

User Guide to the
Life Cycle Costing Tool
for Green Public Procurement of
Computers and Monitors



The LCC Tool for Computers and Monitors

What is the LCC tool for?

The purpose of the tool is to encourage and facilitate the wide application of life cycle costing (LCC) among public authorities in the European Union, so that organisations can make more cost-effective decisions in their procurement processes for computers and monitors.

Purchasing price is only a small fraction of all costs of any given product or service. Calculating life cycle costs allows you to be aware of future expenditure and select more cost-effective solutions. To do so, the LCC tool allows you to consider:

- **Initial acquisition costs** (purchase and installation),
- **Operating and maintenance costs** (especially energy given that computers are energy consuming products with considerable operating costs),
- **Other costs** (such as residual value), and
- **Costs of environmental externalities**, namely those associated with climate change/CO₂ emissions due to the energy consumption during their operation.

This guide provides you with the key aspects to consider when using LCC in public procurement, especially during the preparatory and tendering stages, and introduces briefly the main sections and elements of the LCC tool itself.

Who is this tool intended for?

The LCC tool has been developed for procurement practitioners in public organisations in the European Union. It is designed for procurement both below and above the thresholds for application of the EU procurement directives ([Directives 2014/24/EU on public procurement](#) and [2014/25/EU on procurement by entities operating in the water, energy, transport and postal services sectors](#)). However, it can also be used by private sector purchasers and even the general public.

For which products can this tool be used?

This user guide contains the basic information to start using LCC in the procurement of computers and monitors, specifically the following products as defined in the [EU GPP Criteria for computers and monitors](#):

- **Desktop computers** incl. Integrated Desktop Computers and Thin Clients.
- **Portable computers**: Notebooks, Two-In-One Notebook, Tablets, Portable Thin Client and Portable All-In-One Computer.
- **Computer monitors**.

The tool does not cover workstations or small-scale servers.

When to use the tool?

The tool has been designed to be used during tendering processes. However, that is not the only stage in a procurement process when it can be applied. You can use the tool:

BEFORE TENDERING

To assess the LCC of the current situation and roughly evaluate different solutions to help guide pre-tendering market engagement activities, or to narrow down different technological solutions.

DURING TENDERING

To compare offers during the evaluation and award of contracts, as foreseen in [Directives 2014/24/EU on public procurement](#) and [2014/25/EU on procurement by entities operating in the water, energy, transport and postal services sectors](#).

AFTER TENDERING

To evaluate the performance of the awarded solution in comparison to the previous situation or other offers, to monitor and communicate results and help prepare future tenders.

I. Prior to the tendering process

Before starting the tendering process, it is important to know what your real IT needs are, what solutions exist to cover them and which have lower life cycle costs. To do so you need to involve internal stakeholders and consult with the market.

Not all cost drivers are easily included in LCC; you should be aware of that and decide which elements to include in the LCC and which to consider separately as additional criteria, to select the best solution for your needs and for the environment.

Determine your needs

An organisation's need in relation to computers is not the computers themselves but the capacity to process data, exchange information, etc. Each work position has different needs, so prior to a tendering process, it is important to clarify what needs and requirements each post has and what other needs exist, to better define the specifications for possible solutions.

For example, overspecifying -e.g. asking for a too powerful machine for what is needed- can produce unnecessary costs. Underspecifying -e.g. asking for a computer with limited performance- causes work inefficiencies that will have also negative consequences such as an earlier need for upgrade or replacement of the equipment.

Identify solutions for those needs

There are many options to cover your needs in a cost-effective manner when you take your time to evaluate the options instead of just tendering by inertia based on what you previously did. Consultation with internal stakeholders and the market is key.

Do we really need to acquire new products?

Consider whether you can extend the life of all or part of your existing computers by upgrading them (e.g. increasing their RAM, investing in cloud storage, re-installing the operating system, streamlining software, etc.) and, if needed, relocating them to work posts with lower computing needs.

Are desktop computers the only solution?

For most of your needs a laptop can perform as well as a desktop computer, but with a lower energy consumption and greater flexibility (for trips, meetings, etc.).

Thin Clients also have smaller environmental impacts and costs compared to desktops, especially when considering software licenses, maintenance and lifespan of the equipment (see *Fraunhofer Institute (2008)*).

