



Aalborg Universitet

AALBORG UNIVERSITY  
DENMARK

## LCCbyg version 3.1

*Installation guide and user manual*

Haugbølle, Kim; Scheutz, Peter; Mahdi, Vania

Creative Commons License  
Unspecified

Publication date:  
2020

Document Version  
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

### Citation for published version (APA):

Haugbølle, K., Scheutz, P., & Mahdi, V. (2020). *LCCbyg version 3.1: Installation guide and user manual*. Institut for Byggeri, By og Miljø (BUILD), Aalborg Universitet. BUILD Rapport No. 2020:21

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal -

### Take down policy

If you believe that this document breaches copyright please contact us at vbn@aub.aau.dk providing details, and we will remove access to the work immediately and investigate your claim.

# BUILD Report 2020:21

LCCbyg version 3.1

Installation guide and user manual





# LCCBYG VERSION 3.1

Installation guide and user manual

Kim Haugbølle

Peter Scheutz

Vania Mahdi

BUILD Report 2020:21

Department of the Built Environment, Aalborg University

2020

<b>TITLE</b>	LCCbyg version 3.1
<b>SUBTITLE</b>	Installation guide and user manual
<b>SERIAL TITLE</b>	BUILD Report 2020:21
<b>FORMAT</b>	Print
<b>EDITION</b>	1. edition
<b>YEAR</b>	2020
<b>DIGITAL PUBLICATION DATE</b>	August 2020
<b>AUTHOR</b>	Kim Haugbølle, Peter Scheutz, Vania Mahdi
<b>LANGUAGE</b>	English
<b>PAGES</b>	37
<b>KEY WORDS</b>	Lifecycle costing, acquisition costs, operation and maintenance costs, administration costs, utility costs, cleaning costs, revenue, residual value
<b>ISBN</b>	978-87-563-1960-7
<b>DRAWINGS</b>	All illustrations from the installation procedure and the application
<b>COVER</b>	Kim Haugbølle
<b>PUBLISHER</b>	Department of the Built Environment, Aalborg University A.C. Meyers Vænge 15, 2450 Copenhagen SV E-mail <a href="mailto:build@build.aau.dk">build@build.aau.dk</a> <a href="http://www.build.aau.dk">www.build.aau.dk</a>

The Danish Copyright Act covers this publication.

# CONTENTS

<b>FIGURES</b>	<b>4</b>
<b>PREFACE</b>	<b>5</b>
<b>1 INTRODUCTION</b>	<b>8</b>
1.1 About lifecycle costing	8
<b>2 INSTALLATION GUIDE</b>	<b>10</b>
2.1 General information about installation	10
2.2 Windows 10 installation guide	10
2.3 Uninstalling the application	13
<b>3 USER MANUAL</b>	<b>16</b>
3.1 Start page	16
3.2 Main menu bar	18
3.3 Data entry	20
3.4 Alternatives	24
3.5 Result field	25
3.6 Details for alternative	26
3.7 Account plans	27
3.8 Expenditure and income types	28
3.9 Prerequisites	30
3.10 Reports	32
3.11 Export of report	37

# FIGURES

<b>FIGURE 1.</b> Homepage for download of LCCbyg.....	10
<b>FIGURE 2.</b> Alternative screenshot for start of installation. ....	11
<b>FIGURE 3.</b> Start of installation. ....	11
<b>FIGURE 4.</b> Accept of End User License Agreement (EULA). ....	12
<b>FIGURE 5.</b> Selection of destination folder.....	12
<b>FIGURE 6.</b> Confirmation of completed installation. ....	13
<b>FIGURE 7.</b> Search for the Control Panel. ....	13
<b>FIGURE 8.</b> Uninstall via 'Programs and Features'....	14
<b>FIGURE 9.</b> Start page of LCCbyg 3.1. ....	17
<b>FIGURE 10.</b> Setting for language.....	18
<b>FIGURE 11.</b> Drop-down menu 'File' .....	18
<b>FIGURE 12.</b> Drop-down menu 'Actions'.....	19
<b>FIGURE 13.</b> Drop-down menu 'Help'. ....	20
<b>FIGURE 14.</b> The data entre tab. ....	21
<b>FIGURE 15.</b> Data entry tab - showing the rows. ....	22
<b>FIGURE 16.</b> Symbols for adding groups and for removal. ....	22
<b>FIGURE 17.</b> The icon to export the report.....	24
<b>FIGURE 18.</b> Setting for the alternatives. ....	25
<b>FIGURE 19.</b> Icon to duplicate alternatives. ....	25
<b>FIGURE 20.</b> Result field.....	26
<b>FIGURE 21.</b> Rate and price development.....	27
<b>FIGURE 22.</b> Export of account plans. ....	28
<b>FIGURE 23.</b> Example on types of row details. ....	28
<b>FIGURE 24.</b> Prerequisites screen.....	30
<b>FIGURE 25.</b> Calculation rate and price development.....	31
<b>FIGURE 26.</b> The assumptions screen under the DGNB templates.....	32
<b>FIGURE 27.</b> Report tab.....	33
<b>FIGURE 28.</b> The sections that can be selected under 'Reports'. ....	34
<b>FIGURE 29.</b> Report section: 'Summarised values for each alternative' . ....	36
<b>FIGURE 30.</b> Report section: 'Summary net present value'. ....	36
<b>FIGURE 31.</b> Export of report.....	37

# PREFACE

The tool LCCbyg is developed by BUILD / Aalborg University with financial support from the Landowners' Investment Fund and the Danish Transport, Building and Housing Agency.

LCCbyg is developed by:

- Senior researcher, Ph.D. Kim Haugbølle, who has been the project manager and responsible for the professional content.
- Senior researcher, Ph.D. Nils Lykke Sørensen, who has been responsible for preparing the data model and documentation.
- Software architect Peter Scheutz, Scheutz & Clementsen Design, who has been responsible for the preparation of the data model, design and programming.

The steering group for the development project has consisted of:

- Special consultant Niels Bruus Varming, Danish Transport, Building and Construction Agency.
- Section leader Søren Aggerholm, BUILD / Aalborg University.
- Senior researcher Kim Haugbølle, BUILD / Aalborg University.

A warm thank you goes to the reference group, who in a very valuable way have contributed actively and constructively to the development of LCCbyg.

A warm thank you also goes to the group of test persons who tested and commented on a preliminary version of LCCbyg. The beta test provided many valuable and concrete inputs and suggestions for the further development of LCCbyg.

BUILD - Department of the Built Environment, Aalborg University  
Division of Building Technology and Management

Ruut Peuhkuri  
Section leader  
August 2020



1

# INTRODUCTION

# 1 INTRODUCTION

## 1.1 About lifecycle costing

LCCbyg is a tool that calculates the lifecycle costs and produces a clear overview of the lifecycle costs either for an entire building or for individual building parts. LCCbyg can i.a. help decision-makers compare two or more alternatives that have different cost profiles over time.

It will usually be difficult to immediately determine whether a solution with a high acquisition costs and low annual costs is cheaper in the long run compared to a solution with lower acquisition costs and higher annual costs. The tool solves this by calculating a net present value or an annualized equivalent cost for each of the alternatives based on the types of costs that the decision-maker has chosen to include in the assessment. These two net present values or annualized equivalent costs can now be compared, and the cheapest solution in the long run can be identified.

LCCbyg facilitates the work by automating the calculations because the tool contains several default settings and values that can meet most needs. At the same time, LCCbyg allows the user to tailor his calculations to his purposes by changing several parameters if the predefined default values in the tool are not appropriate for the user. The default values in the application are based on input from several sources, including the Ministry of Finance's guide from 2018 on calculation rates (also called discount rates), the life time table from SBi report 2013: 30, the Danish Energy Agency's price projections, cost databases from Molio Prisdata and various DGNB manuals.

2

# INSTALLATION GUIDE

## 2 INSTALLATION GUIDE

### 2.1 General information about installation

The installation guide pilots the user through the installation of LCCbyg. The guide describes step by step how the application is installed to be ready to use. The installation is demonstrated using the Windows 10 operating systems and by using the Google Chrome browser. However, it is not required to use the same version of the operating system or browser to download the application. The application is designed for the operating system of Windows. Generally, Windows applications can also run on Mac through, for instance, Parallels® Desktop or Apple's Boot Camp, which is integrated into the OS X operating system. The application can be downloaded using other browsers.

The application is downloaded from the path <https://lccbyg.dk/download/>. Figure 1 shows the website window. LCCbyg has been released in several versions. The latest is always available at the top, while the older versions can be found further down the page.

