

SMART SPP 
innovation through sustainable procurement

LCC-CO₂ tool user guide

Visual guide to using the life-cycle costing
and CO₂ assessment tool
(LCC-CO₂ tool)

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Part I – Introduction

I.1 Objective of the guidance

This User Guide accompanies the SMART SPP LCC-CO₂ Tool. The tool has been developed to help you calculate the life cycle costs (LCC) and CO₂ emissions of different products and services (referred to only as “products” from now on) to assist in procurement decision-making. It is specifically targeted at evaluating innovative products, which are still in the phase of development and market introduction.

The User Guide has been produced to help you understand:

- What kind of information the tool can provide
- How to use the tool in a tendering process
- How the tool should be completed, and by whom

The LCC-CO₂ Tool itself has been designed to accompany a Procurement Guide to driving energy efficient innovation through sustainable procurement, which particularly focuses on engagement with the market prior to tendering. The Guide and Tool can be downloaded from: www.smart-spp.eu.

I.2 What information does the tool provide?

The tool can be used to assess two different things that are, in the case of innovative energy-efficient technologies, very closely related: the life cycle costs and the CO₂ emissions of different product options. Up to 15 different products can be compared by the tool. The tool can also be used to assess your current situation and thus determine potential financial and CO₂ emissions impacts of innovative alternative solutions.

Life-cycle costs (LCC)

Life-cycle costs (LCC) (also called “whole life costs” (WLC)) are the costs that a product will cause to the contracting authority during its useful life¹. Beyond the acquisition costs LCC also takes into account operational costs (particularly energy and water consumption), maintenance costs, taxes, and disposal costs/resale value.

CO₂ emissions

The tool can also be used to calculate the CO₂ emissions of products, considering both emissions deriving from operation of the product (operation emissions – mainly caused by energy consumption) as well as embedded emissions (that is, emissions caused during production (including raw material extraction), transportation, installation and disposal). The tool also provides a differentiation between emissions deriving from direct combustion of fuels, and emissions due to electricity production (used for operating the product).

Tender evaluation

The tool also contains a function to allow it to be used for the direct evaluation of different offers during the tender evaluation stage.

¹ For further information read the SMART SPP report on Existing approaches to encourage innovation through procurement http://www.iclei-europe.org/fileadmin/template/projects/smart_spp/files/SMART_SPP_D2.2_ExistingProcurementApproaches.pdf, pp. 36.

In principle, the **SMART SPP LCC-CO₂ Tool** is based on a life-cycle perspective. Both the calculations of LCC and CO₂ emissions can generally include the entire physical life-cycle of a product, from production to disposal. Against this background, the following life-cycle phases can be covered:

- Production: The production phase comprises all processes for the manufacturing of the product. It includes the extraction of resources, the production of all required semi-finished products, the necessary transports in the supply chain as well as the assembly and installation of the final product. Regarding LCC, all relevant cost aspects are incorporated in the purchase and installation costs. With respect to CO₂, the environmental impacts of the mentioned aspects are covered by the embedded emissions (cf. glossary of the **LCC-CO₂ Tool**).
- Operation: This life-cycle phase includes all costs and CO₂ emissions for materials and services relevant during the use of the product, such as electricity, fuel, gas, other consumables, training, service and maintenance and others (e.g. taxes, insurance costs, etc).
- End-of-life/disposal: After the end of its service life, the product enters the end-of-life phase, where it will be recycled and/or disposed. Concerning LCC, the remnant value as well as the waste treatment costs (if applicable) has to be considered, whereas all relevant CO₂ emissions have to be included in the embedded emissions (see above).

Particularly with respect to CO₂ emissions, it must be emphasised that embedded emissions (including the production phase and end of life/disposal), will have to be derived as input parameters from a separate life-cycle analysis (LCA) which has to be applied consistently for all covered products. This is particularly challenging for products which are innovative and still under development and therefore not fully addressed by LCA studies. Users might want to consult the future development of the ISO/WD Standard 14067 "Carbon Footprint of Products" regularly at www.ilo.org that is expected to be released in 2012. In practice, it will therefore be hard to include correct values or even reasonable estimates for the production chain. **Therefore, it will often not be possible to include emissions deriving from other life-cycle phases other than the operational phase within the remits of this Tool. Consideration of this phase should only be done with substantiated scientific support on a case by case basis.** Please see www.smart-spp.eu for further information and news regarding this topic.

I.3 When should the tool be used?

You can use the tool at different stages in the procurement process:

At a preparatory stage:

To assess the LCC and/or CO₂ emissions of your current solution. This can:

- Give you a baseline to work from,
- Identify the different cost elements relating to the product,
- Allow better communication of the benefits of new technologies, and
- Help define some general performance requirements for the new solutions.

Before tendering:

To roughly assess different proposals to help guide market engagement activities before tendering, or to narrow down the different technological solutions to be considered.

During tendering:

To compare the LCC and the anticipated CO₂ emissions of different offers, during the evaluation phase. If the tool is used during this phase, the authority must ensure that the information provided by companies is accurate and comparable by:

- Defining in the tender set standards and test norms with experts and/or during market engagement, and
- Asking suppliers to provide evidence in support of the information provided, preferably third party verified.

After tendering (if not already used):

To evaluate and communicate the LCC and CO₂ emissions improvements of the purchased product in comparison to the current situation and/or other products and to communicate results.

I.4 Who should fill in the tool?

Who within the contracting authority should be involved?

- The tool requires someone with knowledge of LCC and/or energy consumption and CO₂ emissions to operate (for example, procurer, energy officer).
- When assessing your current situation, involve all departments which have relevant budgetary responsibilities (for example, including energy costs, waste disposal).

Which parts should be completed by the supplier and which by the contracting authority?

→ Different models are possible:

- Certain basic data must be completed by the authority (see Part III).
- The authority may wish to further define the relevant cost positions for which supplier should provide information, or suppliers may be allowed to use their own cost models.
- Suppliers must be asked to provide evidence to support the costing and the information on CO₂ emissions that they submit.