Environmental Comparison of the Relevance of PC and Thin Client Desktop Equipment for the Climate).

Do we need more than just equipment?

Consider whether to just buy equipment through a supply contract or to choose a leasing or other mixed contract if you require ongoing services. Clauses for the upgrade and reuse of equipment could be included if no in-house services are available; and other types of innovation such as energy efficiency audits could also be fostered.

Identify relevant cost drivers and parameters

Different solutions have different costs throughout their life cycle, analysing the expenses and organisational changes of each of them at this preliminary stage will help you have the full costs picture and unveil “hidden” costs to better evaluate alternatives from an economic point of view.

Some cost drivers can be easily included in LCC calculations, such as energy consumption. Others -such as durability, robustness or higher performance aspects- might be relevant from an economic point of view but are more difficult to quantify in terms of how much they increase the product’s lifespan. Consider such aspects at the start and use them to define tender specifications (more in section II).

When identifying cost drivers, make sure to provide clear and objective definitions and refer to industry-acknowledged standards to facilitate acceptance of the process and the provision of data by bidders (the [EU GPP](#) and [Ecolabel criteria](#) can be a good starting point for this). If you are unsure about any of them, use the consultation with internal stakeholders and/or the market to find out.

In addition to the cost drivers, you will also need to define the basic parameters for the LCC (evaluation period, discount rate, your electricity cost, etc.). Ask your internal stakeholders for that information.

LCC evaluation period

To calculate life cycle costs, it is necessary to define the expected lifespan of the product or solution to be acquired, based on which the calculations will be done. Selecting the appropriate LCC evaluation period is key to obtaining meaningful results.

If you are purchasing computers and monitors, the LCC evaluation period should be the average life expectancy of such products in your organisation.

If you are acquiring the IT equipment through a leasing contract and you do not plan on buying them at the end of the contract, the LCC evaluation period would be the duration of the contract, given that at the end of such contract, you will replace the equipment through a new contract.

Consult with relevant parties

It is important to involve and enter into dialogue with other departments of your organisation, end-users and suppliers in this process.

Internal departments can help identify and prioritise cost drivers and define the parameters for the LCC calculations (i.e. usage patterns, appropriate discount rate, electricity cost and CO₂ emissions from your energy contract if you include externalities, etc.).

Users will be able to identify any real needs and concerns in changing systems, for example how certain products might affect work procedures.

Suppliers will be helpful in identifying the product types and solutions on the market, determining how to best meet your needs, and especially the type of information and standards available for the different cost drivers and parameters you want to consider in your procurement. Consulting with suppliers in advance also helps to ensure their acceptance of the use of LCC in the call for tenders.

Use all of this information in your decision process to select the type of solution you want, the criteria to consider and how LCC will be used in the tendering process.

Data needed from other departments and units

Before using the LCC tool for procurement you must liaise with other departments or units within your organisation in order to gather all data needed for the LCC tool, as not all of it will be automatically available to you. In some cases, you may also need to consult other public sector bodies.

For example, if you are a government agency operating in a building managed by the central government, you might need to identify the person in charge of the electricity supply contract to obtain the information on the cost of electricity (to be able to calculate operational costs) and associated CO₂ emissions of your electricity (if you plan to include the associated externalities in the LCC calculation).

Using LCC prior to tendering process

The LCC tool can be used at this stage to help you select the type of solution to purchase, by comparing different solutions, in different columns of the tool, using preliminary data gathered in the consultation process.

II. How to use LCC during the tendering process

If in your tendering process you plan to use life cycle costs instead of pure acquisition price to evaluate economic offers, state it clearly in the tender documents, provide the LCC Tool with the common parameters to ensure transparency, ask for the data that you need for the LCC calculations and make sure to provide clear definitions and standards to ensure the comparability of offers.

Reflect on what additional environmental criteria to consider, to select the best solution, from an economic and environmental point of view.

Decide your LCC parameters

The LCC Tool has been designed to allow you to consider different cost categories and, at a preliminary stage, it is important to have the full costs picture for better planning. However, you do not need to include all these categories in the tendering process if there is a good reason to exclude them. If a cost driver is difficult to quantify and no reference standard exist, you may choose to exclude it from the LCC but use it as a technical specification, award criterion or contract clause instead (see below).

