ANNEX I

Planning and Environmental Policy Group

Part III of the Environment (Northern Ireland) Order 2002

Local Air Quality Management Guidance

Worked Examples for the Practice Guidance

December 2009

YEAR	Discount Factor
0	1
1	0.9662
2	0.9335
3	0.9019
4	0.8714
5	0.8420
6	0.8135
7	0.7860
8	0.7594
9	0.7337
10	0.7089
11	0.6849
12	0.6618
13	0.6394
14	0.6178
15	0.5969
16	0.5767
17	0.5572
18	0.5384
19	0.5202
20	0.5026
21	0.4856
22	0.4692
23	0.4533
24	0.4380
25	0.4231
26	0.4088
27	0.3950
28	0.3817
29	0.3687
30	0.3563

for Government recommended 3.5% discount rate

Example of the use of discounting
This shows how the present value of £1,000 declines in future years with a discount rate of 3.5 per cent.
The value of £1000 in each year is multiplied by the discount factor

Year	0	1	2	3	4	5
Value	£1,000	£1,000	£1,000	£1,000	£1,000	£1,000
Discount factor	1	0.9662	0.9335	0.9019	0.8714	0.842
Discounted Present Value	£1,000	£966	£934	£902	£871	£842

from HMT scheme (left)

Source: Green Book, Annex 6, Page 100.
http://www.hm-treasury.gov.uk/media/F/D/Green_Book2_03.pdf

In this example, the costs of the scheme are expressed as a present value
See Box 6 of economic guidance
document

Note that it is assumed that the base year is year 0, so the discount factor for year 0 is 1

Scheme A	**0**	**1**	**2**	**3**	**4**	**5**
Capital costs	£50,000					
Operating costs	£1,000	£1,000	£1,000	£1,000	£1,000	£1,000
Costs	£51,000	£1,000	£1,000	£1,000	£1,000	£1,000
Discount factor	1	0.9662	0.9335	0.9019	0.8714	0.842
Present value	£51,000	£966	£934	£902	£871	£842
Sum of PV	£55,515					

from HMT scheme (previous worksheet)

The value in each year is multiplied by the discount factor

The sum of these present values give the present value

Scheme B	**0**	**1**	**2**	**3**	**4**	**5**
Capital costs	£10,000					
Operating costs	£10,000	£10,000	£10,000	£10,000	£10,000	£10,000
Costs	£20,000	£10,000	£10,000	£10,000	£10,000	£10,000
Discount factor	1	0.9662	0.9335	0.9019	0.8714	0.842
Present value	£20,000	£9,662	£9,335	£9,019	£8,714	£8,420
Sum of PV	£65,150					

from HMT scheme (previous worksheet)

The value in each year is multiplied by the discount factor

The sum of these present values give the present value

In this example, the equivalent annual cost of the schemes are estimated
See Box 7 of economic guidance document

The net present value (previous sheet) can be used to derive an equivalent annualised cost (EAC)
The formula to do this is Equivalent annualised Cost = $\left[\frac{r(1+r)^n}{(1+r)^n-1}\right]$ where r is the discount rate (3.5% in the UK, i.e. 0.035) and n is the scheme length in years

However, there is an excel function that can be used to generate this value
take a NPV of £10000 and ten year

NPV	£10,000
Discount rate, r	3.50%
Number of year, n	10
Fomula	£1,202
Excel	£1,202

There is an excel formula to do this (see cell). Note strictly speaking, this formula (and formula above) provides an EAC for a scheme starting in year 1

