

# User Manual

Impact calculator for furniture



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# 1. Introduction

This impact calculator for furniture is intended to be used as a management tool to help public entities obtain an overview of, assess, implement, and evaluate measures to reduce the climate impact of an organization's use of furniture.

This guide describes how to use the calculator, as well as information about the data sources utilized.

The calculator highlights measures that can be implemented to reduce an organization's climate footprint from furniture purchases. There are several kinds of environmental impacts associated with the production of furniture, and there are many measures that can reduce these environmental impacts as well. Example requirements that can be set to reduce environmental impact, reduce content of chemicals and harmful substances, and increase the life expectancy of furniture can be found on [anskaffelser.no](https://anskaffelser.no).

## 2. Impact calculator for furniture

### 2.1. Categories and subcategories

The calculator includes multiple categories of furniture. Categories have been selected based on are included is based on available emissions data and relevancy to the needs of public organizations. We have also prioritized categories where climate footprint reductions are possible through concrete measures.

Some of the furniture categories have associated subcategories that can be selected in the tool. If you do not yet know which subcategory the furniture belongs to, you can also choose the average value for the main categories. All available categories and subcategories are listed in the table below.

Table 2-1: Categories and subcategories available in the tool

Category	Subcategory
Office chair (optional to add armrests and headrests)	Padded with polyester on the seat and back Padded with polyester on the seat Padded with wool on the seat and back Padded with wool on the seat
Meeting room chairs	Metal legs, plastic seat Metal legs, textile seat Metal legs, wooden seat Wood legs, textile seat Wooden chair
Sofa	3-seat, wool 3-seat, polyester 2-seat, wool 2-seat, polyester 1-seat, wool 1-seat, polyester
Lounge chairs	No subcategories
Desk	No subcategories
Meeting room table	Small or medium Large

Room divider	Room divider, wool Room divider, felt Room divider, polyester
Desk divider	Desk divider, wool Desk divider, felt Desk divider, polyester
Cabinets and shelves	No subcategories

### Office chairs



Figure 2-1: Examples of products that are considered office chairs. The image on the left is from NEPD-8212-7877, and the image on the right is from NEPD-7918-7589

The category “Office chairs” includes chairs with five wheeled feet, wheels for hard or soft floors, a gas cylinder for height adjustment, a padded seat, and an optional padded backrest. Figure 2-1 above shows examples of some office chairs. There are several subcategories of office chairs, where the user can select polyester or wool upholstery for either the seat or the seat and the backrest.

### Meeting room chairs



Figure 2-2 Different types of meeting room chairs. From the left, metal legs with a textile seat, metal legs with a wooden seat, metal legs with a plastic seat, wooden legs with a textile seat. From the left, the images are from: NEPD-6833-6143, NEPD-7200-6600, NEPD-5730-5025, NEPD-5944-5221



Figure 2-3: A simple wooden chair. The image is from NEPD-6917-6304

Meeting room chairs are simple chairs that do not rotate and have no height adjustment. They are mainly stackable chairs. The chairs are categorized by material and the figure above shows some example pictures. Some organizations use chairs more similar to office chairs in meeting rooms. If this is a more suitable category for the chairs you are procuring, use the office chair category instead.

## Sofa



Figure 2-4: Example images of sofas. The image to the left is from NEPD-6306-5569

For sofas, there are subcategories for 1-, 2-, and 3-seats. They can be upholstered with both polyester and wool, which is selected in the subcategories. The images in Figure 2-4 show an example of a 3-seat and a 2-seat sofa.

## Lounge chairs



Figure 2-5 Examples of different lounge chairs. The image to the left is from NEPD-7089-6484, the image to the right is from NEPD-5771-5061

Lounge chairs are chairs commonly placed in social zones in offices and schools. Some examples are shown above. We have not distinguished between upholstery types for lounge chairs.

### Desks



Figure 2-6 Examples of desks. The picture to the left is from NEPD-7520-6898; the picture to the right is from NEPD-6279-5540

The desks considered in the calculator all have height adjustable functionality and are typically 160x80cm. The tabletops are typically made of MDF or particleboard coated with laminate. Figure 2-6 shows some examples.