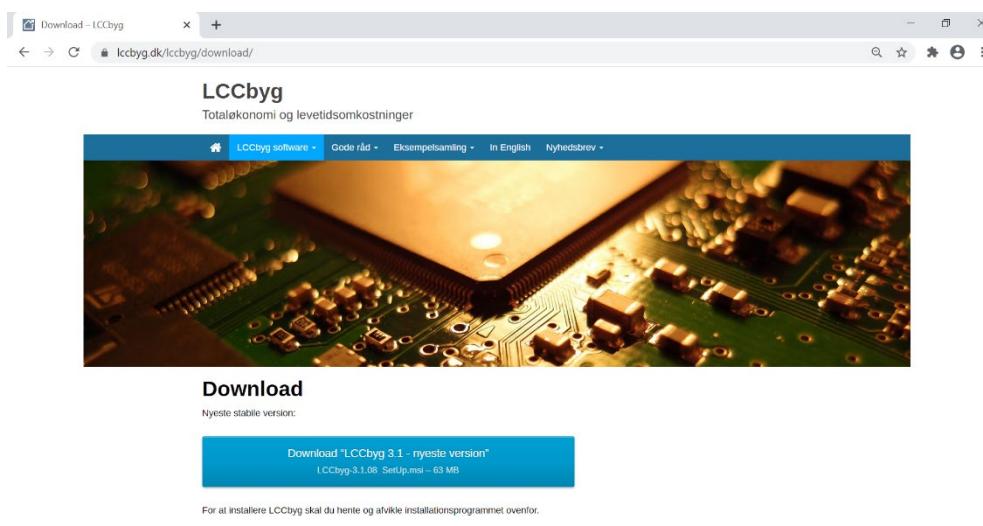


FIGURE 1. Homepage for download of LCCbyg.

A serial number or password is not required to download the application. Downloading the application is done by clicking on the link to the installation file called 'LCCbygSetUp.msi', which downloads the application to the computer. Once the computer has downloaded the installation file, the installation can be started by clicking on the installation file.

### 2.2 Windows 10 installation guide

The browser asks if you want to run the file or cancel the installation. To install the application, press 'Run'. Alternatively, you will see the following screenshot in section (Figure 2). Select 'Run anyway'.

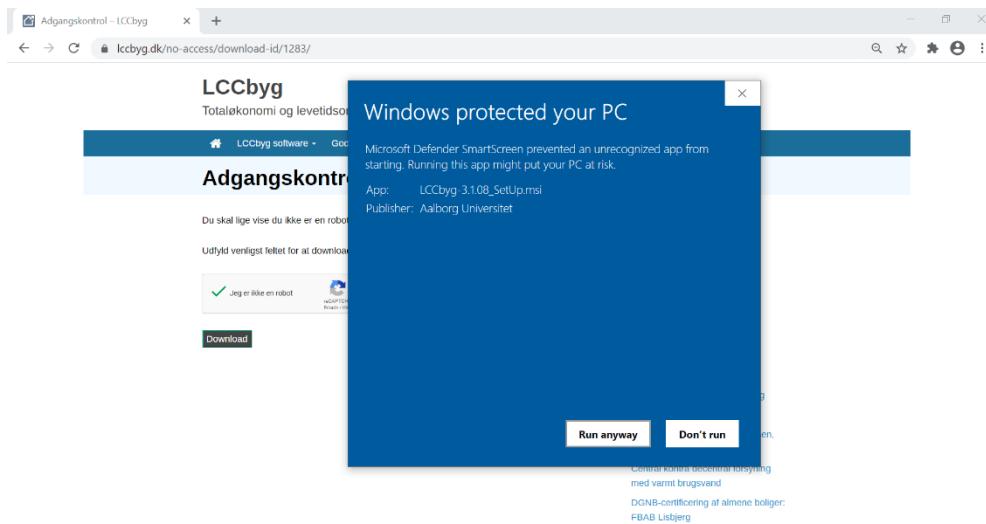


FIGURE 2. Alternative screenshot for start of installation.

A pop-up box for initiating the installation itself will appear. To accept installation, click on 'Next' (Figure 3).

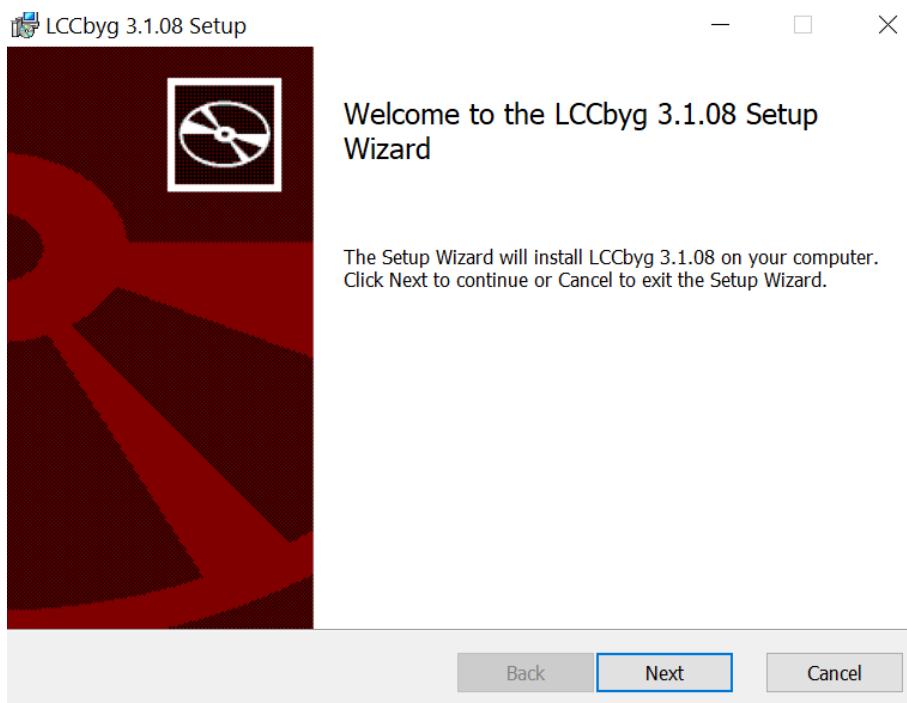


FIGURE 3. Start of installation.

After this, a pop-up box will appear with an end-user license agreement, where you must first check 'I accept the terms of the license agreement' and then click on 'Finish' (Figure 4).

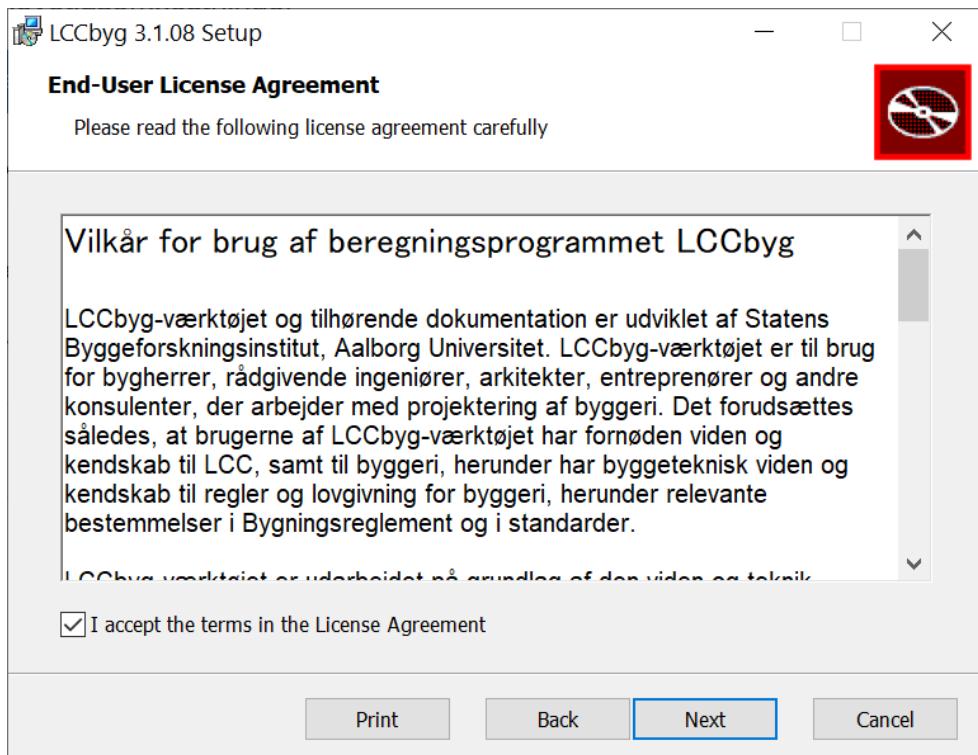


FIGURE 4. Accept of End User License Agreement (EULA).

Next, specify where to place the LCCbyg application. If the suggested location is acceptable, press 'Next', otherwise select the new preferred location by pressing 'Change', then press 'Next' (Figure 5).