This can be applied to the example scheme

Scheme A	**0**	**1**	**2**	**3**	**4**	**5**	
Capital costs	£50,000						
Operating costs	£1,000	£1,000	£1,000	£1,000	£1,000	£1,000	
Costs	£51,000	£1,000	£1,000	£1,000	£1,000	£1,000	
Discount factor	1	0.9662	0.9335	0.9019	0.8714	0.842	from HMT scheme (previous worksheet)
Present value	£51,000	£966	£934	£902	£871	£842	The value in each year is multiplied by the discount factor
Sum of PV	£55,515						The sum of these present values give the present value
Discount rate	3.50%						
Number of years	6						
EAC (formula)	£10,418						The EAC formula is applied to the sum of PV to generate the equivalent annual cost (annualised costs)
EAC (excel)	£10,418						It requires the discount rate - 3.5% - and the number of years to annualise over - in this case 6

Scheme B	**0**	**1**	**2**	**3**	**4**	**5**	
Capital costs	£10,000						
Operating costs	£10,000	£10,000	£10,000	£10,000	£10,000	£10,000	
Costs	£20,000	£10,000	£10,000	£10,000	£10,000	£10,000	
Discount factor	1	0.9662	0.9335	0.9019	0.8714	0.842	from HMT scheme (previous worksheet)
Present value	£20,000	£9,662	£9,335	£9,019	£8,714	£8,420	
Sum of PV	£65,150						
Discount rate	3.50%						
Number of years	6						
EAC (formula)	£12,227						**In this case example A has a lower equivalent annualised cost**
EAC (excel)	£12,227						**of 10418 compared to 12227**

In this example, the cost-effectiveness of the schemes are compared
See Box 7 of economic guidance document

The cost-effectiveness calculation combines the EAC (annualised) costs with the annual emission reduction

Option A reduces emissions by 10 tonnes of NOx a year in the area.

Option B reduces emissions by 14 tonnes of NOx a year in the area

The cost-effectiveness is then the annual emission reduction divided by the equivalent annual cost
EAC was given on previous work sheet

	EAC	Tonnes abated/year	Costs per tonne abated
Option A	10418	10	1042
Option B	12227	14	873

So option B is the more cost-effective option, as it achieves a reduction in NOx for lower cost per tonne

Note that to consider other environmental objectives, the 'net' cost-effectiveness should be estimated

SPC In this example, the economic benefits of GHG reductions are estimated
See Box 4 of economic guidance document

Guidance available at

http://www.defra.gov.uk/environment/climatechange/research/carboncost/step1.htm.

Year	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 reduction (tonnes)	100	80	60	40	20	0

Year	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
SPC in 2007 prices (w2%)	25.5	26	26.5	27	27.6	28.1

Total Values	2550	2080	1590	1080	552	0

Multiply CO2 reduction by SPC value

Discount factor	1	0.9662	0.9335	0.9019	0.8714	0.842

from HMT scheme (previous worksheet)

Discounted value	2550	2010	1484	974	481	0

The value in each year is multiplied by the discount factor

Net Present Value	7499

The sum of these present values give the net present value

In this example, the economic benefits of NOx reductions are estimated
See Box 9 of economic guidance document

The benefits of air pollution reductions can be valued in economc terms

These benefits can be obtained using 'damage costs', which provide the benefits of marginal air quality improvements,
in benefits (£) per tonne of pollutant reduced.
These damage costs are presented on the Defra web-site

http://www.defra.gov.uk/environment/airquality/panels/igcb/guidance/index.htm

To estimate benefits, it is necessary to select the pollutant, and specify the year that the scheme starts and the length of time

	Tonnes abated/year	Nox	Present Value benefits (£)
Option A		10	53148
Option B		14	74407

These calculations can be undertaken with the damage cost calculator, as below

1. What length (in years) is your policy appraisal?	6
2. When is the first year of your appraisal?	2007
3. What pollutant are you assessing? (click box to select from drop-down menu)	1
4. Input the annual changes in emissions below (in tonnes)	

Year	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*
Change in emissions (tonnes)	10	10	10	10	10	10	

CALCULATED RESULTS

Central Estimate Present Value	£ 0.05	Million
	£ 53,148	

1. What length (in years) is your policy appraisal?	6
2. What is the base year for the appraisal?	2007
3. What pollutant are you assessing? (click box to select from drop-down menu)	1
4. Input the annual changes in emissions below (in tonnes)	