Two specific options are presented in the table below:

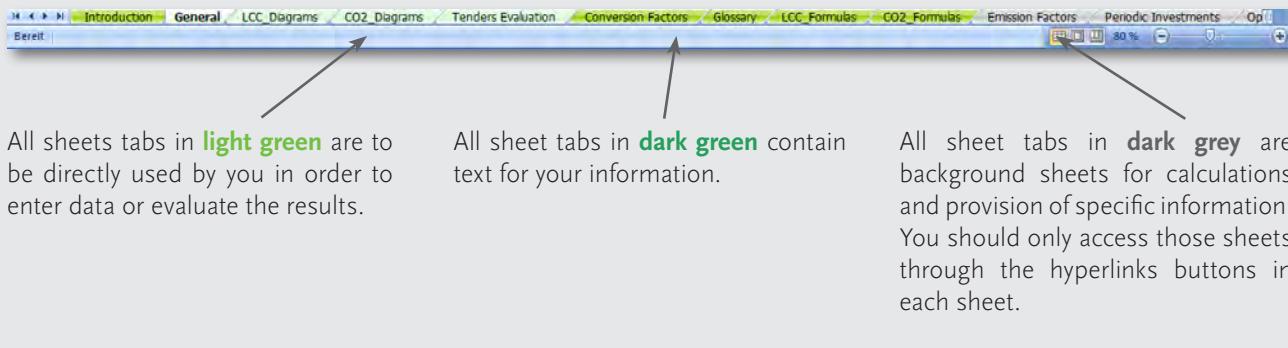
Option A: Suppliers respond to set questions	Option B: Suppliers complete the tool directly
<p>Suppliers are given a document stating the exact information they must provide (see Part III), including evidence in support of their data.</p> <p>The procurer should then complete the tool with the data from each supplier in a different column of the tool.</p>	<p>Suppliers are asked to provide data directly in the tool in Column A or in the first columns if there are several elements involved in the offer. Evidence in support of the data should be attached.</p> <p>The procurer must then copy the information from each supplier in a different column into a single master file</p>

Attention!

If the offers consist of several elements, you will have to manually make the addition of the results for each element (rows 70 and 110 in the GENERAL sheet) and introduce them in the tool (in those same rows). This is to know the total LCC and CO₂ emissions of the different proposed solutions and to be able to compare them.

Part II – General features of the tool

The tool consists of several worksheets whose tabs have been colour coded:



The tool contains the following worksheets:

Introduction Provides some basic information on the tool.

General This is **the main worksheet for entering data**. It is split into three sections:

- General information
- LCC data input & results
- CO₂ data input & results

For certain life-cycle phases you can either enter single aggregated cost/CO₂ figures in this sheet, or select the option to specify detailed information. Choosing the second option will take you directly to other worksheets where you can provide a more detailed breakdown of costs/energy consumption/CO₂ emissions. This is where the numerical results of LCC-CO₂ calculations will be displayed.

LCC diagrams This sheet provides a graphical display of the LCC results for the different products/services for which you have provided data.

CO₂ diagrams This sheet provides a graphical display of the CO₂ emissions results for the different products/services for which you have provided data.

Tender evaluation This optional sheet can be used for evaluating the different offers to identify the economically most advantageous offer. You will need to input your award criteria and weighting scheme to use it.

Conversion factors If you want to make calculations in order to compare different units (e.g. MJ and kWh) this sheet provides you with the respective conversion factors.

Glossary A glossary of terms used in the tool.

Emission factors This sheet provides emission factors for various fuel types. You can use either one of the provided lists of emission factors or create your own customised list.

Annual investments This sheet can be filled in for lease agreements or when reinvestments are necessary during the usage period.

CO₂ Formulas A documentation of formulas used for the calculation of CO₂ results.

LCC Formulas A documentation of formulas used for the calculation of LCC results.

Operation Here you can calculate the operational costs and emissions of the offers in detail. It can take into account fuel types used, different operational modes, and working time.

Maintenance Here you can specify the maintenance costs of the offers in detail. It takes into account labour costs, spare parts, etc.

CO₂ Here you can specify the maintenance costs of the offers in detail. It takes into account labour costs, spare parts, etc.

Additionally, cells are colour-coded to help identify how to use them.

Red cells contain comments (draw your cursor over it to view them)

In **white cells** you have to input data

Click on **+/- button** to expand and reduce extra rows and columns.

The screenshot shows a Microsoft Excel spreadsheet titled "LCC & CO₂ - Calculation for Procurement Activities". The spreadsheet is divided into several sections:

- General Information Input:** Includes fields for Tender ID, Your location, Planning horizon, Discount rate (nominal), Inflation rate, and CO₂ emission factors. A red cell with a comment is highlighted.
- Information to be specified by the procurer:** Includes fields for Product Offers, Personal offer ID, Number of units to be purchased/leased, and Lifespan.
- Example-tender: Street Lighting:** Shows a table with columns for Product A (Lamp_Inst.A) and Product B (Lamp_Inst.B). The table has three rows: one with values 20 and 20, and two more rows below with values 20 and 20. An orange cell with a dropdown menu is highlighted.
- Comments of the Procurement Coordinator:** A text area with a red cell containing a comment.
- Comments / Explanations:** A column for additional notes.
- Life-cycle Costing (LCC) Information Input:** Includes fields for Discount rate, Inflation rate, Acquisition Costs (Purchase price or Specify annual Investment costs), Installation costs for all units, and Initial one-off costs. A grey cell with a formula is highlighted.
- Product Costs:** A table showing costs per unit (EUR/unit) for Product A and Product B. The table has four rows: one with values 800.00 and 800.00, and two more rows below with values 7,000.00 and 7,000.00, and 10,000.00 and 10,000.00. An orange cell with a dropdown menu is highlighted.