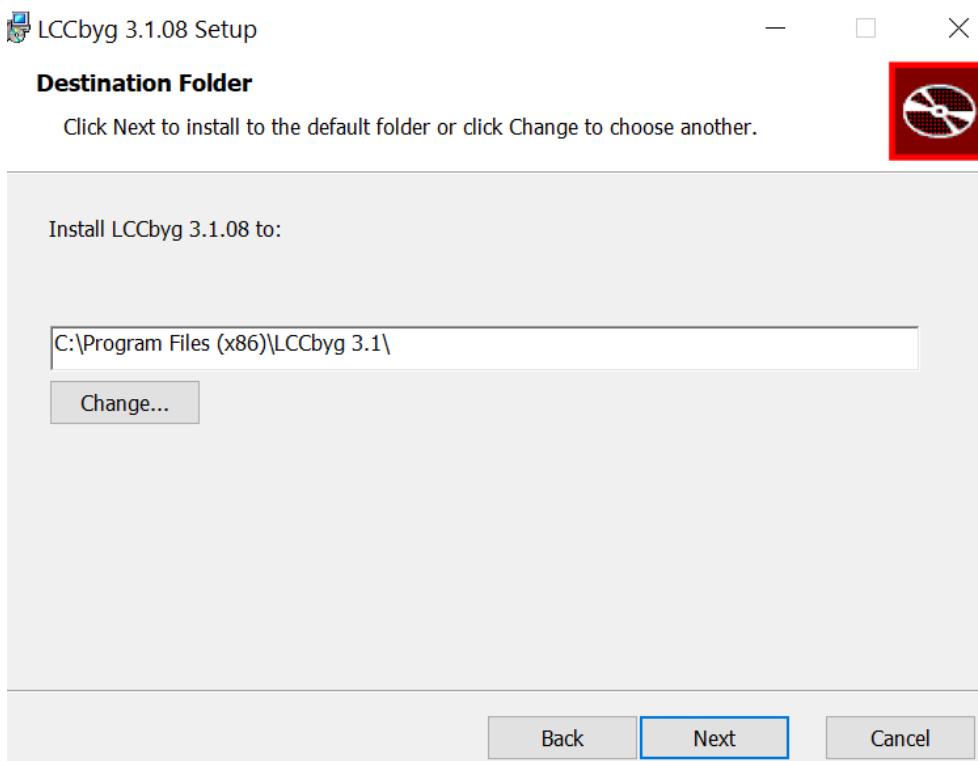


FIGURE 5. Selection of destination folder.

In the next pop-up box, press 'Finish' to finish installing the application (Figure 6).

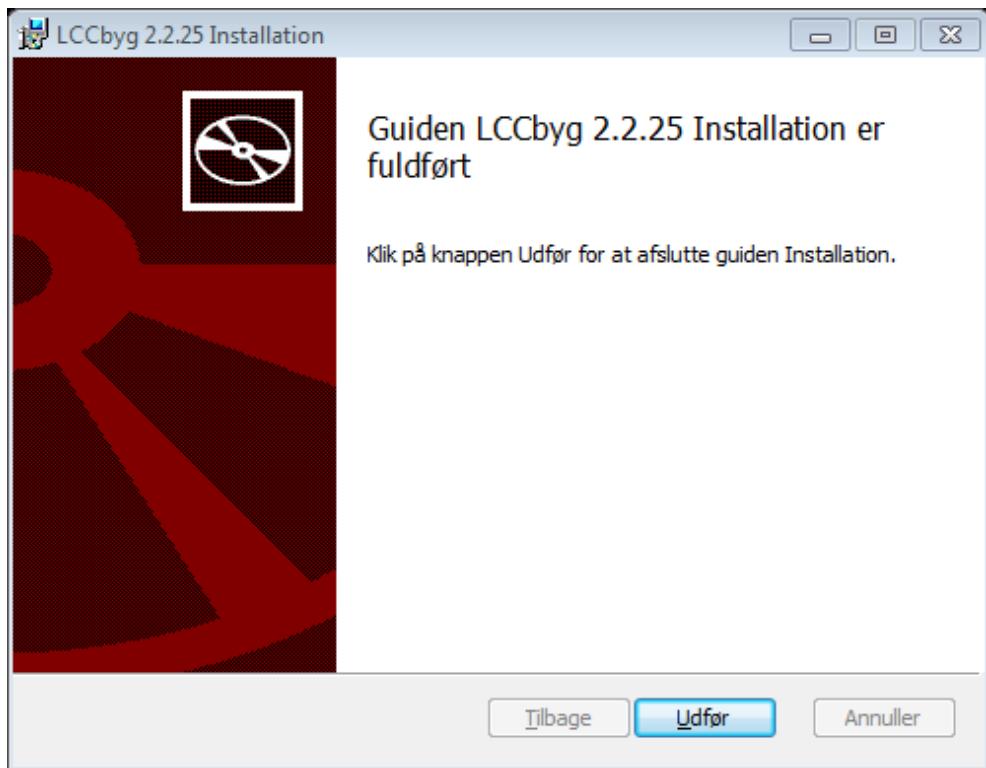


FIGURE 6. Confirmation of completed installation.

## 2.3 Uninstalling the application

If you want to uninstall the application, it is done in the same way as with other applications. Open 'Start' and select 'Control Panel'. If the 'Control panel' function is not visible in the start menu, you can also open a pathfinder and type 'control panel' in the search field (Figure 7).

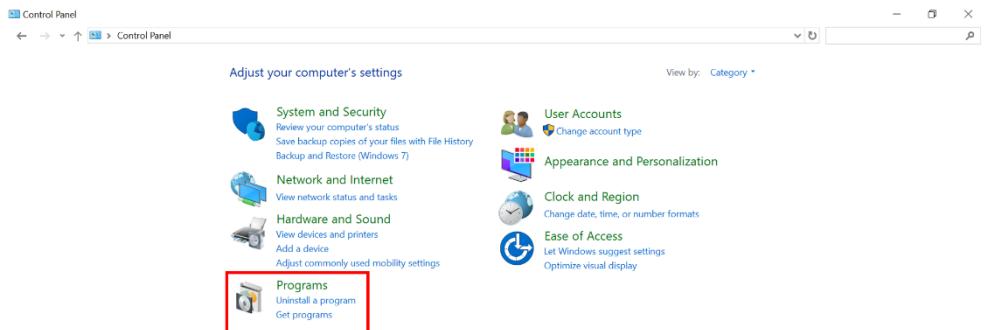


FIGURE 7. Search for the Control Panel.

Here, either 'Uninstall a program' or 'Programs and functions' is selected, depending on whether you have selected a categorical view or a view in the form of icons. Find LCCbyg in the list and press 'Remove / Edit' and the application will be uninstalled (Figure 8).

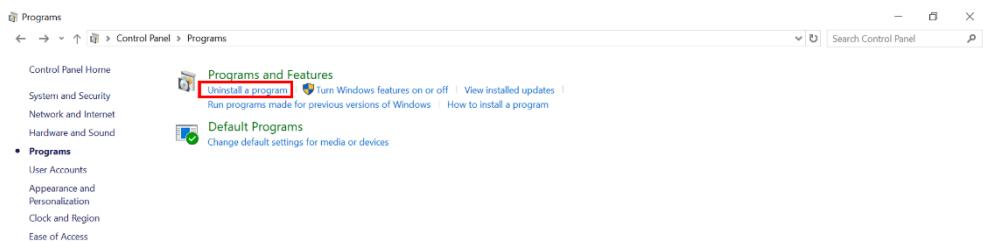


FIGURE 8. Uninstall via 'Programs and Features'.

# USER MANUAL

## **3 USER MANUAL**

### **3.1 Start page**

This is the LCCbyg version 3.1 User Guide, which is a digital tool that can be used for lifecycle costing calculations. The user guide reviews the points that you should be aware of before doing a calculation and the various steps of the calculation.

At the home page, you can choose the preferred language as well as the template that is relevant to your project. Depending on your needs, you can choose between any templates.

#### **3.1.1 Introduction to LCCbyg**

LCCbyg calculations generally consist of the following steps in the program:

- Choose the calculation type from several different templates on the home page.
- Enter information under 'Data entry' where it is possible to set up several alternatives.
- Under 'Prerequisites', it is possible to edit technical details for the total economic calculation. (This point is disregarded by 'Simple Interface').
- Under 'Reports', evaluate the incoming volumes and calculated results.