Year	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	
Change in emissions (tonnes)	14	14	14	14	14	14	

CALCULATED RESULTS

Central Estimate Present Value	£ 0.07	Million
	£ 74,407	

If additonal PM10 emissions are included
With the location

	Tonnes abated/year	PM10	Present Value benefits (£)	NOX + PM10
Option A		0.1	65,602	118,750
Option B		0.05	32801	107,208

1. What length (in years) is your policy appraisal?	**6**
2. What is the base year for the appraisal?	**2007**
3. What pollutant are you assessing? (click box to select from drop-down menu)	***12***
4. Input the annual changes in emissions below (in tonnes)	

Year	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	
Change in emissions (tonnes)	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	

CALCULATED RESULTS

Central Estimate Present Value

£ 0.07 **Million**

£ 65,602

1. What length (in years) is your policy appraisal?	**6**
2. What is the base year for the appraisal?	**2007**
3. What pollutant are you assessing? (click box to select from drop-down menu)	***12***
4. Input the annual changes in emissions below (in tonnes)	

Year	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	
Change in emissions (tonnes)	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	

CALCULATED RESULTS

Central Estimate Present Value

£ 0.03 **Million**

£ 32,801

In this example, the cost benefit analysis is undertaken
See Box 9 of economic guidance document

First if only NOx is included

	Present Value costs (£)	Present Value benefits (£)	Net Present Value	
Option A	55515	53148	-2367	This scheme has a negative net present value
Option B	65150	74407	9257	This scheme has a positive net present value
	see earlier sheet	see earlier sheet	benefits - costs	

Then in NOX and PM10 are included

	Present Value costs (£)	Present Value benefits (£)	Net Present Value	
Option A	55515	118750	63235	This scheme now has a positive net present value
Option B	65150	107208	42058	and it is now greater than scheme B
	see earlier sheet	see earlier sheet	benefits - costs	

In this example, a 'net' cost-effectiveness analysis is undertaken
See Box 10 of economic guidance document

The estimation of the net cost-effectiveness analysis nets benefits from the pure cost aspects to give the cost-effectiveness ranking

Option A reduces emissions by 10 tonnes of NOx a year in the area.

Option B reduces emissions by 14 tonnes of NOx a year in the area

The cost-effectiveness is then the annual emission reduction divided by the equivalent annual cost
for costs, the EAC was given on previous work sheet
For benefits, the total benefits (NOX and PM) have to be annualised

	A	B
Sum of PV	£118,750	£107,208
Discount rate	3.50%	3.50%
Number of years	6	6
EAC (formula)	£22,286	£20,120
EAC (excel)	£22,286	£20,120

	EAC	EAB	Net	NOX Tonnes abated/year	Costs per tonne abated	
Option A	10418	£22,286	-£11,867	10	-1187	option A now is more cost-effective when the other environmental aspects are taken into account
Option B	12227	£20,120	-£7,893	14	-564	

Cost-Effectiveness

Example on Retrofit technology

This is for a DPF, using the costs from the IGCB economic analysis

Base year	2008	
Scheme start	2008	Note in this example, the base year is the same as the start year, so the discount factor is 1 for year 0
Discount rate	3.50%	
Number of years	5	

	2008	2009	2010	2011	2012	
Equipment - bus	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	
DPF capital (resource)	1,750					
DPF maintenance	240	240	240	240	240	
DPF fuel	0	0	0	0	0	
Total	**1,990**	**240**	**240**	**240**	**240**	
Discount factor	1.00000	0.96620	0.93350	0.90190	0.87140	from HMT scheme (previous worksheet)
Discounted cost	1,990	232	224	216	209	The value in each year is multiplied by the discount factor
Present value	2,872					The sum of these present values give the present value
Equivalent annualised cost	£636					Use equation or the simple excel formula (PMT)