Grey cells contain text or calculation results. These files are protected and **can not be altered!**

In **orange cells** you can select an option from the dropdown menu

Click on **light orange** – the links will bring you to other sheets where you can continue your input (and back again).

Finally, **Error alerts** are red text.

Part III – Step-by-step guide

III.1 How to fill in the tool

For reference:

CA. = Data should be provided by the contracting authority

S. = Data should be provided by the supplier

(LCC) = Data only necessary for life-cycle cost calculations

(CO₂) = Data only necessary for CO₂ emission calculations

Note: For most of the life-cycle phases, cost/CO₂ emission information can either be given as a single aggregated figure, or can be further detailed on separate worksheets within the tool. You will need to decide:

- Whether you accept single aggregated figures provided by suppliers (for example, if the tool is being used for rough calculations within the pre-procurement phase), or if it requires a more detailed breakdown of costs/emissions.
- Whether you wish to specify the exact types of cost/emissions to be included within each category. Within the tool, this can be left up to the supplier to define, or can be defined in advance by the authority with the suppliers simply requested for the figures and not given the tool itself to complete.

→ Let's get started!

III.2 One example to guide you through

To help guide you through the tool, an example has been prepared with screenshots included below. The example is for a new street lighting system. All information related to this and other examples are in dark green text.

STEP 1: INPUTTING GENERAL INFORMATION

Start with the input of data in the General Information section at the top of the GENERAL worksheet.

The screenshot shows the 'General Information Input' section of the tool. It includes fields for Tender ID (with a placeholder 'C'), Example-tender: Street Lighting, and a 'Comments' area. Below this, there's a table for 'Information to be specified by the procurer' with columns for 'Your location' (Germany), 'Planning horizon' (3 years), 'Discount rate (nominal)' (3.80%), and 'Inflation rate' (2.00%). A note says 'Click to specify emission factors' with a link to 'CO2 emission factors'.

Your location	[country]	Germany	Currency	EUR
Planning horizon	[years]	3		
Discount rate (nominal)	[%]	3.80		
Inflation rate	[%]	2.00		
CO2 emission factors				

CA. **Tender ID:** Give the tender a short description or reference ID. You can also add some further comments or explanation in the **area for further comments** on the top right corner.

CA. **Location ^{LCC}:** Choose the country where the activities will take place in order to automatically select the currency.

CA. **Planning horizon:** Choose a planning horizon (between 1 and 25 years). This term refers to the time period over which you wish to compare the different offers, that is to say the time period over which the LCC and CO₂ calculations will be made. As different products and solutions will have different replacement rates, considering which period you will assess is vital.

Example: Product X needs to be replaced every six years and product Y every 15 years. If you consider the costs over a five year period (or planning horizon) purchase and installation costs will only occur once during the period (at the beginning). If instead you consider the costs over a ten year period then the purchase and installation costs for Product X will occur twice, whilst still only once for product Y. In the included example a 23 year planning horizon has been chosen.

The longer the planning horizon, the more important the life-span of the product appears. Therefore this needs to be carefully considered. You may consider using the contract period as the planning horizon, however this may still risk having a too short-term perspective to realise the potential benefits of durable products that naturally have a longer life expectancy. This is also important when finding the remnant value or end-of-life costs.

The tool will automatically also provide results with a planning horizon of 25 years.

CA. **Discount rate (nominal) ^{LCC}:** For simplicity, you may use your country's interest rate (which includes inflation). In this case, it will be necessary to also include the inflation rate (see next point) in the tool to calculate the real discount rate. If the contrary occurs - you obtain an interest rate which does not include inflation, you will need to add the inflation rate in order to obtain the nominal discount rate. For a definition, check the glossary sheet in the tool. Current figures can be found on the webpage of the European Central Bank (ECB): <http://www.ecb.int/stats/money/long/html/index.en.html>.

The discount rate should be carefully chosen, whereas the latest figures might not always be appropriate. Basically, the development of national interest rate in the past as well as its 12-month expectation should be taken into account. Figures for the 12-month expectation are not available on the ECB webpage, but can be obtained from national banks.

CA. **Inflation rate^{LCC}:** You need to introduce this value if in the discount rate the interest rate (including inflation) has been used, in order for the calculation to generate the real discount rate². See tool glossary for a definition. Current figures for the annual average rate of change can be found in the Statistical Data Warehouse of the European Central Bank (ECB): <http://sdw.ecb.europa.eu/browse.do?node=2120778>

CA. **Emission factors CO₂:** Click on the light orange button. This will take you to the Emission Factors sheet where you will be able to specify the list of emission factors you want to use. This defines the amount of CO₂ emitted by the use of different fuel types (oil, gas, electricity etc.), which the tool uses to calculate the emissions caused during the use of the product.

In the Emission Factors sheet you can select one of the ready-prepared lists included with the tool (**GEMIS or Defra**) from the orange cell, or provide your own list.

For further information on the included fuels, click on the **+/- buttons** on top of the sheet to expand more rows.

Emission Factors					
Please select the list of emission factors					
Select fuel list with data you want to use for your CO ₂ calculations from the drop down menu below (see also lists further right, where you can also enter custom emission factors for your specific purposes):					
GEMIS_long					
>>> BACK TO GENERAL SHEET					
GEMIS_long	Comment / Explanation	Unit	kg CO ₂ /unit	Electricity?	
000_FUEL_TYPES	Upstream fuel emissions are based on Germany				
001_wood-pellets	upstream emissions	kg	0.059923	no	
002_wood-chips	upstream emissions	kg	0.0230216	no	
003_bioethanol	upstream emissions	liter	1.5171859	no	
004_biodiesel_rapeseed	upstream emissions	liter	2.6179417	no	
005_biodiesel_rapeseed_organic	upstream emissions	liter	2.6111155	no	
006_biodiesel_rapemethylester	upstream emissions	liter	2.6127712	no	
007_biodiesel_sunflowerseed-oil	upstream emissions	liter	2.6112528	no	
008_biodiesel_soymethylester	upstream emissions	liter	2.6111747	no	
009_biodiesel_palmoil	upstream emissions	liter	2.6112528	no	
010_fossile-oil_lite	incl. upstream emissions, efficiency = 100%	liter	2.6671648	no	
011_natural-gas_cooking	incl. upstream emissions, efficiency = 100%	kWh	0.2816262	no	
012_natural-gas_heating	incl. upstream emissions, efficiency = 100%	kWh	0.2519	no	

Fuel list GEMIS_short - General Comments and Explanations:
All data from GEMIS 4.2 and GEMIS 4.5 (see www.gemis.de).
Upstream fuel emissions (besides electricity) are based on Germany
Electricity mixes for all countries include upstream emissions (incl. respectively excl. grid losses)
Provided information reflects CO2eq, wherever feasible.