### Meeting room tables



Figure 2-7 Examples of small and medium meeting room tables at left and center; a large meeting room table to the right. The images are taken from (from the left): NEPD-6740-6055, NEPD-7437-6822, NEPD-7536-6917

For meeting room tables, we distinguish between small or medium and large meeting room tables. Small or medium tables are tables up to desk size. Large meeting room tables are commonly dimensioned for 8 people. Meeting room tables are assumed to be fixed, without lift / lower functionality. Some examples are shown in Figure 2-7 above.



### Cabinets and shelves



Figure 2-8 Examples of cabinets and shelves. The images are taken from (from the left): NEPD-5585-4875, NEPD-7535-6918, NEPD-7532-6922

The cabinets and shelves category includes pull-out shelving units, cabinets, and shelves with sliding doors. The cabinets and shelves are typically 90 – 130 cm tall. Some examples are shown in Figure 2-8.

### Room and desk dividers



Figure 2-9: A room divider is shown to the left, and a desk divider to the right. The images are taken from NEPD-7964-7629 and NEPD-5134-4474

For dividers, we distinguish between free standing room dividers upholstered in cloth, and smaller desk dividers / privacy screens that are used as a sound barrier between desks and are attached directly to the desk. We also distinguish between the type of cloth used to upholster the dividers.

## 2.2. Life cycle phases

The calculator is limited to the impacts of greenhouse gas emissions and does not include other environmental impacts.

Not all life cycle phases are included in the calculations. When a product is manufactured, it will generate emissions connected to its production (A1-A3), transport (A4), use (B phase), and end of life (C1-C4). The calculator only considers emissions related to production, a phase often called cradle-to-gate. During the data analysis, we found that the production phase typically accounts for most of the climate footprint of furniture, and it is therefore the cradle-to-gate phase that is included in the calculator.

The climate footprint resulting from the production of furniture (A1-A3) is taken from Environmental Product Declarations (EPDs). In this calculator, only fossil emissions are included. This means the global warming potential (GWP) from biogenic sources and from area use and land use change are excluded. Therefore, only the GWP fossil value from the EPD is used for each piece of furniture.

This means that emissions from transport, emissions associated with use (maintenance), as well as waste treatment at the end of the furniture's lifespan are not included in the calculation.

Emissions from **transport** typically have a relatively modest contribution to the total climate footprint but can be more significant in cases where heavier items are shipped intercontinentally.

Emissions from **maintenance** are negligible as this typically involves only washing the furniture.

**Waste treatment** can have a significant emissions contribution, especially for tabletops. The reason for excluding this phase is that there is significant uncertainty in what will happen in the future (when the furniture is disposed of), and it is highly dependent on the choices of the owner of the furniture.

## 2.3. Measures

The tool allows for the selection of several measures that can reduce the climate footprint of furniture, but there are additional measures that are not covered by the calculator. For example, reducing the total amount of furniture procured is always better than purchasing furniture, whether it be new or used. That is, it is always better from an environmental standpoint to avoid making a purchase. This is relevant when considering reducing the number of workstations in an

office. Though this calculator only includes climate footprint, there are other environmental impacts that can also be reduced. More information about various measures to reduce environmental impacts can be found on [anskaffelser.no](https://anskaffelser.no).

Table 2-2 summarizes the measures available in the calculator for each category of furniture. The impacts of the following measures are quantified explicitly in the calculator:

- **Internal reuse** encompasses reuse within the organization. For example, existing chairs can be migrated during a moving process, instead of buying new chairs
- **Secondhand purchase.** This encompasses buying products that are refurbished or otherwise prepared for reuse. These are typically used products from furniture providers.
- **Repairs** apply to office chairs, sofas and lounge chairs as well as desks. For the chairs, repair implies reupholstering, while for desks we assume that the tabletop is changed.