Annual emission benefits

PM10	emissions g/km	emission per year tonnes	benefit at 90% abatement	cost per tonne
Euro II	0.194	0.00387	0.0035	£182,409
Euro III	0.139	0.00279	0.0025	£253,346
Euro IV	0.029	0.00058	0.0005	£1,216,062
Euro IV+ (2008)	0.029	0.00058	0.0005	£1,216,062

source NAEI

Assume 20 000 km peryear in area

Cost-benefit analysis

The benefits for a Euro II bus are based on a five year lifetime

	benefit at 90% abatement	
Euro II	0.0035	in the central zone

This value is entered into the Defra damage cost calculator

http://www.defra.gov.uk/environment/airquality/panels/igcb/guidance/index.htm

The length of the scheme and the base year need to be entered
In this case, we are using a 2008 base year and a 5 year scheme

To estimate benefits, it is necessary to select the pollutant, and specify the year that the scheme starts and the length of time

A 5 year lifetime

The central zone corresponds with area location 12 - inner conurbation

1. What length (in years) is your policy appraisal?	5
2. What is the base year for the appraisal?	2008
3. What pollutant are you assessing? (click box to select from drop-down menu)	*12*
4. Input the annual changes in emissions below (in tonnes)	

Year	*2008*	*2009*	*2010*	*2011*	*2012*		
Change in emissions (tonnes)	0.00349	0.00349	0.00349	0.00349	0.00349		

CALCULATED RESULTS				
Central Estimate Present Value	£	0.00	Million	
	£	*1,966*		
Estimated Range	£	0.00	-	0.00 Million
	£	*1,537*	-	*2,231*

This gives the benefits, however, the total benefits are relevant for the Cba, so it is also necessary to add the benefits outside the zone
We assume the vehicle also does 30 000 km outside the zone each year

Annual emission benefits

PM10	emissions g/km	emission per year tonnes	benefit at 90% abatement
Euro II	0.194	0.00581	0.00523

source NAEI Assume 30 000 km peryear in area

This value is also entered into the damage cost spreadsheet.
However, for PM, the location of emissions is important, and so a new page must be used

The outer zone corresponds with area location 13 - outer conurbation

1. What length (in years) is your policy appraisal?	5
2. What is the base year for the appraisal?	2008
3. What pollutant are you assessing? (click box to select from drop-down menu)	*13*
4. Input the annual changes in emissions below (in tonnes)	

Year	*2008*	*2009*	*2010*	*2011*	*2012*		
Change in emissions (tonnes)	0.00523	0.00523	0.00523	0.00523	0.00523		

CALCULATED RESULTS

Central Estimate Present Value	*£*	0.00	Million
	£	*1,832*	

Estimated Range	£	0.00	-	0.00	Million
	£	*1,433*	-	*2,080*	

The main page then shows the total benefits, i.e. the two sets of benefits are added together

IGCB Damage Cost Calculator - Total Appraisal Results

Key:

Central Estimate: *This is the most likely estimate of damage costs based on the probability distribution used for Monte-Carlo analysis of air quality impacts*

Estimated Results: *This is the main central results of the calculator using the range of damage cost values as agreed by the IGCB.*

Sensitivity Damage Cost Range: *These are the sensitivity low and high values of the central damage costs.*

Central Estimate Present Value	**£**	**0.0**	**Million**	
	£	***3,798***		
Estimated Range	**£**	**0.0**	**-**	**0.0** **Million**
	£	***2,970***	**-**	***4,311***

This is compared against the NPV of costs

Equipment - bus	**NPV Benefits**	**NPV Costs**	**Net NPV**
DPF	3,798	2,872	926

To estimate the net cost-effectiveness analysis, the benefits need to be expressed as an equivalent annual cost.