Fuel list Defra_short - General Comments and Explanations:
All data from "2010 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting", Version 1.2.1 FINAL.
Please see the further comments in that document on specific fuels as referred to here.
"Net" and "Gross" refer to emission factors calculated on a Net (Gross) Calorific Value basis.
CO2eq and include Scope 3 emissions

Note: CO₂ emission factors for different fuels are only indicative and can vary considerably from country to country, and depending on usage.

The GEMIS and Defra lists provided reflect (respectively) German and UK conditions. You may find lists more suited to your country. GEMIS, however, also provides data for electricity for all EU countries, based on the national electricity mixes. For both the GEMIS and the Defra lists, a short list including only the most relevant fuels are also available. For products only using electricity you might want to restrict the fuel list to one single option, which reflects your local electricity supply.

For this, just copy and paste the relevant option to one of the CUSTOM lists and choose the list in the orange cell.

² For more information check the SMART SPP report on Existing approaches to encourage innovation through procurement http://www.iclei-europe.org/fileadmin/template/projects/smart_spp/files/SMART_SPP_D2.2_ExistingProcurementApproaches.pdf, pp. 38.

To create your own fuel list, you can enter data in one of the **CUSTOM columns** (from column X onwards). To input data you must expand the columns with the **+** button at the top of the sheet to view all input fields. For the fuel names do not use blank spaces or special characters except „_“ and „-“.

Emission Factors

Please select the list of emission factors

Select fuel list with data you want to use for your CO₂ calculations from the drop down menu below
(see also lists further right, where you can also enter custom emission factors for your specific

GEMIS_long

>>> BACK TO GENERAL SHEET

	Comment / Explanation	Unit	kg CO ₂ /unit Electricity?
GEMIS_long			
000_FUEL_TYPES	Upstream fuel emissions are based on Germany		
001_wood-pellets	upstream emissions	kg	0.05992301 no
002_wood-chips	upstream emissions	kg	0.02302157 no
003_bioethanol	upstream emissions	liter	1.51718593 no
004_biodiesel_rapeseed	upstream emissions	liter	2.61794171 no
005_biodiesel_rapeseed_organ	upstream emissions	liter	2.61794171 no
006_biodiesel_rapemethyleste	upstream emissions	liter	2.61115468 no
007_biodiesel_sunflowerseed	upstream emissions	liter	2.61277117 no
008_biodiesel_soymethylester	upstream emissions	liter	2.61117469 no
009_biodiesel_palmoil	upstream emissions	liter	2.61125278 no
010_fossile-oil_lte	incl upstream emissions, efficiency > 100%	liter	2.66716485 no
011_natural-gas_cooking	incl upstream emissions, efficiency > 100%	kWh	0.28162617 no
012_natural-gas_heating	incl upstream emissions, efficiency = 100%	kWh	0.2519 no

Fuel list CUSTOM 1 - General Comments and Explanations:
Fuel names may not include blanks or special characters besides „_“ and „-“

Fuel list CUSTOM 2 - General Comments and Explanations:
Fuel names may not include blanks or special characters besides „_“ and „-“

After choosing the Emission Factor list, go back to the **GENERAL sheet** by clicking on the button.

STEP 2: PRODUCT INFORMATION FROM THE COMPANIES

Step 2.1 General information

Once the previous information has been introduced, you will need mainly information from companies. You may either ask them to input the data directly into the tool, or send them a document outlining the information you require from them. The first part is the following general information to include in the **GENERAL sheet**:

Information to be specified by the supplier		Product A Lamp_Inst.A	Product B Lamp_Inst.B	Product C	Product D	Product E
Product Offers						
Personal offer ID						
Number of units to be purchased/leased		20	20			
Lifespan	[#] [years]			20	20	

In our lighting example in the first column (Product A) the data from the present situation has been introduced. The second column (Product B) represents one alternative to the present product.

S. **Personal offer ID:** Give a short (max. 12 letters) name for the offers of each company that will be shown in the diagrams sheet to better compare offers (*ie. Lamp_Inst.A and Lamp_Inst.B*). If one offer consists of different products, companies should enter the information in neighbouring columns.

Note: If one offer consists of different products you will need to combine the LCC and/or CO₂ results manually in order to give the totals – the tool cannot do this for you.