Table 2-2 Available measures for each of the categories in the calculator

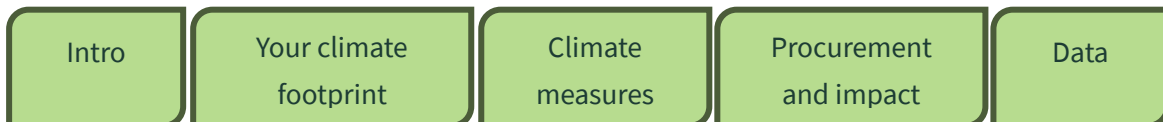
Category	Available measures
Office chair (arm and headrests are optional)	Purchase secondhand Internal reuse Repair (reupholstering)
Meeting room chairs	Purchase secondhand Internal reuse
Sofa	Purchased secondhand Internal reuse Repair (reupholstering)
Lounge chair	Purchase secondhand Internal reuse Repair (reupholstering)
Desks	Purchase secondhand Internal reuse Repair (changing table tops)
Meeting room tables	Purchase secondhand Internal reuse
Room dividers	Purchase secondhand Internal reuse
Desk dividers	Purchase secondhand Internal reuse

Cabinets and shelves	Purchase secondhand Internal reuse
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## 3. User guide

### 3.1. Calculator layout

The impact calculator contains five tabs with different purposes.



**Intro:** Contains a short introduction to the various tabs and how they can be used

**Your climate footprint:** Intended to be used for calculating the climate footprint of the existing furniture currently in use in the organization.

**Climate measures:** Compares the effect of different measures for different categories of furniture. Not all possible measures are included in the calculator, but the included measures are all compared in this tab.

**Procurement and impact:** Allows you to estimate the specific effect of climate measures implemented during or after procurement. The impact is calculated relative to buying all the furniture new.

**Data:** Presents an overview of footprint, expected lifespan, and price data for new furniture. You cannot input your own data here but cost data can be overridden in the “Procurement and Impact” sheet.

### 3.2. Intro

The “Intro” tab presents general information about how the different sheets in the spreadsheet can be used, and what each sheet is useful for.

### 3.3. Your climate footprint

‘Your climate footprint’ can be used for calculating the climate footprint of IT equipment currently in use in your organization. You must fill out the number of employees and the number of categories of IT equipment in use in your organization. You can then see the total emissions

associated with your organization's furniture, per year and per employee. If some categories of furniture aren't relevant for your organization, simply leave them blank.

In the result sections, you can toggle between figures that show:

- Annual climate footprint [kg CO<sub>2</sub>e/year]
- Total climate footprint [kg CO<sub>2</sub>e]
- Estimated annual costs [NOK]

The climate footprint is given in kg CO<sub>2</sub>-equivalents, abbreviated to kg CO<sub>2</sub>e. CO<sub>2</sub>-equivalents are a common method to calculate the impact of greenhouse gas emissions. They take into account the impact of all greenhouse gases and their relative global warming potential. In this calculator, only fossil greenhouse gas emissions are included.

The results also show a set of indicators, which are key numbers that can be used to monitor the progress of your organization's footprint over time. The indicators are:

- Climate footprint for furniture per year [kg CO<sub>2</sub>e/year]
- Climate footprint for furniture per employee [kg CO<sub>2</sub>e/employee]
- Total expenses per year [NOK/year]
- Climate footprint per employee per year [kg CO<sub>2</sub>e/employee/year]

### 3.4. Climate measures

The 'Climate measures' sheet allows you to compare the impact of different measures for categories and subcategories. First, select a category from the dropdown, and then select a subcategory. Not all categories have subcategory options, and in these cases the average is automatically selected. Subcategories can be selected where they are available, such as a chair with wool upholstery. The 'Average' subcategory is the average of all subcategories and is representative of the typical chair, sofa or similar.

If you find that the graph is empty and does not show any numbers, this is because a subcategory has been chosen that doesn't match the main category. Check your categories and try again.

The results graph shows the impact of different measures per year per unit. The results can be used to prioritize measures in your organization. You can see which measures have the greatest impact and choose actions based on this.

Note that the calculator does not encompass all possible climate measures. There are many measures that are not quantified in the calculator, including measures that reduce other types of environmental impacts. Read more about these at [anskaffelser.no](https://anskaffelser.no).