	A
Sum of PV	£3,798
Discount rate	3.50%
Number of years	5
EAC (formula)	£841
EAC (excel)	£841

	EAC Costs	EAC Benefits	Net	Tonnes abated	Net cost effectiveness
Net cost effectiveness	£636	£841	-£205	0.00349 in central area	-£58,853

Annualised Costs

In this example, we are estimating the costs of alternative schemes

	Base scheme	Scheme A Bus	Scheme B Heavy	Scheme C All
Start-up (capital)				
Equipment	150,000	250,000	250,000	350,000
Central system	50,000	100,000	150,000	200,000
Other	70,000	100,000	200,000	250,000
Total	**270,000**	**450,000**	**600,000**	**800,000**
Operating costs (end of year 1)				
Maintainance	10,000	20,000	20,000	30,000
Central system, premises and supplies	65,000	75,000	80,000	150,000
Staff costs	120,000	170,000	230,000	330,000
Total	**195,000**	**265,000**	**330,000**	**510,000**

BASE

Base year	2007	This is year 0
Scheme start year	2008	This is year 1. This is important in picking the correct discount factor note below that this starts with year 1 discount factor
Discount rate	3.50%	
Number of years	8	

	2008	2009	2010	2011	2012	2013	2014	2015
Base	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**
Capital costs	270,000							
Ongoing costs	195,000	195,000	195,000	195,000	195,000	195,000	195,000	195,000
Total	465,000	195,000	195,000	195,000	195,000	195,000	195,000	195,000
Discount factor	0.96620	0.93350	0.90190	0.87140	0.84200	0.81350	0.78600	0.75940
Discounted cost	449,283	182,033	175,871	169,923	164,190	158,633	153,270	148,083
Net present value	1,601,285							
Equivalent annualised cost	£232,949							

Scheme A

Discount rate	3.50%
Number of years	8

A	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**
Capital costs	450,000							
Ongoing costs	265,000	265,000	265,000	265,000	265,000	265,000	265,000	265,000
Total	715,000	265,000	265,000	265,000	265,000	265,000	265,000	265,000
Discount factor	0.96620	0.93350	0.90190	0.87140	0.84200	0.81350	0.78600	0.75940
Discounted cost	690,833	247,378	239,004	230,921	223,130	215,578	208,290	201,241
Present value	2,256,374							
Equivalent annualised cost	£328,250							

Scheme B

Discount rate	3.50%
Number of years	8

B	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Capital costs	600,000							
Ongoing costs	330,000	330,000	330,000	330,000	330,000	330,000	330,000	330,000
Total	930,000	330,000	330,000	330,000	330,000	330,000	330,000	330,000
Discount factor	0.96620	0.93350	0.90190	0.87140	0.84200	0.81350	0.78600	0.75940
Discounted cost	898,566	308,055	297,627	287,562	277,860	268,455	259,380	250,602
Present value	2,848,107							
Equivalent annualised cost	£414,333							

Scheme c

Discount rate	3.50%
Number of years	8

Capital costs	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Capital costs	800,000							
Ongoing costs	510,000	510,000	510,000	510,000	510,000	510,000	510,000	510,000
Total	1,310,000	510,000	510,000	510,000	510,000	510,000	510,000	510,000
Discount factor	0.96620	0.93350	0.90190	0.87140	0.84200	0.81350	0.78600	0.75940
Discounted cost	1,265,722	476,085	459,969	444,414	429,420	414,885	400,860	387,294
Present value	4,278,649							
Equivalent annualised cost	£622,444							

Thee summary of present value and equivalent annual cost values are shown below

	Base	A	B	C
PV	**1,601,285**	**2,256,374**	**2,848,107**	**4,278,649**
EAC	**232,949**	**328,250**	**414,333**	**622,444**

The EAC can be compared against the emission benefits of the schemes, to look which is most cost-effective
The PV can be used to compare against the present value of (ecnomic) benefits to look at the net present value of the scheme

However, to assess cost-effectiveness and cost-benefit analysis fully, it is necessary to also consider the costs to operators
This would include, for example, the costs of fitting DPF to older vehicles, see retrofit example