S. **Number of units to purchase:** Enter the number of product units which are needed in order to meet the total requirements of the tender. *For example 20 light posts and luminaires for the street lighting installation or 12 for the purchase of 12 hybrid buses.*

S. **Lifespan^{LCC}:** Enter the estimated time in years for which the product will be usable (note: 14 months is equivalent to 1.2 years). This may also depend on the amount which the product is used. In order to provide that information, the **CA** should define in the tender how many hours the installation will be in operation. Based on this the **S.** will be able to calculate the lifespan of their product. Sometimes it might be difficult to estimate the lifespan, especially when considering innovative products, and if not enough experience or proof regarding their durability exists. In this case, the warranty provided by the **S.** could be used as the minimum lifespan. However, warranties for innovative products are usually relatively low (mostly two years). Hence, the **CA** may enter into a negotiation with the **S.** in order to be granted an extended warranty with extra costs (that will have to be taken into account in the LCC calculation). *In our example, the lifespan of the lighting installation refers to the posts and luminaires, estimated in 20 years for both products. Components that need frequent change, such as the lamps, are considered in the maintenance section.*

Step 2.2 Acquisition costs

Life-cycle Costing (LCC) Information Input					
Discount rate	[%]	3.8	Inflation rate	[%]	2
Acquisition Costs					
Purchase price	[EUR/unit]	800.00	800.00		
or <i>Specify annual investment costs >></i>		[Click to specify]	[Click to specify]	[Click to specify]	[Click to specify]
Installation costs for all units	[EUR]	7,000.00	7,000.00		
Initial one-off costs	[EUR]	10,000.00	10,000.00		

Acquisition costs include the following:

S. **Purchase price^{LCC}:** By unit, including procurement taxes if applicable.

S. *If our street lighting installation consists of 20 posts and luminaires, the total price for those elements will be divided by 20 to have the costs per unit.*

S. **Annual investments costs^{LCC}:** When you know that investments are necessary during the planning horizon and therefore no single purchasing price can be given, you will have to specify investment costs annually. Due to the formula in the tool, if you choose this option, remnant/end-of-life costs won't be calculated automatically. Therefore you will have to add them yourself in the annual investment costs (in negative or positive value respectively). We also recommend to include here the installation and other initial costs.

S. **Installation costs^{LCC}:** This is for the whole installation and does not depend on the number of units to be installed.

S. **Initial one-off costs^{LCC}:** This refers to one-off, non-repeating initial costs (for things such as training, communication, etc.). This excludes the purchase and installation costs. These costs are normally independent from the number of units and from the lifespan of the product. The **CA** should specify in the tender whether this is necessary or not or leave it up to the bidders.

Step 2.3 Operation costs

Operation costs can be provided as an aggregated value in the GENERAL Worksheet or also be detailed in the specific (OPERATION) worksheet accessed through the light orange button.



Note: If you also want to calculate CO₂ emissions, you will have to provide detailed information through the specific (OPERATION) worksheet.

If the product can be operated in different ways which affect energy consumption (that is, different operation modes) these should be clearly defined in the tender/description provided by the CA so that bidders can adapt the information they provide accordingly.

If the S is given the tool to complete, then short names for the different operation modes can be included beforehand in the tool in the (OPERATION) worksheet.

For example, for streetlights: full and reduced power with indication of annual hours for the respective operation modes. For vehicles: annual km within a city and on long-distance trips.

For each operation mode, the tool allows also for specifying different fuels, which might be relevant e.g. for multi-fuel vehicles or for heating and cooling. Alternatively suppliers may be left to define the different operating modes for their solution, together with the likely usage pattern. In this case they should be asked to provide a justification for their calculations with supporting evidence where possible.

In the specific (OPERATION) sheet a supplier (or the contracting authority if this is defined beforehand) can enter information for up to five different fuels or different operation modes for the product.

For "Energy source/op. mode 2 to 5", expand the respective rows by clicking on the + button on the left side of the sheet.

Note: The wording of these elements is so abstract because each solution may function with different energy sources such as litres of fuel, kWh for electricity, etc. and with different reference units such as km, hours, etc.

For each energy source or operation mode you have to specify:

S. **Energy source/op mode 1:** Choose the respective energy source for this operation mode from the drop down list of the orange cells.

S. **Specify operation mode:** Give an indicative name, e.g. "full power", "reduced power" etc.

CA. **Cost of the energy source^{LCC}:** The cost by energy unit (i.e. Euros/kWh). Check that this is consistent with the energy unit, which is automatically entered after choosing the energy source.

CA. **Energy type specific inflation rate^{LCC}:** Considering the inflation rate is especially important for products with a high energy/water demand and/or in case of a long planning horizon; you should introduce the specific price increase for electricity and other fuels and water (provided by your national statistics). For all other operation materials the general inflation rate is applied. The energy type specific inflation rate should be the average data (i.e. average for the last five or ten years) in order to suppress cyclical economic effects.

S. **Reference unit for consumption:** i.e. per hour, km, etc.

Personal offer ID:	Product A	Product B
Energy source / op. mode 1	037_DE_electricity-mix_incl-grid	037_DE_electricity-mix_incl-grid
Energy unit (= en. unit)	kWh	kWh
Emission factor	0.6754	0.6754
Specify operation mode	Full power	Full power
Costs of energy source per en. unit	0.12	0.12
Price increase rate (energy type specific inflation rate) electricity?	3	3
Reference operational unit for consumption	yes	yes
Units of energy consumption per reference operational unit	h	h
	kWh / h	kWh / h
Specific consumption (i.e. nr. of units of energy consumption per reference consumption unit)	en. unit / ref. cons. unit	0.142
Reference units per year	h / year	0.044
Average nr. of reference units per year	ref. units / year	2281.25
	h / year	2281.25

S. **Number of units of energy consumption per reference consumption unit:** Indicate how much energy the product consumes in terms of the reference unit you gave above (i.e. energy consumption of 0.142 kWh/hour).

Please note that the energy consumption must be measured in the energy unit which is automatically chosen for the energy source.

S. **Average number of reference units per year:** That is to say, how many operation hours, km, etc. or any other specified reference unit the product works in that operation mode and/or with the specified energy source within one year.

If the product consumes also water or requires other annual operation costs, the S. can also provide the information in this sheet. In the example, also information has been provided for the energy mode „Reduced power“.

After entering all the information, click on the light orange button to go back to the GENERAL sheet.

Step 2.4 Maintenance costs

For this section data can also be given as a single global figure (in the GENERAL sheet), or can be further detailed through the link in the light orange button.