#### **3.1.2 Project templates – choose the calculation type from several different templates**

LCCbyg version 3.1 is structured as follows (Figure 9):

- A. Main menu bar – 'Files', 'Help'
- B. To all users/ Til alle brugere (not available in English)
- C. To professional users/ Til professionelle brugere – Project templates
- D. Language

On the start page, you can choose the template that is most relevant to your project. You can choose from three template types. If you are an individual or a newcomer to lifecycle costing calculations, templates under 'For all users' (in Danish: 'Til alle brugere') will be your preference. If, on the other hand, you are an expert, templates under 'Professional users' (in Danish: 'Til professionelle brugere') may be preferable for you. Here you can choose between four standard templates and two DGNB templates. Both audiences can open sample templates where one or more typical metrics are shown. Currently, only the 'New standard project in English' has been translated to English.

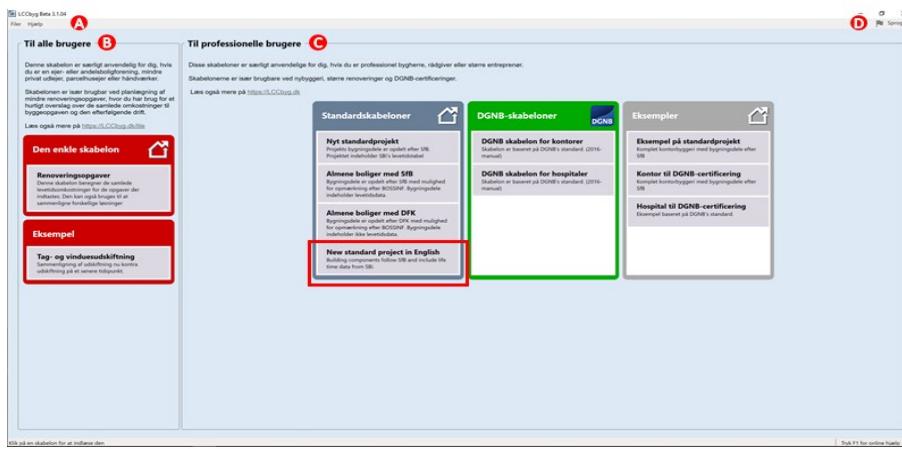


FIGURE 9. Start page of LCCbyg 3.1.

### 3.1.3 Project templates – choose your calculation type among different templates

*Note: It is only the ‘New standard project in English’ which is in English fully.*

You can start a calculation by selecting the appropriate calculation type from the templates below:

- ‘Nyt Standardprojekt’ (In English: New Standard Project).
- ‘Almene boliger med SfB’ klassificering (In English: Social Housing with SfB classification).
- ‘Almene boliger med DFK’ klassificering (In English: Social Housing with DFK classification).
- ‘New basic project in English’
- ‘DGNB-skabelon for kontorer’ (In English: DGNB Office Template)
- ‘DGNB skabelon for hospitaler’ (In English: DGNB template for hospitals)

Simply click once on the desired template and you’re ready to start.

In the standard templates (in Danish and English), the building parts are registered based on the SfB classification system and the lifetime table of SBi is contained. There are also two templates for social housing, the one is based on the SfB classification system with lifetime data, and the other on the DFK classification system without lifetime data. The various project templates can be accessed either from the ‘Start page’ or from the ‘Files’ menu. The differences between the templates are mainly the degree of detail of inputs and calculations as well as whether the application offers default values or not.

When you open a new template, the project will be empty except for the default values, and it will be ready for entering project-specific data. The selection of an empty project is preferable if you want to make a new lifecycle cost calculation. You can also choose to open the DGNB Office Building Template (‘DGNB skabelon for kontorer’) or the DGNB template for hospitals (‘DGNB skabelon for hospitaler’). Both DGNB templates are based on the New Standard projects (‘Nyt Standardprojekt’), however, they contain several locked values for calculation assumptions, lifetimes, etc. that meet the requirements of the DGNB certification.

### 3.1.4 Language version – Danish or English

You can choose which language version you want to work with. If you click the flag in the upper right corner, a menu appears where you can select your preferred language. There are two options, namely Danish and English (Figure 10).

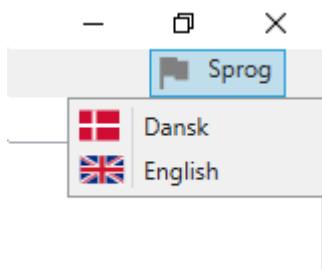


FIGURE 10. Setting for language.

The general rule for language versioning is that the chosen template controls the language. Danish templates will, therefore, open in Danish, and the English template will open in English. Regardless of your language choice, when you open a Danish project file or an English project file, it will continue to be displayed in Danish and English respectively. In other words, you cannot expect Danish templates to be translated into English and vice versa by simply switching languages.

## 3.2 Main menu bar

On the ‘Start Page’, there is a menu bar on the left upper corner that consist of ‘Files’, ‘Actions’ and ‘Help’. The ‘Files’ menu item is active, however, there are some features such as ‘Close Project’, ‘Save’ and ‘Save as’ that are inactive and will only be activated when a project file is open. All functions in the ‘Help’ menu item are active and can be assessed. The menu item ‘Actions’ is not visible on the ‘Start page’ but becomes visible and active when a project is open. When a file project is open, all functions in the main menu bar will be activated. Here, both the functions that are active in the ‘Start page’ and the functions that will become active when a project is open are described.

### File

LCCbyg saves data as text files in XML file format. This format makes the files relatively small and can easily be exchanged over mail. Note, however, that inserting an image or logo can increase the size of the project file significantly (Figure 11).

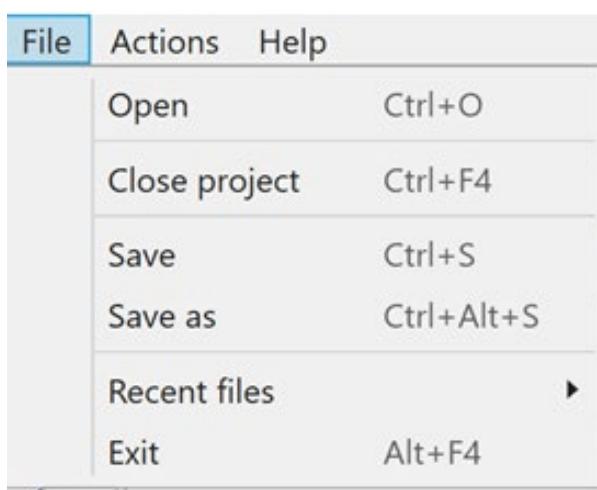


FIGURE 11. Drop-down menu ‘File’.

### **Open a project file**

You can open a project file from the 'Files' menu bar if you have already saved one or more project files on your computer or in the cloud. You can also use the shortcut key Ctrl+O.

When you load an old project file from an earlier version of LCCbyg, you will receive a warning that you are loading an old project file and in which version of LCCbyg, the project file was created. However, this does not apply to project files made in the first version of LCCbyg.

In case you want two project files open at the same time, you can open the application twice and open a project file in each of the two open applications.

### **Close the project file**

When you want to get back into the 'Start Page', you can select 'Close project' under 'Files' in the menu bar. Remember to save all changes before closing the project. You can also use the shortcut key Ctrl+F4.

### **Save and Save as**

You can save files in two ways – 'Save' or 'Save A's, as is known from most common office applications. If you use 'Save', the file will be saved to the drive location that your computer is generally set up for. If you use 'Save as' – which is recommended – you can decide for yourself where to save the file.

### **Recent**

The 'Files\ Recent' feature provides an overview of the most recently opened files. The function acts as a shortcut where you can open the most recently opened files by clicking on it.

### **Quit**

You can close the application with the Alt+F4 shortcut key or via the menu bar 'Files / Exit'.

### **Actions**

Under 'Actions' you will find the following features (Figure 12):

- Undo.
- Redo.
- Undo global change.
- Redo global change.

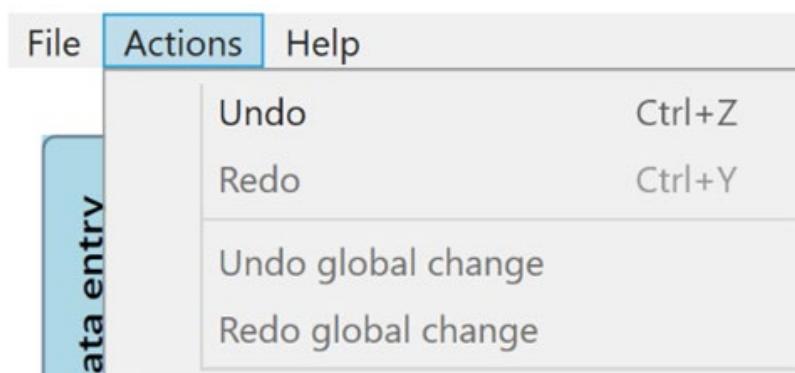


FIGURE 12. Drop-down menu 'Actions'.

### **'Undo' and 'Redo'**

The 'Undo' and 'Restore' features appear in light grey because they are inactive and are activated only when data has been entered or changes have been made. The functions can also be used using the shortcuts Ctrl+Z and Ctrl+Y.

