>	Discount rate	3.5% from appraisal year 0 to 30 3% from appraisal year 31 to 75 2.5% from appraisal year 76 to 125
	Health uplift factor	2%

Damage Cost User Interface

Pollutant

NOx

Road Transport Rural

Pollutant

PM2.5

Road Transport Rural

Note: If you are assessing PM10 impacts, please convert these to PM2.5 using conversion factors found in the Assumptions sheet

NOx Road Transport Rural

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Reduction in emissions (tonnes)	0.369	0.369	0.369	0.369	0.369	0.369	0.369	0.369	0.369	0.369
Central Damage Costs (£)	3360	3427	3496	3565	3637	3709	3784	3859	3937	4015
Central Benefit (£)	1240	1265	1290	1316	1342	1369	1396	1424	1453	1482
Discounted Central Benefit (£)	1240	1222	1204	1187	1169	1152	1136	1119	1103	1087
Central Present Value	£11,620									
Low Sensitivity Damage Costs (£)	386	394	402	410	418	426	435	444	453	462
Low Sensitivity Benefit (£)	143	145	148	151	154	157	161	164	167	170
Discounted Low Sensitivity Benefit (£)	143	140	138	136	134	133	131	129	127	125
Low Sensitivity Present Value	£1,336									
High Sensitivity Damage Costs (£)	12186	12430	12678	12932	13190	13454	13723	13998	14278	14563
High Sensitivity Benefit (£)	4497	4587	4678	4772	4867	4965	5064	5165	5268	5374
Discounted High Sensitivity Benefit (£)	4497	4431	4367	4304	4242	4180	4119	4060	4001	3943
High Sensitivity Present Value	£42,144									

PM2.5 Road Transport Rural

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Reduction in emissions (tonnes)	0	0	0	0	0	0	0	0	0	0
Central Damage Costs (£)	32576	33227	33892	34570	35261	35966	36686	37419	38168	38931
Central Benefit (£)	782	797	813	830	846	863	880	898	916	934
Discounted Central Benefit (£)	782	770	759	748	737	727	716	706	696	686
Central Present Value	£7,328									
Low Sensitivity Damage Costs (£)	7479	7629	7782	7937	8096	8258	8423	8591	8763	8939
Low Sensitivity Benefit (£)	180	183	187	190	194	198	202	206	210	215
Discounted Low Sensitivity Benefit (£)	180	177	174	172	169	167	164	162	160	157
Low Sensitivity Present Value	£1,682									
High Sensitivity Damage Costs (£)	99536	101527	103557	105628	107741	109896	112094	114336	116622	118955
High Sensitivity Benefit (£)	2389	2437	2485	2535	2586	2637	2690	2744	2799	2855
Discounted High Sensitivity Benefit (£)	2389	2354	2320	2286	2253	2221	2189	2157	2126	2095
High Sensitivity Present Value	£22,389									

Outputs

Pollutant	Low Sensitivity Present Value	Central Present Value	High Sensitivity Present Value
NOx Road Transport Rural	£1,336	£11,620	£42,144
PM2.5 Road Transport Rural	£1,682	£7,328	£22,389