Maintenance Costs			
Total maintenance costs per year <i>or Specify detailed maintenance costs >></i>	[EUR/unit/year]	[Click to specify]	[Click to specify]

When maintenance costs are specified in the (MAINTENANCE) sheet, bidders will have to provide the following data:

	Product A	Product B
Personal offer ID:	Lamp_Inst.A	Lamp_Inst.B
Annual fixed rate for maintenance for the specific product: put in here the Price per year	[EUR/unit/year]	100 100
Maintenance Flat Rate Prices		100 100
Spare Part 1 (SP1) or other maintenance task	C	
Durability spare part / maintenance frequency	[Year]	2.3 3.2
Price for new spare part / maintenance	[EUR]	5 7.5
Annual Average Replacement Costs SP1	[EUR/unit/year]	2.173913043 2.34375

S. **Annual fixed rate for maintenance:** *In our example, 100 EUR per lighting post and year.* This parameter may or may not include the cost of the spare parts, therefore the CA will have to specify that in the tender.

S. **Spare part 1 (up to 5):** If costs for spare parts are not included in the annual fixed rate, you need to specify the durability of the spare part and its price in order to calculate how many spare parts will be necessary during the planning horizon. *In our example, the lamps' lifespan depends, among other, on the time and intensity the installation is working. In order to provide that information, the CA should define how many hours in total the installation will be in operation (this is also necessary for the operation costs) and afterwards the S. will be able to calculate the lifespan in years of their products. If a lamp has a lifespan of 8.000 hours and the installation will be in operation 3.500 hours/year, the lifespan will be 2.3 years. If the luminaire contains 3 identical lamps, you will have to multiply the "price for new spare" part by 3.*

S. **Other maintenance costs per unit regarding the whole product:** If there are other maintenance costs for the whole product (not spare parts) additional to the annual fixed rate by unit.

Step 2.5 Annual taxes/fees or other annual costs

Other Costs

Annual taxes / fees / subsidies or other costs



[EUR/unit/year]

CA. Include the costs in annual taxes as well as other annual fees or subsidies of the product for the **CA.** Initial tax payments such as *matriculation taxes for vehicles* should instead be included in the purchasing price. All costs (taxes and fees) will be included in positive value. Subsidies, as they reduce the total costs of the product will need to be deducted from the total cost, therefore in negative value.

Step 2.6 Remnant value or end-of-life costs

At the end of the planning horizon the products may either be:

- Out of service and require disposal in the correct manner, or
- Still usable and have a value.

In the first case, the product may have an extra cost, which should be added in the LCC calculations.

In the second case you could decide to sell, in which case it will provide you with some money (the remnant value) which should be deducted to the LCC calculation.

Remnant Value / End-of-Life Costs

Remnant value / End-of-life-costs



[EUR/unit]

CA. **Remnant value or end-of-life costs** ^{LCC}: Estimate the remnant value or disposal cost of the product and add it to the tool as a negative or positive value respectively. If the planning horizon is twice or more as long as the lifespan, the remnant/disposal costs will be included in the LCC calculation as many times as the product is renewed. If no costs or benefits are derived from the product, leave the cells blank.

Step 2.7 CO₂ specific information

S. Emissions Use phase CO₂: The tool allows you to directly enter CO₂ emissions from the use phase in the GENERAL sheet. This might be appropriate if you are in a very early planning stage and are only using "target values" for comparison or if you are comparing readily available pre-calculated values (this applies also for costs aspects).

CO₂-specific Information Input			
<i>All figures you enter will be treated cumulatively</i>		Product A	Product B
Total embedded emissions	[kg CO ₂ /unit]	[Click to specify]	[Click to specify]
<i>or Specify detailed embedded emissions >></i>			
Annual emissions: use phase	[kg CO ₂ /year/unit]		
Thereof emissions from electricity supply	[kg CO ₂ /year/unit]		
<i>or Specify detailed annual emissions >></i>			
specified emissions in use phase	[kg CO ₂ /year/unit]	219	68
specified emissions (el) use phase	[kg CO ₂ /year/unit]	219	68

Mostly, a more differentiated specification should be made based on actual energy consumption information. For this, follow the link in the light orange cell that will take you to the (OPERATION) sheet.

S. Embedded emissions CO₂: In addition to the CO₂ emissions relating to energy consumption during use, products also contain embedded emissions. Most CO₂ monitoring schemes and targets of public authorities and other institutions only refer to emissions due to energy consumption in the use phase. For many products (particularly non-energy using products) such emissions may be of high relevance for evaluation of the overall climate effects.

These emissions may also be included within the tool (provided the information is reliable) and will be added automatically to the global emission figure:

		C	Product A	Product B
Personal offer ID:			Lamp_Inst.A	Lamp_Inst.B
<i>All entered values will be treated cumulatively</i>				
Absolute figures for embedded emissions				
Embedded emissions by production	kg CO ₂ /unit			
Embedded emissions by transportation	kg CO ₂ /unit			
Embedded emissions by installation	kg CO ₂ /unit			
Embedded emissions by disposal	kg CO ₂ /unit			
TOTAL	kg CO ₂ /unit	0	0	

Note: Where you wish to include information on the embedded emissions of products, it needs to be ensured that any data submitted by suppliers is based on sound life-cycle assessment (LCA). In tendering it is important to very clearly specify whether such information shall be given or not, and if so, make a very clear reference to both the methodical conditions and the scope (system boundaries) of considered upstream and downstream effects which you want to have included. It is advised only to do this with the support of LCA experts. The complexity of a full LCA can not be addressed with the LCC-CO₂ tool provided, therefore this tool only allows for the inclusion of previously calculated aggregated data on embedded emissions.

Further information on LCA data can be found here: <http://lca.jrc.ec.europa.eu/lcainfohub/directory.vm>

STEP 3: RESULTS

Once all data from the different solutions (and, if possible, from the present situation) has been compiled you will need to introduce them in the tool. Give each offer a short name and a separate column (Product A, Product B, Product C,...). Then paste into the corresponding cells the information provided by companies in the corresponding white cells. Make sure that you fill in the columns continuously from left to right without leaving a column free.