Define it clearly in the tender documents

Be transparent on how you will evaluate the offer, especially on how the economic offer will be evaluated and then weighed against other award criteria. Inform bidders in the tender documents that you will evaluate the economic offer using a life-cycle costing approach and include the LCC tool to be transparent and simplify explanations. The tool should include the parameters defined by the contracting authority for the LCC calculations (section A).

For each parameter, define in the tender documents exactly what is included and, if relevant, what standard they have to comply with, to obtain comparable offers.

Cost drivers included in the LCC tool and used to evaluate the economic offers in the contract award	Other aspects to include in the tender as technical specifications, award criteria or contract clauses
<ul style="list-style-type: none"> • Acquisition costs • Delivery and installation costs • Maintenance/service costs • Operation costs (Energy consumption) ← • Fees, taxes and other costs • Externalities (CO₂ emissions linked to energy consumption) 	<ul style="list-style-type: none"> • Service requirements • Technical specifications of the products (hardware and software) • Minimum energy efficiency (lower energy consumption is evaluated as part of the LCC operation costs linked to energy consumption) • Other environmental criteria (e.g. noise levels, exclusion of toxic substances, recyclability, durability) • Packaging and end of life management, etc.

Note: Based on [Directive 2012/19/EU on waste electrical and electronic equipment \(WEEE\)](#), producers are responsible for financing the collection, treatment, recovery and environmentally sound disposal of electric and electronic waste. It is assumed that all products include, in their purchase price, those waste management costs and, therefore no end of life costs have been included in the tool.

II. How to use LCC during the tendering process

The standard for energy consumption

The EU GPP Criteria for computers and monitors require that all equipment comply with the energy requirements of the latest version of the Energy Star standard (currently version 6.1 for computers and 7.1 for monitors). This is the most widely available standard in the sector for energy efficiency and given that it is an international market, its use is deemed still relevant even though the agreement to coordinate energy labelling of office equipment between the EU and the US Government has expired.

In a green procurement where you plan to use LCC to evaluate the economic offer, you should specify in the tender documents that all equipment must comply with the energy requirements of the Energy Star standard and require bidders to provide the annual energy consumption of the equipment (E_{TEC} value) or the power requirements in off, sleep, long idle and short idle modes as defined in the Energy Star standard, for the calculation of operational costs in the LCC Tool. This way you ensure a minimum energy efficiency and consider lower energy consumption in the award process through LCC.

As a means of proof, bidders may provide the Energy Star certificate or the products' specifications or technical sheet where this information is provided. According to Commission [Regulation \(EU\) n° 617/2013 on ecodesign requirements for computers and computer servers](#), from 1 July 2014 manufacturers have to provide in the technical documentation and make publicly available on free-access websites certain information, including the energy consumption and power requirements mentioned above. You can also find this information in the [Energy Star certified products database](#).

To facilitate data input in the tool, request bidders to present the appropriate information through the "Bidder response sheet" of the tool, making sure that, for each computer and monitor there is a column for the bidders to input their data.

If the tender is divided in lots, you will need to provide a tool for each lot, including the relevant products in each of them.

Bidders have to provide all the required data in order to calculate LCC and be eligible for award the contract. Making suppliers aware of this as part of preliminary market engagement and in the tender documents is important for a successful tender.

Include other environmental criteria

In the LCC Tool energy consumption is included as an operational cost, but you should include additional environmental criteria (e.g. on durability, recyclability, noise, toxicity, etc.) beyond what is considered directly in the LCC to ensure that the acquired products or solutions are environmentally preferable. This is particularly relevant for environmental aspects that affect product lifespan and thus costs, but that are difficult to quantify financially.

Purchase vs Leasing

The tool has been designed so that both purchase and leasing contracts can be evaluated. To allow this, some cost parameters might not be relevant in one or the other case. In the following table we summarise what costs linked to the economic offer should be asked for in each type of contract. Make sure you state this clearly in the tender and in the tool by hiding unnecessary rows.