### 3.5. Procurement and impact

In the 'Procurement and impact' tab, input a list of devices to be procured. You can then select measures from a menu to see their potential impact. You can also select 'Purchase new' if you are not planning to implement any specific measures.

If you know the price of the units you are procuring, it is possible to override the default pricing data. Otherwise, the estimated prices in the calculator are used.

For a procurement to show in the results, a category, subcategory, number of devices and a measure must be selected. For example, if you are procuring office chairs where some have wool upholstery and some have polyester, these must be input in separate rows. Similarly, if you are procuring multiple office chairs with wool upholstery, but some are to be used and some are to be new, this must also be entered in separate rows.

The results per purchase can be seen in the grey table and give an overview of the annual footprint and the annual costs.

The results section also shows the climate footprint and costs for the whole procurement. In this section, the actual procured products are compared to a scenario where all items are purchased new. If the set of purchases you have filled in includes items bought new, there will be no cost or climate savings associated with these purchases. Both the total climate footprint and footprint per year are shown. Footprint per year is computed by dividing by the expected lifespan of the furniture to be procured.

## 4. Data sources

### 4.1. Pricing data

The estimated costs of purchasing new products are summarized in **Feil! Fant ikke referanseilden..**

These costs are based on historical figures from DFØ, supplemented with prices gathered from furniture suppliers for popular products. These costs have been slightly adjusted based on feedback from DFØ.

Table 4-1: Cost data for new furniture, as used in the calculator

Category	Subcategory	Price excl. VAT [NOK]
Office chair	Average	6 000
	Polyester seat and back	6 000
	Polyester seat	6 000
	Wool seat and back	7 000
	Wool seat	6 000
	Average	2 600
Meeting room chairs	Metal legs, plastic seat	1 500
	Metal legs, textile seat	2 000
	Metal legs, wooden seat	2 500
	Wooden legs, textile seat	3 000
	Wooden chair	4 000
	Average	10 000
Sofa	3-seat, average	15 000
	3-seat, wool	16 000
	3-seat, polyester	14 000
	2-seat, average	10 000
	2-seat, wool	11 000
	2-seat, polyester	9 000
	1-seat, average	5 000
	1-seat, wool	5 500
Lounge chair	1-seat, polyester	5 000
Lounge chair	Average	8 000



Desk	Average	4 500
	Average	6 500
	Small / medium	5 000
Meeting room table	Large	8 000
Cabinets and shelves	Average	5 000
	Average	3 200
	Wool	3 500
	Felt	3 000
Room dividers	Polyester	3 000
	Average	2 400
	Wool	2 700
	Felt	2 300
Desk dividers	Polyester	2 300

## 4.2. Climate footprint

The calculator includes emissions from production of new furniture. Data is mainly obtained from EPD Norway and includes an average value of all EPDs that follow EN 15804:2012+A2:2019. The indicator GWP fossil for A1-A3 is used. This means that only fossil production emissions are included in the emissions factors. The reason only production emissions are included is that these contribute the most to the climate footprint of the products. It was therefore decided that transport, maintenance, and waste management should not be included.

The figures provided are an average of all available EPDs. A varying number of EPDs were used based on their availability.

Only production emissions are included, as these have the most significant contribution to the climate footprint of products. We therefore decided to exclude transport, maintenance and waste treatment. The footprint values are the average of all available EPDs.

The numbers are based on a different number of EPDs depending on available.

The list below shows the number of EPDs that are available for different categories:

Office chairs: 26

Meeting room chairs: 33

Sofa: 13

Lounge chairs: 11

Desk: 10

Meeting room tables: 6

Cabinets and shelves: 11

Desk dividers: 13

Room dividers: 9

For 1-seat and 2-seat sofas, there are relatively few EPDs available, and so a scaling factor based on data from 3-seat sofas was used to estimate the greenhouse gas emissions associated with these types of products. We assume that a 1-seat sofa has 1/3 of the product emissions of a 3-seat, and that a 2-seat has 2/3 of the emissions of a 3-seat sofa.

We have also scaled data to estimate the footprint of a large meeting room table, since very few EPDs were available. The scaling is based on the length of the table.