As long as the project has not been saved, both functions will be delimited within each tab. This means you have to go back to another tab yourself if you want to undo or restore something in that tab. So the application remembers all your changes within each tab, but not across tabs.

### **'Undo Global change' and 'Redo Global change'**

The 'Undo Global Change' and 'Undo Global Change' features are one level above 'Undo' and 'Undo' and will remain inactive as long as no new alternative has been added or you have not deleted an existing alternative. As soon as you have added a new alternative or deleted an existing alternative, both functions will be active. If you are deleting an option, you can undo deletion by tapping 'Undo Global Change' in 'Actions' or restoring the action by tapping 'Undo Global Change'.

### **Help**

You can get help either by pressing F1 anywhere in the application or under the 'Help' function in the menu bar (Figure 13). Moreover, an offline version of the User Guide can be downloaded via the website <https://lccbyg.dk/help/31-en>, which you can use if you are offline, for example, on a train or plane. Remember to check that the application version and user guide are compatible.

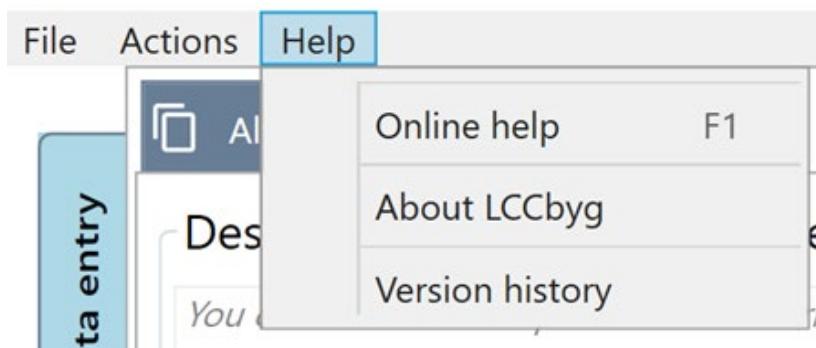


FIGURE 13. Drop-down menu 'Help'.

### **About LCCbyg**

'About LCCbyg' provides an overview of contributors to LCCbyg, describes the license terms for using LCCbyg, and specifies which open external libraries and licenses the application uses.

### **Version history**

Finally, this feature also includes 'Version History', which provides a brief overview of the most important changes for each version of the application.

## **3.3 Data entry**

In 'Data Entry' you can perform your calculation to carry out a lifecycle cost analysis of the construction. You can choose to perform a lifecycle cost calculation for an entire building if it

is, for example, a complete renovation. You can also choose to perform your calculation for individual building parts if only a few building parts are wanted to be renovated.

All templates can be displayed in 'Ordinary Interface' (in Danish: 'Almindelig grænseflade'). The ordinary interface is made up of a 'Data entry', 'Prerequisites' and 'Reports'.

Under 'Data entry', the selected building elements can be dragged into 'My Tasks'. Here they can be divided into groups under different alternatives. The 'Data entry'/'Inddatering' tab includes five parts (Figure 14):

- A. Main menu bar – 'Files', 'Actions' and 'Help'. The 'Action' feature in the menu bar is now visible.
- B. Details for alternatives – 'Period of calculation', 'Gross floor area' and 'Rate and Price development'.
- C. Data entry where the relevant main cost groups and cost types are added.
- D. 'Account plans'.
- E. Result field, including 'Net present value' and 'Residual value'.

The screenshot shows the 'Data entry' tab of the LCCbyg software. At the top, there's a menu bar with 'File', 'Actions', and 'Help'. Below the menu is a section for 'Alternative 1' with fields for 'Period of calculation', 'Gross floor area', and 'Rate and price development'. To the right is a list of 'Account plans - SfB' with checkboxes for categories like 'Plot, consultancy and client costs', 'Site and structures', etc. At the bottom, there's a row of buttons for account plan types: Acquisition, Non-recurring cost, Maintenance, Replacement, Management, Supply, Cleaning, Recurring income, Non-recurring income, Residual value, and Net present value. The entire interface is labeled with red numbers A through E corresponding to the points in the accompanying text.

FIGURE 14. The data entre tab.

### 3.3.1 Data entry

When you open any of the New standard project template, the template for Social Housing with SfB or DFK classification, or the template of Project in English, the project will be blank, except for default values, and ready for entering project-specific data. The empty project is preferable if you want to make a new life-cycle cost calculation.

The data entry fields for each account plan are used to set the values that LCCbyg needs to calculate the present value and residual value. The entry values vary for each account plans. Accounts for 'Plot, consultancy and client costs' (field D in the Figure 14) include non-recurring cost, start year of calculation period, quantities and unit prices. Account plans for 'Site and structures' include acquisition cost, maintenance, the interval of maintenance, replacement, lifetime, start and end year of calculation period, quantities and unit prices (Figure 15). Besides, when you open the template for Social Housing either with SfB or DFK classification, there will be additional opportunities to choose 'BOSSINF' and 'Type' of costs.

FIGURE 15. Data entry tab - showing the rows.

The data entry fields also include the 'Description' field for adding notes. This field may be useful, for example, to make references to the source of a cost (e.g. calculating through Molio Price Data or private price database), the source of quantities (e.g. calculation made in the Be18 energy application) or the need for help from a colleague (e.g. "Susanne: Please check the window scheme for quantities"). Comments under the 'Note' field are not included in the report (PDF format) but will be available in the project file (XML format). Besides, the data entry tab includes the field 'Sum', which shows the total amount for each cost type.

The default values are presented in green colour. The colour changes to black if the value in the field is changed by the user, distinguishing between the default values and the ones you have entered yourself. Once you have entered or changed values in the relevant fields, LCCbyg will calculate the present value and residual value for each cost type. The calculated present value and residual value, as well as the selected material type, are shown under the data entry field.

You can also add a description of the selected alternative in the field just below 'Period of Calculation', 'Gross floor Area' and 'Rate and Price Development' fields.

### 3.3.2 Rows and Columns

The items that appear in the cost group and main cost group charts of the report are the items that have been selected under the individual account plans (Item D in Figure 14). If you want a group is missing from the account plans or if there are too many groups in the form, groups can be added by pressing the '+' symbol or removed by pressing the trash can ikon (Figure 16).



FIGURE 16. Symbols for adding groups and for removal.

An exception to this is the DGNB templates where the main groups are locked and thus, cannot be deleted.

To make the navigation easier, the data entry is constructed as a grid system consisting of main groups and followed by relevant subgroups which are filled by subtracting the relevant items from the field on the right (Item D in Figure 14). The item is added by dragging the relevant account plans from the right into the desired group.

You can change the order of columns by holding down the arrow symbol in front of the group or by dragging it up and down. You can also make columns wider or narrower by dragging the edge of the column.

#### **Drop-down menus**

In the account plans, the main cost groups are empty by default and can be unfolded by pressing the horizontal arrow in front of the group name. You can add subgroups by pulling relevant items from the right field (Account plan field, Field D in Figure 14).

#### **3.3.3 Colour coding**

LCCbyg uses a colour code and symbols to make visible where the data comes from. Data with green colour code indicate that the values are inherited from the chart of accounts, while the black colour code indicates that the values are entered by the user himself. If you want to go back to the inherited values, the entered value can be deleted or the use the 'Undo' function.

Once you have added the desired rows from the chart of accounts to the right, you can begin to update the values. LCCbyg uses three types of values:

- Predefined values.
- Updated values.
- Open values.

The predefined values (green values) are default values in the program. The updated values are specified by the user (black values) and overwrite the predefined values. The last values are open, where there are no predefined values in advance. For example, they indicate the amount or in some templates the size of the cost associated with the row.

#### **3.3.4 Use only numeric values: Error messages**

Only numeric values can be entered in the forms under 'Data entry' in LCCbyg. When letters or both numbers and letters are used as input, the field is marked with a red square around the input field. The red square indicates that the application cannot calculate the cost as long as letters are entered in the field. If you enter numbers in the next field, the application will automatically correct the letter field by deleting the entered values (letters or letters and numbers).

Besides, numerical values in LCCbyg are formatted according to standard conventions for thousands of separators. In the English template, commas are used, while full stops are used in the Danish templates. Numbers are rounded up to the nearest round figures.

#### **Delete**

Changing or deleting a value can be done by selecting the data field and overwriting the value or using 'Backspace' or 'Delete' on your keyboard.

Remember that you can also use the 'Undo' and 'Redo' functions, for example, using the keyboard shortcuts Ctrl+Z and Ctrl+Y.

### 3.3.5 Export of key figures

It is possible to export data to Excel spreadsheets (XLSX format). Specifically, under 'Account plans', it is possible to export key figures to spreadsheets. The export features send all standard values into a spreadsheet that can be opened and edited in both MS Excel and 'Open Document' format.