Once all solutions are entered you will be able to see the final results and compare offers.

The key LCC results – total costs per planning horizon and year- are shown in lines 70 and 71 of the GENERAL sheet. You can view more detailed and specific results (total costs for 25 years and per unit) by clicking on the expansion button left of the sheet.

LCC Results, in net present value			
<< Click expansion buttons [+] on the left to show more results			
Total cost in present net value [after 3 years] per offer	[EUR]	41,314	39,743
Average annual costs per offer	[EUR/year]	8,388	7,864

In order for you to see the LCC results graphically, click on the light orange button that will take you to the LCC_DIAGRAMS sheet. The main formulas used for the calculation of LCC results are provided in the sheet LCC_FORMULAS.

Be aware though that in order to see well the differences, you will only be able to compare 5 products at a time. To choose them you will have to select them by specifying them in the orange cells.



The CO₂ key results are given in lines 109 and 110 of the GENERAL sheet. You can view more detailed and specific results by clicking on the expansion button left of the sheet.

CO₂-specific Information Input		Product A	Product B
<i>All figures you enter will be treated cumulatively</i>			
Total embedded emissions	[kg CO ₂ /unit]		
<i>or Specify detailed embedded emissions >></i>			
Annual emissions: use phase	[kg CO ₂ /year/unit]		
Thereof emissions from electricity supply	[kg CO ₂ /year/unit]		
<i>or Specify detailed annual emissions >></i>			
specified emissions in use phase	[kg CO ₂ /year/unit]	219	68
specified emissions (el) use phase	[kg CO ₂ /year/unit]	219	68

CO₂ Results: Key Figures			
Average annual emissions per offer	C [kg CO ₂ /year/offer]	4,376	1,356
Total emissions per offer	[kg CO ₂ /offer]	13,127	4,067

Emissions are distinguished between overall emissions and emissions deriving from electricity consumption. This is NOT relevant within the tendering process. This distinction is of relevance for monitoring and using the figures for the municipal carbon accounting – many carbon accounting standards do distinguish between emissions from your own combustion and emissions which occur when generating the electricity for your supply. For this purpose, the tool provides you with the figures readily available.

You can view diagrams showing the results by clicking on the light orange button that will take you to the CO₂_DIAGRAMS sheet. Again, more graphics are available when clicking the expansion button on the **left** side of the sheet. The main formulas used for the calculation of CO₂ results are provided in the sheet CO₂_formulas.

Attention! If the offers consist of several elements, you won't be able to see the aggregated graphical representation of the results, but you will have to combine them yourself.

STEP 4: TENDERS EVALUATION AND AWARD OF THE CONTRACT

Within the sheet TENDERS EVALUATION this tool also allows you to compare the different proposed solutions and to identify the **economically most advantageous offer**. This includes considering the LCC and the CO₂ emissions both calculated in the GENERAL sheet. Tailored to the needs of your tender, you can also include additional award criteria, such as quality of service, aesthetics and other environmental criteria. This flexible sheet offers you both the option of exporting the results for use in your own tender evaluation matrixes and systems as well as importing results from those into this tool.

Please, note that all award criteria must be linked to the subject matter. It is recommended to make specific reference to LCC and CO₂ emissions criteria in the subject matter of the tender, for example using key phrases such as “taking into account life-cycle costs” and “reduced CO₂ emissions”. The inclusion of operational lifetime costs of energy consumption and CO₂-emissions as award criteria in the procurement process is legally sound. Please refer to the case of road transport vehicles regulated in Directive 2009/33/EC. A problem can arise for contracting authorities in the absence of such regulated calculation methods and financial assessment criteria as in Directive 2009/33/EC, as the inclusion of external costs is then legally possible but the contracting authority may encounter implementation problems. This LCC- CO₂ -Tool attempts to support the implementation of LCC and CO₂-emissions in the award phase of the tender.

Therefore, while awarding the contract referring to LCC calculations you must ensure not to assess criteria, for example, on maintenance or energy performance twice (that is, both in the technical specifications and in the award criteria).

To use the sheet TENDERS EVALUATION, you will need to specify the following:

- All compulsory technical specifications have been met (confirming with either “yes” or “no”). Please note, that all offers not meeting the compulsory specifications will be automatically excluded by the tool;
- Award criteria (including sub-criteria), the maximum possible points for each of those and the points that the different offers obtain in each criterion. The proposed standard formula applied to distribute points for the award criteria is arithmetic progression between the lowest offer and the rest. This formula has been verified by the Court of Justice of the European Communities in its ruling in the ‘Concordia’ case (Case from 17. 9. 2002 - C-513/99 - Concordia Bus Finland Oy Ab).

Specifically, the points for the LCC (and CO₂ emissions) criteria are given using the following formula: (Lowest costs (CO₂ emissions) of all products/costs (CO₂ emissions of the specific product) multiplied by 100.

The points for all other award criteria are given using the following formula: (points of the specific product/maximum possible points for this category) multiplied by 100.

The weighting factors of each of the award criteria defined in the section “Weighting of award criteria”. Make sure that the total is not higher than 100%. Please include your specific weighting according to the used award criteria and relevance for the specific tender.

If you want to take LCC and CO₂ emissions into account by applying another method than proposed by the default calculation (see above formulas multiplied by the assigned weighting factor in %), you can also

- Copy LCC and/or CO₂ values as separate award category
- Treat LCC and/or CO₂ values as any other criterion or define your own calculation method. The sheet supports you with this, providing all the calculation results and blank fields in the section “Overall Evaluation Results (alternative method)”. You can also use those fields if the offers consist of several elements.