The table below shows the emission factors used in the calculator for new products.

*Table 4-2 Greenhouse gas emissions and expected lifetimes for new products. Only the production phase is included in the climate footprint (A1-A3)*

Category	Subcategory	Expected lifespan [years]	kgCO <sub>2</sub> e / unit
Office chair	Average	8	61.1
	Polyester on the seat and back	8	65.6
	Polyester on the seat	8	54.3
	Wool seat and back	12	76.6
	Wool seat	12	58.6
Meeting room chairs	Average	8	23.7
	Metal legs, plastic seat	8	25.1
	Metal legs, cloth seat	8	32.2
	Metal legs, wooden seat	8	15.4
	Wooden legs, cloth seat	8	32.4
Sofa	Wooden chair	8	8.2
	Average	8	116
	3-seat, average	8	165.2
	3-seat, wool	12	241.1
	3-seat, polyester	8	117.7
	2-seat, average	8	110.1
	2-seat, wool	12	153.8

	2-seat, polyester	8	81.4
	1-seat, average	8	55.1
	1-seat, wool	12	76.9
	1-seat, polyester	8	40.7
Lounge chair	Average	8	78.4
Desk	Average	15	114.3
	Average	15	110.2
	Small / medium	15	70.7
Meeting room table	Large	15	149.7
Cabinets and shelves	Average	15	47.0
	Average	15	53.8
	Wool	15	45.2
	Felt	15	57.9
Room dividers	Polyester	15	56.8
	Average	15	14.0
	Wool	15	15.0
	Felt	15	9.8
Desk dividers	Polyester	15	26.4

#### 4.2.1. Expected lifespan

The reference service life of furniture products is set to 15 years in the EPDs. This is considered the maximum expected lifespan in the calculator, with seating furniture upholstered with cloth adjusted to set the lifespan shorter than the reference service life. Seating furniture upholstered with wool is expected to have a slightly longer lifespan than seating furniture upholstered with polyester. The actual service life will also depend on usage, but this is difficult to account for in the calculator as it will vary between users.

The expected lives used in the calculator are summarized in Table 4-2. It has been assumed that table furniture has the longest expected life, along with dividers, as they experience minimal wear. For dividers, no distinction is made based on material, as these experience minimal wear, and it is assumed that the type of material does not impact the expected lifespan.

### 4.3. Measures

To calculate the impact of the measures available in the calculator, the climate footprint, expected lifespan, and costs are adjusted. The following chapter describes assumptions and data sources used to quantify each measure.

#### 4.3.1. Cost

Measure	Data source and assumptions
<b>Purchase secondhand</b>	Price data has been collected from several furniture suppliers who sell used products. Prices for several products are obtained and used to calculate an average price for each category. Since there are fewer products available for reuse, in some cases the prices are assumed to be the same for all subcategories. In cases where the collected data indicated that it was cheaper to purchase a new piece of furniture compared to used, the used price has been set to equal to the new price. <b>Calculated prices based on supplier averages were used in the calculator.</b>
<b>Internal reuse</b>	Internal reuse is assumed to have no additional costs. There are typically personnel costs associated with organizing internal reuse, in addition to distribution and storage. <b>0% of the new price is used for all categories in the calculator</b>
<b>Repair</b>	Pricing for repairs is highly uncertain, as there is limited available data. <b>The pricing for repairs is set as equal to purchasing a new product in the calculator</b>

All the prices for measures are shown in Table 4-3. In the “Procurement and impact” tab, prices for purchasing can be overwritten if you have more detailed price data.