Values can be exported to a spreadsheet by clicking on the symbol marked with the red square in 'Account plans' or 'Empty Rows' (Figure 17).



FIGURE 17. The icon to export the report.

### 3.4 Alternatives

It is possible to work with several alternatives in the same calculation. Alternatives are created and edited in any account plan under 'Data Entry'. You only need to create and edit an alternative in one account plan, as corrections affect all account plans. The names and descriptions of alternatives are as follows:

- LCCbyg will always accommodate at least one alternative.
  - Alternatives can be freely named by clicking on the name text box and entering a new name.
  - A description can be added for each option.
  - 'Period of calculation', a 'Gross floor area' and 'Rate and price development' must be specified for each alternative. Under 'Rent and price development' you can select either 'Public projects', 'Nominal interest and current prices', 'Real discount rate and fixed prices' and 'Zero discounting'.
  - The current alternative that you are working on is highlighted in grey.
  - A new alternative can be created by tapping the '+' tab.
  - An alternative can be deleted by pressing 'trashcan' next to that option.
  - Deleting an alternative can be undone by pressing 'Undo Global Change' in the 'Actions' menu bar.
  -
- LCCbyg makes it possible to work with several alternatives in the same calculation.

Alternatives are created and edited under 'Data entry' (Figure 18).

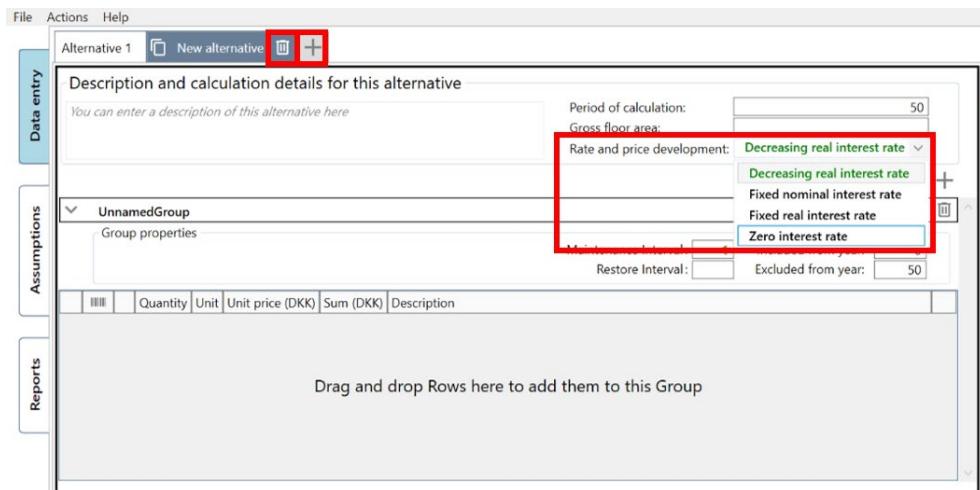


FIGURE 18. Setting for the alternatives.

### 3.4.1 Copying values from one alternative to another

When you touch the copy icon with the two “pages” at the right of the new alternative, the selected alternative will be copied. The copy will include all data and structure from that option, including the name of the alternative that is copied, as well as its ‘Description’ if there is any (Figure 19).



FIGURE 19. Icon to duplicate alternatives.

### 3.4.2 Comparison of two alternatives

It is possible to compare two alternatives by using the vertical menu item ‘Prerequisites’ or ‘Reports’. This feature is useful if you need to find the differences between the two alternatives. Comparison is made for Net Present Value, Acquisition, Non-recurring cost, Maintenance, Restore, Management, Supply, Cleaning, Income, Non-recurring Income and Residual Value.

## 3.5 Result field

In ‘Data Entry’, you will see continuous updates of results for the current account plan. The results for that project as well as for the active alternatives are displayed. This allows immediate comparison of results across the alternatives within the project under examination. The detailed results include the following calculations (Figure 20):

- Net Present value.
- Acquire.
- Non-recurring cost.
- Maintain.
- Restore.
- Manage.
- Supply.
- Cleaning.
- Income.
- Non-recurring income.
- Residual value.

<input type="checkbox"/> Acquisition	<input type="checkbox"/> Non-recurring cost	<input type="checkbox"/> Maintenance	<input type="checkbox"/> Replacement	<input type="checkbox"/> Management	<input type="checkbox"/> Supply	<input type="checkbox"/> Cleaning	<input type="checkbox"/> Recurring income	<input type="checkbox"/> Non-recurring income	<input type="checkbox"/> Residual value	<input type="checkbox"/> Net present value
										0

FIGURE 20. Result field.

### Unit selection

The ‘Terrain and Building’, ‘Supply’ and ‘Clean’ schedules all have dropdown menus, allowing you to select appropriate units for the quantities and prices. Selecting an item from the drop-down menu does not affect the calculation. Whether you selected the unit ‘kWh’, ‘m<sup>2</sup>’ or ‘RM’, the application uses the value in the quantities column in the calculation and unit price. The dropdown menu is only a help to you as a user, so that the quantity and unit price can be better compared to each other.

## 3.6 Details for alternative

### Calculation period

LCCbyg calculates the annual costs based on the selected calculation period. This is inserted in the ‘Calculation period’ field, where a full year is indicated. The calculation or calculation period is initially set to 50 years but can be changed to a value between 0 and 120 years if desired. A calculation period of >25 years should be chosen, as many building parts have a lifetime of >25 years.

Thus, a calculation period of fewer than 25 years will not show what effect replacement or repair of building parts will have for the net present value. If the calculation period is set to 0 years, the application will only calculate the acquisition cost.

### Gross floor area

The field ‘Gross area’ is entered according to the Building Regulations, which are measured to the outside of the exterior walls. The floor area is calculated by aggregating the gross area of all floors, including basements and usable roofs, as well as balcony closures, conservatories, connecting corridors and the like.

### Interest and price trends

As a starting point, ‘Interest and price development’ is defined in advance by the application to be equal to ‘Fixed Real Interest Rate’. It is possible to change interest rates and price trends at ‘Ordinary Interface’. Under each cost type, there will be a drop-down menu where you must select the relevant interest rate and price trend (read more about this under Assumptions). You can choose from the following four interest rate and price development kits (Figure 21):

- Declining real interest rates.
- Fixed nominal interest rate.
- Fixed real interest rate.
- Zero-interest rate.

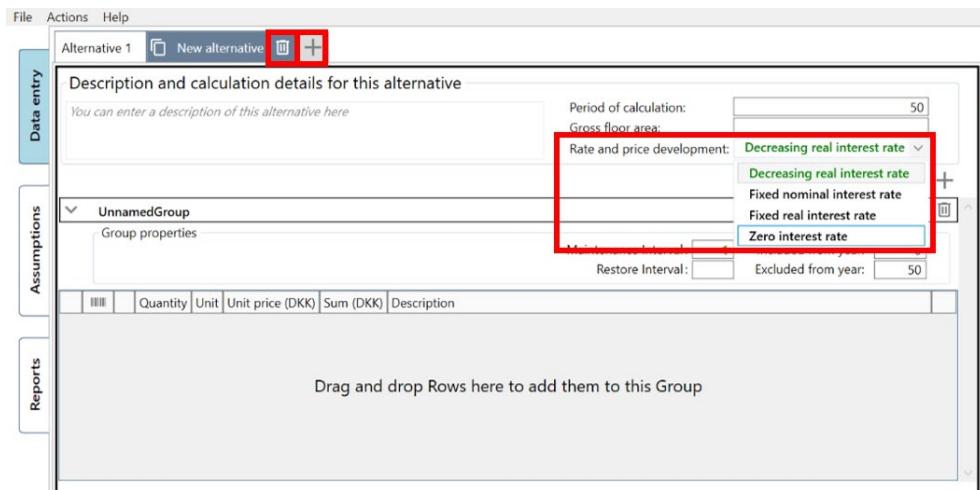


FIGURE 21. Rate and price development.

### 3.7 Account plans

The account plans vary depending on the selected project. Overall, account plans consist of two main points: 'Empty Row' and 'Account plans' (also referred as 'SfB' or 'DFK' in the templates for Social Housing with SfB and DFK classification, respectively). Both 'Empty Row' and 'Account Plans' are locked and cannot be changed.

The account plan 'Empty Rows' include eight elements:

- Acquisition costs (In Danish: Anskaffelse/generelt).
- Non-recurring costs (In Danish: Engangsudgift).
- Building component costs (In Danish: Bygningsdel/Inventar/Udstyr).
- Management costs (In Danish: Forvaltning).
- Utility costs (In Danish: Forsyning).
- Cleaning costs (In Danish: Renhold).
- Recurring income (In Danish: Løbende indtægt).
- Non-recurring income (In Danish: Engangsindtægt).