In a purchase tender

- Acquisition costs
- Installation costs (including delivery and start up)
- Service costs (only if support services are included in the tender)

In a leasing tender

- Service costs (this should include all the costs of the leasing contract including the cost for the equipment, installation and support services defined in the tender)
- Purchase costs at the end of the contract (only if foreseen in the tender)

II. How to use LCC during the tendering process

EU GPP Criteria for computers

Use the EU GPP Criteria for computers and monitors (available in all EU official languages) to identify relevant environmental criteria when buying new IT equipment:

http://ec.europa.eu/environment/gpp/eu_gpp_criteria_en.htm

How to consider quality, performance and durability criteria

Products with higher quality, performance and durability are expected to have a longer useful life. The longer you can use equipment, the later you will need to replace it, thus its life cycle costs will be lower; and so will its environmental impacts in terms of use of resources and waste generation. High quality products can also have a higher resale value, contributing to lower LCC.

However, even though there are standards to test the durability of computers and monitors, such as IEC 60068, there are no standards or agreed references to transform those qualities into expected longer lifespan. For this reason, durability and performance considerations have not been included in the LCC Tool. Nevertheless, these aspects are important for the overall environmental impact of IT equipment and should be included in the tender as technical specifications or award criteria.

Can we define other award criteria linked to energy consumption?

As computers and monitors are energy-consuming products, operation costs based on energy consumption have been included in the LCC Tool.

As energy consumption in usage will be included in the LCC and thus considered as part of the costs award criterion, this should not be duplicated elsewhere in the award criteria. However, it is perfectly possible to combine LCC with technical specifications which set minimum requirements for energy-efficiency, for example those based on Energy Star which are included in the EU GPP criteria. It is also possible to combine LCC with award criteria based on other aspects of environmental performance, such as durability, recyclability and end-of-life considerations.

Should we consider CO₂ externalities in the LCC or as a separate award criterion?

The procurement directives make it clear that LCC can include costs of environmental externalities, as well as costs directly incurred by the owner or user. To do this, it must be possible to determine and verify the cost of the externality - and this is the case for CO₂eq emissions based on energy consumption.

You can choose whether to include the cost of CO₂eq emissions in the LCC, or whether to apply a separate award criterion for it.

If you choose to include them in the tool, the externality cost of CO₂eq emissions will have to be specified. At the EU level, [Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles](#) provided a range between 30-40 EUR/tonne CO₂eq (in 2007 prices). In a more recent report for DG Transport on the “[Update of the Handbook on External Costs of Transport](#)” by Ricardo-AEA from 2014, they propose a central value of 90 EUR/tonne (in 2010 prices) from a range between 48-168 EUR. In some countries, the Government might provide other figures. Therefore, practitioners will need to specify the costs for the climate change externality making sure that the figure they use is in line with the requirements defined in article 68.2 of [Directive 2014/24/EU on public procurement](#). In the tool, it is proposed to use 90 EUR/tonne.

If you apply a separate award criterion based on CO₂eq emissions, you may assign a higher weighting to this than it would have had if considered within the LCC. This approach may make sense if you are particularly concerned about the environmental impact of IT products you purchase.

II. How to use LCC during the tendering process

Establish contract clauses

Include penalties in the tender documents in the event that the contractor does not comply with the tender requirements and the products do not conform to the declared information, to keep contractors accountable for their products' performance.

Consider including a clause to provide external test reports on energy consumption for the supplied products based on the standard specified in the tender documents, as real-life consumption will differ from standardised test results.

Evaluate offers

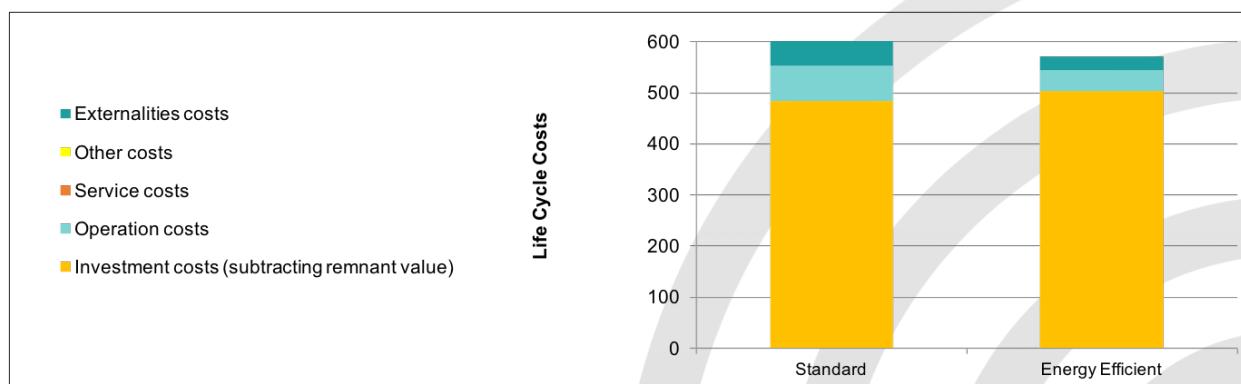
With the information provided in the bids, you can evaluate the economic offers based on the life cycle costs calculated with the LCC Tool.