Table 4-3 Costs of different measures per category. Prices are excluding VAT

Category	Subcategory	Used purchase price [NOK]
	Average	3 356
	Polyester on the seat and back	3 356
<b>Office chair</b>	Polyester on the seat	3 356

	Wool seat and back	3 356
	Wool seat	3 356
	Average	1 353
	Metal legs, plastic seat	745
	Metal legs, cloth seat	1 978
	Metal legs, wooden seat	321
	Wooden legs, cloth seat	2 154
<b>Meeting room chairs</b>	Wooden chair	957
	Average	10 000
	3-seat, average	15 000
	3-seat, wool	16 000
	3-seat, polyester	14 000
	2-seat, average	10 000
	2-seat, wool	11 000
	2-seat, polyester	9 000
	1-seat, average	5 000
	1-seat, wool	5 500
<b>Sofa</b>	1-seat, polyester	5 000
<b>Lounge chair</b>	Average	8 000
<b>Desk</b>	Average	3 277
	Average	6 500
	Small / medium	5 000
<b>Meeting room table</b>	Large	8 000
<b>Cabinets and shelves</b>	Average	2 297
	Average	1 700
	Wool	1 700
	Felt	1 700
<b>Room dividers</b>	Polyester	1 700
	Average	1 176
	Wool	1 176
	Felt	1 176
<b>Desk dividers</b>	Polyester	1 176

#### 4.3.2. Climate footprint

- Purchase secondhand:** The greenhouse gas emissions associated with purchasing a secondhand piece of furniture are calculated based on an assumed need for replacement, storage and transport. The production emissions associated with the reused product are set to zero, but emissions from repairs, storage, and transport are added. We have not

distinguished between subcategories for all reused products; several subcategories have the same emissions as the uncertainty is high.

- **Internal reuse:** The greenhouse gas emissions associated with internal reuse are set to zero, assuming that no repairs, storage or transport are required in this case.
- **Repair:** The greenhouse gas emissions associate with reupholstering are calculated based on the contribution of the cloth portion of sofas and chairs. Emissions for replacing tabletops are taken from EPDs for new tabletops.

Table 4-4 shows the emissions associated with repairs and external reuse. The emissions are much lower than for new products. Internal reuse is assumed to produce no additional greenhouse gas emissions.

*Table 4-4 The greenhouse gas emissions associated with repair and external reuse. Empty cells in the repair column indicate categories that do not have repair as an available measure.*

Category	Subcategory	Repair [kgCO <sub>2</sub> e]	External reuse [kgCO <sub>2</sub> e]
<b>Office chair</b>	Average	11.0	4.7
	Polyester on the seat and back	9.5	4.7
	Polyester on the seat	2.9	4.7
	Wool seat and back	8.5	4.7
	Wool seat	23.1	4.7
	Average		3.3
<b>Meeting room chairs</b>	Metal legs, plastic seat		3.6
	Metal legs, cloth seat		3.6
	Metal legs, wooden seat		3.8
	Wooden legs, cloth seat		3.5
	Wooden chair		3.8
	Average	24.0	25.0
<b>Sofa</b>	3-seat, average	34.7	36.4
	3-seat, wool	50.6	36.4
	3-seat, polyester	24.7	36.4
	2-seat, average	23.1	24.5
	2-seat, wool	32.3	24.5
	2-seat, polyester	17.1	24.5
	1-seat, average	11.6	13.8
	1-seat, wool	16.1	13.8
<b>Lounge chair</b>	1-seat, polyester	8.5	13.8
<b>Desk</b>	Average	16.5	8.7
	Average	23.4	19.5
<b>Meeting room table</b>	Average		27.6
	Small / medium		14.7

	Large	40.5
<b>Cabinets and shelves</b>	Average	10.9
	Average	4.2
	Wool	4.2
	Felt	4.2
<b>Room dividers</b>	Polyester	4.2
	Average	3.7
	Wool	3.7
	Felt	3.7
<b>Desk dividers</b>	Polyester	3.7

#### 4.3.3. Expected lifespan

The expected life is adjusted for each measure, as used and repaired products are assumed to have a shorter service life than new products.

Measure	Data source and assumptions
<b>Buying used</b>	Most furniture which is sold used is in good condition and has many service years left. It is assumed that <b>the lifespan of used products is 70% of the expected lifespan of a corresponding new product.</b>
<b>Internal reuse</b>	We assume that internal reused products are somewhat more worn than those purchased used externally. <b>The lifespan of internally reused products is set to 50% of the expected lifespan of a corresponding new product.</b>
<b>Repair</b>	<b>Repairs are assumed to give the product a remaining lifespan equal to 80% of the lifespan of a corresponding new product.</b>