'Accountplans' (also referred as 'SfB' and 'DFK' in the templates for Social Housing with SfB and DFK classification, respectively) for the New project Danish template, the Social housing template with SfB certification, the New basic project in English template and the templates for the DGNB certification include six elements:

- Plot, consultancy and client costs.
- Site and structure.
- Furniture and equipment.
- Management.
- Supply.
- Cleaning.

In contrast, the template of Social Housing with DFK classification differs from the above-mentioned account plans and include four elements:

- Income (In Danish: Indtægter).
- Building Elements (In Danish: Bygningsdele).
- Equipment (In Danish: Materiel).
- Activities (In Danish: Aktiviteter).

Each of the cost types has its colour, which makes it possible to separate the one to each other.

### Using account plans

You will need 'Account plans' to compile and adjust your metrics to your own needs. Despite many account plans are similar across the templates, the degree of detail etc. differ from template to template. The calculation method of each account plan also varies when the calculation refers to only the acquisition costs, only operating costs in different variants or to a combination of both acquisitions and operating costs, including also replacement.

### Export of account plans

It is possible to export data to Excel spreadsheets (XLSX format). Under 'Account plans', it is possible to export spreadsheet key figures, which send all default values into a spreadsheet that can be opened and edited in MS Excel, Libre Office and other spreadsheet programs.

Values can be exported to a spreadsheet by touching the symbol (marked with the red square in the figure) in 'Account plans/ kontoplaner' or 'Empty Rows' (Figure 22).

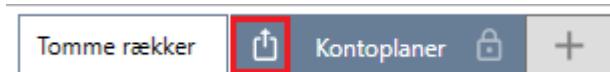


FIGURE 22. Export of account plans.

### Search function

Under the fields 'Empty rows' and 'Account plans' (field D in the Figure 14) there is a search box where you can search for rows. The found rows appear on a list. If the rows have codes, you can also search for them. You can drag the relevant row directly from the search result and insert it into the desired group. Searching is completed by pressing the grey 'X' in the circle in the search box.

## 3.8 Expenditure and income types

When you use LCCbyg, you will encounter different rows of data entry fields. Here are some of the most important types:

- Common.
- Annual maintenance.
- Periodic maintenance.
- Ongoing maintenance.
- Replacement.
- Renhold.
- Management.

Depending on the type of row, different types of row details may appear (Figure 23).

	%	DKK/occurrence	Interval (years)	Lifetime (years)	Start year	End year	Description
Common					0	50	
Maintenance			1		1	50	
Replacement	100					50	

FIGURE 23. Example on types of row details.

### **3.8.1 Common**

Under 'Common', the acquisition cost is entered for each of the cost types selected. Here it is also possible to enter a lifetime and when the values of the row should be included. Some templates contain these values, such as inherited figures from the chart of accounts (templates under 'For all users/ For alle brugere').

### **3.8.2 Management**

*NB. LCCbyg version 3 onwards use all this division of the maintenance record.*

### **3.8.3 Annual maintenance and periodic maintenance**

The maintenance record is divided into annual and periodic maintenance. The annual maintenance record mainly covers inspection, cleaning and small repairs. When the interval = 1, maintenance is included in all years, even in the year the building part is replaced. Interval = 1 is therefore used to indicate a theoretical average or to supplement periodic maintenance with tasks also being carried out in the same year as a part is replaced.

The periodic maintenance record covers all other maintenance that is repeated in intervals larger than 1 year. For values that are >1, the interval is restarted when a part is replaced. In the event of replacement, the periodic maintenance will lapse that year. When the interval is greater than the replacement interval, maintenance is not maintained.

If you want to change the maintenance items, this can be done in two ways, either by changing the % rate, or by inserting a price below DKK at the time, and thus the maintenance percentage is exceeded/overwritten.

#### **Running maintenance**

In some of the templates, there are not two rows to describe maintenance, but just one. However, it works the same way, so the interval determines how often this action should be repeated.

### **3.8.4 Replacement**

LCCbyg calculates replacement costs based on the 'Lifetime (year)' and 'Start year' for the calculation period. If the 'Start year' of replacement is greater than the end of the calculation period, the program will not calculate the replacement costs. For fixtures and fittings, it is enough to enter an acquisition cost for each piece of fixture or fittings, while operation and replacement are calculated by the application.

### **3.8.5 Cleaning**

Cleaning includes costs for different types of cleaning based on standard frequency values (per year) and unit prices.

- Frequency, i.e. how many times a year the cleaning is to be performed (calculated in number/year). For example, a frequency of 4 means that it needs to be cleaned 4 times a year. A frequency of 0.25, on the other hand, means that cleaning only takes place every four years.
- Unit price, i.e. the cost of cleaning staff including overhead costs (calculated in DKK/m<sup>2</sup> or DKK/piece).

Under 'data entry' you only need to enter quantities. However, you can overwrite the default values if necessary.

### 3.8.6 Supply

Supply includes costs for water, heat, electricity and other supply in the calculation based on suggestions for unit prices in the application. Unit prices can be overwritten with own values, for example from the local utility. If necessary, the suggestions for the default values can be overwritten during data entry. Under 'Data entry' you only have to enter the total quantities, e.g. energy requirements calculated in kWh. These quantities will usually appear in the mandatory energy frame calculations or energy labels.

### 3.8.7 Management

Management includes costs for taxes, insurance, etc. Under this type of items, the amount, unit price and start and end years must be updated.

## 3.9 Prerequisites

'Prerequisites' establish several generic calculation assumptions, i.e. calculation rate and price development for various cost groups. The 'Prerequisites' screen includes these main elements (Figure 24):

- A. The selected value for 'Interest and price trends'.
- B. Calculation rate and price development.

FIGURE 24. Prerequisites screen.

### 3.9.1 The selected value for 'Interest and price development'

The user of LCCbyg should pay particular attention to the types of price development and calculation rate that are being worked on. If working at current prices, a nominal discount rate must be used. If, on the other hand, one works with fixed prices, a real interest rate must be used, which is adjusted for inflation. The choice of calculation principle will automatically change the values below under 'Calculation rate and price development'.

### 3.9.2 ‘Calculation rate’ and ‘Price development’

LCCbyg allows the user to work with either a uniform or varying calculation or discount rate over time.

#### Discount rate

It is possible to divide into three periods. The value in the first box indicates the calculation rate used from the start time of the calculations. The term ‘From year’ marks the start time for the use of the next value for the discount rate, and similar with the last period.

In principle, it is not possible to change values specified in ‘Prerequisites’ if you work in a standard template, template for General Housing with SfB classification or template for General Housing DFK classification, as these values are locked and thus protected against change (values are shown in grey). However, you can create a copy of one of the calculation rate/price development sets and then edit the values as required (Figure 25).

Kalkulationsrente	5,00 % fra år: 36 5,00 % fra år: 71 5,00 %
Prisudvikling generelt	2,00 %
Prisudvikling for drikkevand	4,00 %
Prisudvikling for spildevand	7,00 %
Prisudvikling for energi generelt	4,00 %
Prisudvikling for fjernvarme	3,00 %
Prisudvikling for gas	1,50 %
Prisudvikling for flydende brændsel	4,00 %
Prisudvikling for fast brændsel	3,00 %
Prisudvikling for el	3,50 %
Prisudvikling for skatter og afgifter	2,00 %
Prisudvikling for forsikring	5,00 %
Prisudvikling for administration	2,00 %

FIGURE 25. Calculation rate and price development.

If you work with templates for DGNB certification or the English template, the values will not be locked, so you have the opportunity to enter the relevant values. It is not possible to copy interest and price trends when working in templates for DGNB certification or the English template. When the values are locked, they are shown in grey (field B in the Figure 25) and when the values are not locked, the colour changes to black with bold (see Figure 26 below).



FIGURE 26. The assumptions screen under the DGNB templates.

There are two different ways to work with price development in LCCbyg: Either fixed or current prices. If fixed prices are used, the amount will be the same year after year. This means that an amount of, for example, DKK 100 in year 1 will also appear as DKK 100 in all subsequent years. If current prices are worked on, the amount will change year by year, corresponding to the price development for that type of cost. For example, at an annual price development of 2 %, DKK 100 will become DKK102 in year 1, DKK122 in year 10 and DKK269 in year 50.

The user of LCCbyg should pay particular attention to whether there are types of costs that are expected to increase more or less than the average price development. If so, the default values can simply be overwritten with their values. If not, the default values can be used or simply overwritten with their. However, you must be aware that your values will then be deducted from the general price development. For example, if you want to apply a 6 % price development to a cost, and the general price trend is set at 2 % in the application, then you have to write 4 % for that cost.