Each bidder will complete the LCC tool with their information in the "Bidder response sheet" and the LCC tool will calculate the results automatically for each product included in the tool (i.e. by column) and also in total (i.e. by aggregating the results of each column), to have the total LCC for the tender or lot.

Once you have the LCC results for each bid, you will need to calculate the cost score for each bid based on the cost award criterion weighting and formula indicated in the tender documents. By combining this with the other award criteria established in the tender documents, you will be able to select the most economically advantageous tender.

The tool allows you to see the results by product graphically (in the "Graphic results" sheet), but you can use that tab to compare the results of up to 10 different offers too. To do so, copy the answers of each bidder into a single version of the LCC tool.

C. LCC Results (per column and in total)		
Investment costs (acquisition & installation)	490,00	510,00
Service costs	0,00	0,00
Operation costs	68,81	39,45
Other costs	0,00	0,00
Externalities costs	48,26	27,67
Remnant value	-5,40	-5,62
Life cycle cost	601,67	571,50
Energy use	kWh	1200,00
CO2-eq emissions	kg CO ₂ eq	688,00
Total investment costs (acquisition & installation)	1000,00	
Total operation costs	0,00	
Total maintenance and service costs	108,26	
Total other costs	0,00	
Total externalities costs	75,93	
Total remnant value	-11,02	
Total life cycle cost	1173,17	
Total energy use	kWh	1888,00
Total CO2-eq emissions	kg CO ₂ eq	913,37



Steps to complete and use the LCC Tool

1

Decide the cost categories to be included in the LCC and the offers' structure

The tool has been designed to consider different cost categories and options. If for some of them, namely “other costs” you do not have the appropriate data, exclude them from the calculations. Also decide what energy data must be provided to evaluate operational costs due to energy consumption and decide if you will include the environmental externalities or not. Based on those decisions, hide (don’t delete) the unused cost categories.

Also, based on the tender lots structure - e.g. if each lot is for one specific product or if a lot is composed of several products - define how each offer should be presented, so that bidders know where to input their data and how it will be aggregated if several columns of the tool are used for the same offer.

2

Complete Section A (green box) of the LCC Tool with your parameters

The tool will use data provided by the bidder and parameters provided by you, the contracting authority, to calculate life cycle costs. Based on the cost categories decided, fill in section A of the “Inputs and Results” sheet of the tool with your parameters (e.g. evaluation period, discount rate, electricity costs). This will be the basis for the calculations and should be included in the tool provided in the tendering documents, to ensure transparency.

Make sure to protect all sheets of the tool except the “Bidder response sheet”, so that bidders cannot tamper with them accidentally, but can still input their data in the appropriate cells and see their results.

3

Request bidders to complete the “Bidder response sheet” of the tool

In the tender documents, require bidders to present the appropriate information through the “Bidder response sheet” of the tool and to protect that sheet when sending their offers to ensure that no data manipulation can happen during the evaluation process.

The information in this sheet is linked to the “Input & Results sheet” so it is important to keep the provided structure to ensure the correct calculation of LCC results.

4

Use the LCC results to evaluate the cost award criterion

As different formulas and weightings are used by contracting authorities to evaluate costs, the LCC tool does not itself calculate a score for each tender - but provides the cost values to be included in this calculation. Calculate the cost score for each bid based on the LCC results and the cost award criterion weighting and formula indicated in the tender documents.

By combining this with the other award criteria established in the tender documents, you will be able to select the offer with the best overall results.

II. How to use LCC during the tendering process

Tool functions overview

The LCC Tool contains six sheets, but the main one is the “LCC Inputs and Results” where the LCC parameters and information is compiled and results presented.