Cost-Effectiveness

Example on Retrofit technology

This is for a SCR using the costs from the IGCB economic analysis

Base year	2008	
Scheme start	2008	Note in this example, the base year is the same as the start year, so the discount factor is 1 for year 0
Discount rate	3.50%	
Number of years	10	

For fuel consumption

Annual mileage	50000	km per year				Conversion (DfT)	
Fuel efficiency	2.8	km per litre	7.8 miles per gallon	source	TSGB, table 3.4	1 kilometre = 0.6214 mile	1 Gallon = 4.546 litres
Cost fuel per litre (resource)	0.947	no tax included		source	TSGB, table 3.3		
Change in efficiency	-6%						
Fuel cost	17148						

http://www.dft.gov.uk/pgr/statistics/datatablespublications/tsgb/2007edition/section3energyenvironment.pdf

	2008										
Equipment - bus	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	
SCR capital (resource)	430										
SCR additive	219	219	219	219	219	219	219	219	219	219	
SCR fuel penalty	1029	1029	1029	1029	1029	1029	1029	1029	1029	1029	
Total	**1,678**	**1,248**	**1,248**	**1,248**	**1,248**	**1,248**	**1,248**	**1,248**	**1,248**	**1,248**	
Discount factor	1.00000	0.96620	0.93350	0.90190	0.87140	0.84200	0.81350	0.78600	0.75940	0.73370	
Discounted cost	1,678	1,206	1,165	1,125	1,087	1,051	1,015	981	948	916	
Net present value	11,172										
Equivalent annualised cost	£1,343										

Annual emission benefits

Nox	emissions	emission per	cost	
	g/km	year tonnes	per tonne	
Euro IV	3.629	0.07259		
LEV	1.815	0.03629		
Difference	1.815	0.036	£37,011	£38,237

source NAEI Assume
20 000 km
peryear in area

This is for a EGR using the costs from the IGCB economic analysis

Base year	2008				
Scheme start	2008				
Discount rate	3.50%				
Number of years	6				
For fuel consumption					
Annual mileage	25000			1 kilometre = 0.6214 mile	1 Gallon = 4.546 litres
Fuel efficiency	11	km per litre	Diesel cars 39 miles per gallon, increase fc by 130% for LGVs		source TSGB, table 3.4
Cost fuel per litre (resource)	0.947				
Change in efficiency	-2%				
Fuel cost	2229				

Equipment - bus	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**		
SCR capital (resource)	288							
SCR maintenance	12	12	12	12	12	12		
SCR fuel	45	45	45	45	45	45		
Total	**345**	**57**	**57**	**57**	**57**	**57**		
Discount factor	1.00000	0.96620	0.93350	0.90190	0.87140	0.84200		
Discounted cost	345	55	53	51	49	48		
Present value	600							
Equivalent annualised cost	£113							

Annual emission benefits

		Nox	emissions	emission per	cost
			g/km	year tonnes	per tonne
		Euro IV	0.425	0.00849	
		LEV	0.340	0.00679	
0.084925	20% reduction	Difference	0.085	0.0017	£66,302
		Annual emission benefits			
		PM10	emissions	emission per	cost
			g/km	year tonnes	per tonne
		Euro IV	0.051	0.00102	
		LEV	0.005	0.00010	
0.045866	90%	Difference	0.046	0.001	£122,764