Damage Costs & Assumptions

Damage Cost Valuations (£/tonne, 2017 Prices)				PM2.5/PM10	
Number	Pollutant Sector	Low Scenario	Central Scenario	High Scenario	Conversion Factors
1	NOx National	611	6385	24174	-
2	NOx Industry (area)	573	5891	22225	-
3	NOx Commercial	1440	17171	66697	-
4	NOx Domestic	1077	12448	48078	-
5	NOx Solvents	1197	14099	54231	-
6	NOx Road Transport	817	9066	34742	-
7	NOx Aircraft	856	9575	36752	-
8	NOx Offroad	667	7106	27017	-
9	NOx Rail	694	7466	28437	-
10	NOx Ships	309	2451	8664	-
11	NOx Waste	663	7060	26837	-
12	NOx Agriculture	305	2393	8436	-
13	NOx Other	295	2267	7938	-
14	NOx Road Transport Central London	4053	51178	200767	-
15	NOx Road Transport Inner London	4161	52587	206323	-
16	NOx Road Transport Outer London	2252	27741	108367	-
17	NOx Road Transport Inner Conurbation	1574	18913	73565	-
18	NOx Road Transport Outer Conurbation	979	11170	43037	-
19	NOx Road Transport Urban Big	1007	11529	44455	-
20	NOx Road Transport Urban Large	850	9493	36427	-
21	NOx Road Transport Urban Medium	706	7614	29021	-
22	NOx Road Transport Urban Small	601	6251	23646	-
23	NOx Road Transport Rural	364	3166	11483	-
24	NOx Part A Category 1	237	1512	4963	-
25	NOx Part A Category 2	316	2547	9045	-
26	NOx Part A Category 3	553	5630	21196	-
27	NOx Part A Category 4	227	1378	4435	-
28	NOx Part A Category 5	252	1707	5732	-
29	NOx Part A Category 6	310	2464	8715	-
30	NOx Part A Category 7	222	1320	4205	-
31	NOx Part A Category 8	232	1453	4730	-
32	NOx Part A Category 9	247	1641	5473	-
31	PM2.5 National	15888	73403	227323	0.635
32	PM2.5 Industry (area)	16141	71455	257605	0.342
33	PM2.5 Commercial	16674	78458	226997	0.958
34	PM2.5 Domestic	18936	89456	258239	0.978
35	PM2.5 Solvents	3494	110070	343630	0.619
36	PM2.5 Road Transport	17567	81518	252695	0.635
37	PM2.5 Aircraft	15648	73070	216359	0.819
38	PM2.5 Offroad	12503	58367	167598	1
39	PM2.5 Rail	12373	57550	166998	0.926
40	PM2.5 Ships	5484	24255	69497	0.947
41	PM2.5 Waste	15799	74029	216443	0.889
42	PM2.5 Agriculture	7936	25141	109571	0.167
43	PM2.5 Other	19472	91826	268508	0.895
44	PM2.5 Road Transport Central London	83689	401540	1234992	0.681
45	PM2.5 Road Transport Inner London	85544	410293	1273099	0.651
46	PM2.5 Road Transport Outer London	46656	222205	690525	0.642
47	PM2.5 Road Transport Inner Conurbation	32693	154672	480614	0.639
48	PM2.5 Road Transport Outer Conurbation	20374	95108	294812	0.639
49	PM2.5 Road Transport Urban Big	21067	98465	305206	0.639
50	PM2.5 Road Transport Urban Large	17712	82253	254531	0.641
51	PM2.5 Road Transport Urban Medium	14512	66797	206169	0.644
52	PM2.5 Road Transport Urban Small	12231	55777	171775	0.645
53	PM2.5 Road Transport Rural	7048	30697	93795	0.642
54	PM2.5 Part A Category 1	2634	10189	28879	0.848
55	PM2.5 Part A Category 2	5816	25684	74386	0.881
56	PM2.5 Part A Category 3	18983	89359	262747	0.862
57	PM2.5 Part A Category 4	2216	7414	21189	0.657
58	PM2.5 Part A Category 5	1896	6210	17293	0.733
59	PM2.5 Part A Category 6	1990	7250	20040	0.912
60	PM2.5 Part A Category 7	1553	4167	11118	0.649
61	PM2.5 Part A Category 8	1277	3289	8423	0.752
62	PM2.5 Part A Category 9	1502	3421	8749	0.565
63	SO2 National	2893	13026	37611	-
64	NH3 National	1521	7923	24467	-
65	VOC National	55	102	205	-

Pollutants by Sector				
NOx	PM2.5	SO2	VOC	NH3
National	National	National	National	National
Industry (area)	Industry (area)			
Commercial	Commercial			
Domestic	Domestic			
Solvents	Solvents			
Road Transport	Road Transport			
Aircraft	Aircraft			
Offroad	Offroad			
Rail	Rail			
Ships	Ships			
Waste	Waste			
Agriculture	Agriculture			
Other	Other			
Road Transport Central London	Road Transport Central London			
Road Transport Inner London	Road Transport Inner London			
Road Transport Outer London	Road Transport Outer London			
Road Transport Inner Conurbation	Road Transport Inner Conurbation			
Road Transport Outer Conurbation	Road Transport Outer Conurbation			
Road Transport Urban Big	Road Transport Urban Big			
Road Transport Urban Large	Road Transport Urban Large			
Road Transport Urban Medium	Road Transport Urban Medium			
Road Transport Urban Small	Road Transport Urban Small			
Road Transport Rural	Road Transport Rural			
Part A Category 1	Part A Category 1			
Part A Category 2	Part A Category 2			
Part A Category 3	Part A Category 3			
Part A Category 4	Part A Category 4			
Part A Category 5	Part A Category 5			
Part A Category 6	Part A Category 6			
Part A Category 7	Part A Category 7			
Part A Category 8	Part A Category 8			
Part A Category 9	Part A Category 9			