- 1 As a public authority, you have to complete section A - **green box**.
 - 2 Brief explanations and recommendations are provided in pop-up comments to guide you on the information to be provided in each parameter included in the tool. Hover over the cell to read the comment.
 - 3 Click on the [+] sign at the top to show or hide more product columns and on the left to hide or show certain cost parameters.
 - 4 If not all cost parameters are relevant for your calculations, hide the corresponding lines to avoid inputting data. When relevant, hide them also from the “Bidder response sheet” to ensure coherence. This might be the case in purchasing contracts where no maintenance or services are required or if you decide not to include the environmental externalities.
 - 5 Energy consumption of computers and monitors should be calculated based on the latest Energy Star specifications (as required in the EU GPP Criteria). In some cases, you might want to calculate it based on your own use patterns in each user mode. If so, define that in the tool.
 - 6 Data provided by bidders through the “Bidder response sheet” are automatically copied and shown in section B - **turquoise box**. Click on the [+] sign to show or hide them. Costs and other data to be provided by bidders require appropriate definitions in the tender documents to ensure comparability of offers. Make sure that these are properly included (e.g. the tasks to be included in the service costs or the energy standard for computers and monitors).
 - 7 LCC costs are presented in section C - **black box** - by cost category. The formulas used to calculate the final life cycle costs are explained in the “Definitions and Formulas” tab of the LCC tool. The graphic representation of results is provided in the “Graphic results” tab in the form of a bar chart showing the contribution of each cost category to the total LCC of each product included in the tool.
 - 8 The tool also provides you with the estimated total energy consumption and CO₂ emissions of each product for the duration of the evaluation period.

III. After the tendering process

Monitor compliance with the tender requirements and performance levels promised by the contractor; apply sanctions if needed; identify lessons for future tenders; communicate results to motivate internal acceptance and buy-in and promote replication by other stakeholders.

If LCC was part of the tender

Ensure that your contract explicitly mentions the performance levels included in the bidder response sheet as part of the terms. Monitor performance during contract management to ensure compliance with claims made by contractors - for example in relation to maintenance frequency and costs, if included in the tender, or regarding the energy performance of equipment by testing them according to the standard defined in the tender specifications - and apply sanctions when non-compliance is found (in line with Article 70 of [Directive 2014/24/EU on public procurement](#)).

Use this stage to record relevant information for the next tender (e.g. if there was enough competition, if bidders provided all relevant information in the appropriate way, etc.). This will allow you to improve results in future similar calls for tenders.

If LCC was not included in the tender

If LCC was not used during the tendering process but you requested information for all relevant parameters (especially related to operation and service costs), use the LCC Tool to estimate the life cycle costs of the different offers - including the awarded one - and compare between them and to the current situation, if data was identified in the preparatory stage. This will help you develop a baseline of data to inform contract management and future tenders.

Communicate results

Use all this information to communicate results and plan measures for future tenders. This is especially important if you changed the type of products acquired and the results can help to motivate acceptance, buy-in and further improvements.

If possible, share your experience (successes, draw-backs and lessons) with other authorities to encourage replication. One way to share your results at the European level is through the European Commission's collection of [GPP Good Practices](#), published regularly in the EC [GPP News Alert](#).



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As set out in the Communication "Public Procurement for a Better Environment" (2008), the European Commission is encouraging public authorities to green their purchasing decisions. In this context, life cycle costing is considered as a useful tool that could deliver financial savings as well as reductions in the environmental impact of purchases made by public authorities.

The European Commission would like to facilitate the wide use of LCC by providing tools that can help the application of LCC among public authorities in the European Union and commissioned this work.

For its development, the project team has referred to other existing tools, guidelines and data sources, namely:

- [Technical specifications of the Life cycle costing \(LCC\) calculation tool](#) produced by Studio Fieschi & soci Srl and Scuola Superiore Sant'Anna for the European Commission DG-Environment, under service contract N°070201/2014/692192/SER/ENV.F.1 (July 2016).
- [Tool](#) and [User Guide](#) for Total Cost of Ownership in public procurement-Computers produced by FORCE Technology (in cooperation with Operate A/S and Responsible Procurement Excellence) and updated by Viegand Maagøe A/S for the Danish Environmental Protection Agency (version 3 November 2016).
- For the CO₂eq emissions of national electricity mix: [Thinkstep AG Environmental Footprint datasets](#) -data developed in the framework of the Commission Environmental Footprint pilot phase (2013-2018) and valid until December 2020.

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