20 000 inside the main area, 5000 outside

Cost-benefit analysis

The benefits for a LEV rigid vehicle based on a ten year lifetime

Additional benefits outside the zone double total benefits

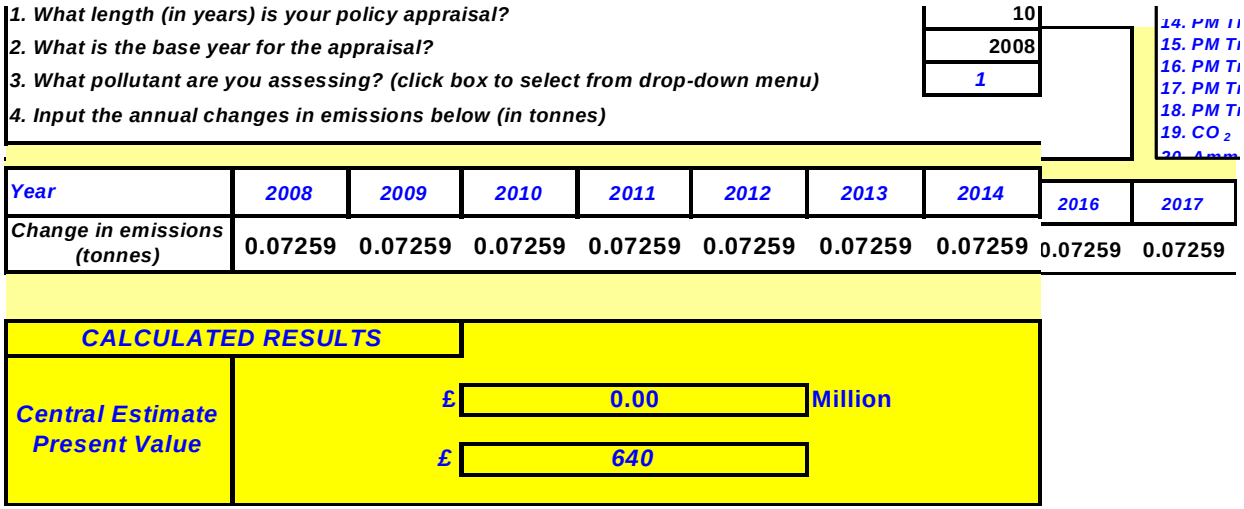
LEV benefit 0.0726

This value is entered into the Defra damage cost calculator

http://www.defra.gov.uk/environment/airquality/panels/igcb/guidance/index.htm

To estimate benefits, it is necessary to select the pollutant, and specify the year that the scheme starts and the length of time

a ten year lifetime
a 2008 base year



1. What length (in years) is your policy appraisal?	10
2. What is the base year for the appraisal?	2008
3. What pollutant are you assessing? (click box to select from drop-down menu)	1
4. Input the annual changes in emissions below (in tonnes)	

14. PM Ti
15. PM Ti
16. PM Ti
17. PM Ti
18. PM Ti
19. CO_2

Year	2008	2009	2010	2011	2012	2013	2014	2016	2017
Change in emissions (tonnes)	0.07259	0.07259	0.07259	0.07259	0.07259	0.07259	0.07259	0.07259	0.07259

CALCULATED RESULTS		
Central Estimate Present Value	£ 0.00 Million	
	£ 640	

The same approach is used for the EGR

Note for PM, it is necessary to enter the location of the emissions

The benefits are
Nox
PM (central conurbation)
PM (outer conurbation)

For all 25000 annual mileage

Annual emission benefits

		Nox	emissions	emission per	
			g/km	year tonnes	
		Euro IV	0.425	0.01062	
		LEV	0.340	0.00849	
0.084925	20%	Difference	0.085	0.0021	
	reduction				
		Annual emission benefits			
		PM10	emissions	emission per	
			g/km	year tonnes	
		Euro IV	0.051	0.00102	
		LEV	0.005	0.00010	
0.045866	90%	Difference	0.046	0.001	

central zone

		Annual emission benefits			
		PM10	emissions	emission per	
			g/km	year tonnes	
		Euro IV	0.051	0.00025	
		LEV	0.005	0.00003	
0.045866	90%	Difference	0.046	0.000	

outer zone

Total present value benefits
724

Equipment - bus	PV Benefits	PV Costs	Net Present Value
EGR LGV	724	600	124
SCR rigid	640	11,172	-10532
	640	11,542	-10902

Note that in this case, the scheme should also take account of the changes in fuel consumption, and GHG emissions using the SPC values to provide estimates of the monetary benefits or costs of changes in CO2 emissions
This is particularly important for LEVs (though not included in this example)