Tenders Evaluation

Compulsory Technical Specifications

Product ID

Have all compulsory requirements been met (Yes/No)?*Every offer has to comply with the compulsory criteria of the tender. Every offer that does not comply will be automatically eliminated.*

Product A	Product B
Lamp_Inst.A	Lamp_Inst.B
Yes	Yes

Award Criteria

Award criteria	Max. Points	Product A	Product B
LCC results [EUR]	41,314	39,743	
CO ₂ results [kg CO ₂]	13,127	4,067	
Award category 1	0	0	0
Award category 2	0	0	0
Award category 3	0	0	0
Award category 4	0	0	0
Award category 5	0	0	0
Special case: LCC results, including CO ₂ cost	not specified	not specified	

<< Click expansion button left to view more diagrams on CO₂ results.

Weighting of award criteria:

Costs (LCC) criterion

Share (%)

80%

CO₂ emissions criterion

20%

Evaluation Results

Unweighted Evaluation Results (LCC/CO₂):

Product A Product B

Product A Product B

Lamp_Inst.A Lamp_Inst.B

Yes Yes

83.15 100.00

2 1

Overall Evaluation Results (default calc. method)

C

Have all compulsory requirements been met?

C

Which is the total points for each offer?

Ranking of the offers (number 1 is the economically most advantageous offer)

Overall Evaluation Results (alternative method)

C

Product A Product B

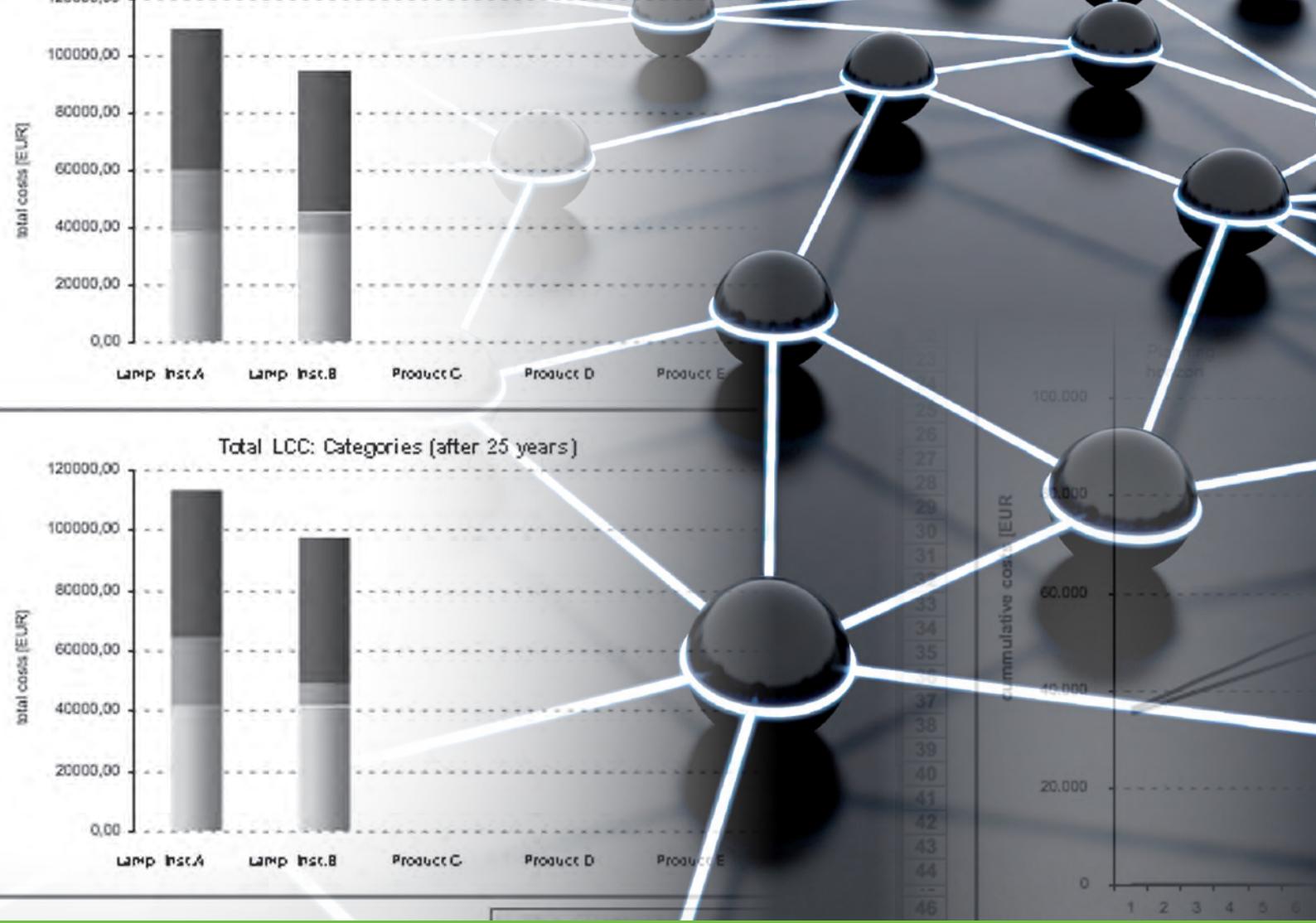
Lamp_Inst.A Lamp_Inst.B

Particularly upon request from UK stakeholders, the tool also offers you the option of assigning a monetary value to CO₂. In this case, the CO₂ cost will be included in the LCC following the default calculation method outlined above.

By using the default calculation method, the tool automatically calculates the economically most advantageous offer and highlights it in green.

→ We hope that everything is clear now and wish you a successful innovative procurement process!





SMART SPP – innovation through sustainable procurement

Running from September 2008 until August 2011 “SMART SPP - innovation through sustainable procurement” is a three year project which promotes the introduction of new, innovative low carbon emission technologies and integrated solutions onto the European market. This is being done through encouraging early market engagement between public authority procurers and suppliers and developers of new innovative products and services in the pre-procurement phase of public tendering.

SMART SPP is an initiative of the Procura⁺ Campaign, run by ICLEI – Local Governments for Sustainability and designed to help support public authorities across Europe in implementing Sustainable Procurement and help promote their achievements. For more information visit www.procuraplus.org

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