## 3.10 Reports

Once you are satisfied with the update, you can generate customised reports. In 'Reports' you have the opportunity to compile and customize the report for your recipient, which can be, for example, a developer, decision-maker, user/resident representative or operator. Depending on the recipient, you can drag and paste relevant sections into your report so that the recipient receives only the relevant information. 'Reports' include three main elements (Figure 27):

- A. Main menu bar.
- B. Report sections that contain the various sections that can be included in the report.
- C. Report where you can include the relevant sections.

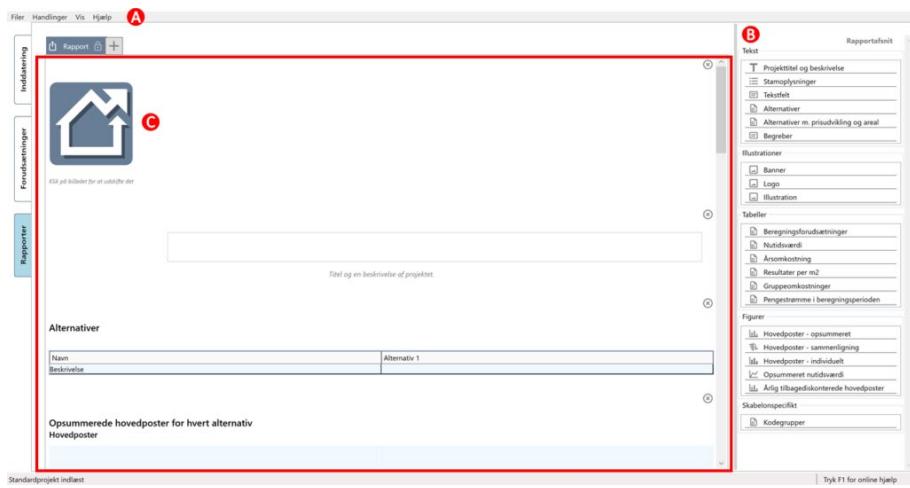


FIGURE 27. Report tab.

### 3.10.1 Project information

The 'Project information' field allows you to enter several master information about advisors as well as add a description of the project and/or the purpose of the analysis (see Figure 28 below). The entered information can be exported directly to PDF and can be stored in documents or the cloud.

### 3.10.2 Report sections

Under 'Report sections' you can choose to include all sections or just the relevant sections for the final report. For each section, you will find a symbol to the right of the section name that illustrates whether the section appears in image, text, graph, or table. The report section consists of the following parts as illustrated in Figure 28.

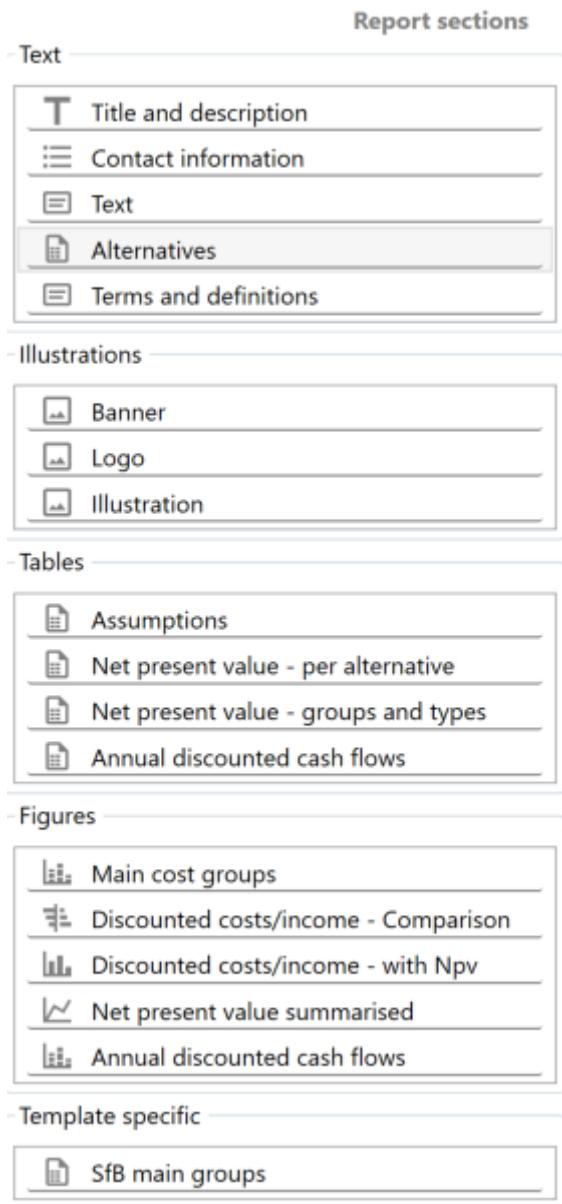


FIGURE 28. The sections that can be selected under 'Reports'.

In report sections, you select which sections you want to include in the final report. The report sections are shown on the right side of the screen (field B in the figure). You can select a wide range of report sections such as 'Banner', 'Logo', 'Illustration', 'Master Details', 'Alternatives', 'Main Cost Groups', 'Summary Present Values', etc.

You choose to include a section by holding the cursor over that section and dragging it into the left side (field C in Figure 27). You can freely choose where you want to place that section by dragging it up / down the left side. You can remove a section by touching the grey 'trashcan' in the top right of each section.

### 3.10.3 Composition of the report

Several sections are pre-set to be included in the report, but you can change it as you see fit. As a starting point, the following sections are included in the report:

- 'Logo' where you can insert a picture. If you want to insert a larger image, you can also choose to insert 'Banner' and/or 'Illustration' if applicable to the project. You can insert a

picture, banner or illustration by clicking on the image (house symbol on the top figure) or clicking on the symbol with the heading DGNB (only DGNB office building).

- ‘Headline and text’.
- ‘Basic information’.
- ‘Present value’ shown in tabular form.
- ‘Annual discounted costs’.
- ‘Summarized present values’ shown as a graph.
- ‘Concepts’ shows the definition of the important concepts.

#### **‘Net present value’ and ‘Group costs’**

Net present value is defined as the sum of the discounted future cash flows. The present value is an indication of how much money must be set aside today to cover all future costs during the calculation period.

The section ‘Present values’ summarizes the most important calculations in tabular form. The table gives an overview of the distribution of costs by main cost groups. The acquisition indicates the sum of the costs associated with the acquisition in ‘Year Zero’. The other main cost groups include operating costs over time. You can compare the alternatives selected based on the following costs and revenues:

- Acquisition costs.
- Non-recurring costs.
- Maintenance costs.
- Replacement costs.
- Management costs.
- Supply costs.
- Cleaning costs.
- Recurring income.
- Non-recurring income.
- Residual value.
- Net present value.

Group cost for each alternative is shown in tabular form and summarises the costs associated with the different main cost groups.

#### **‘Main cost groups’**

‘Main cost groups’ shows the sum of costs over the entire calculation period. Alternatives are shown in the same graph so that the results can be compared. Each entry has a specific colour that makes it easier to recognize that entry in the various alternatives. You can display the values in list form by holding the cursor over any colour on the graph (Figure 29).

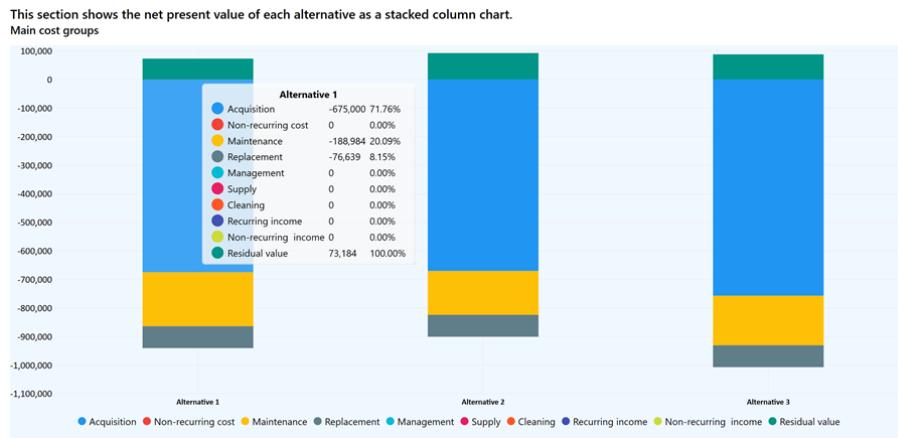


FIGURE 29. Report section: ‘Summarised values for each alternative’.

### Net present value summarised

‘Net present value’ shows the annual present values for the selected alternatives throughout the calculation period. The values for the different alternatives are shown as a graph, where the y-axis shows cost, while the x-axis shows the year (the specified calculation period). To display the present value in a particular year, hold the cursor over the year and a text box will appear showing values for the selected alternatives (Figure 30) for that year (the year is shown in black and bold).

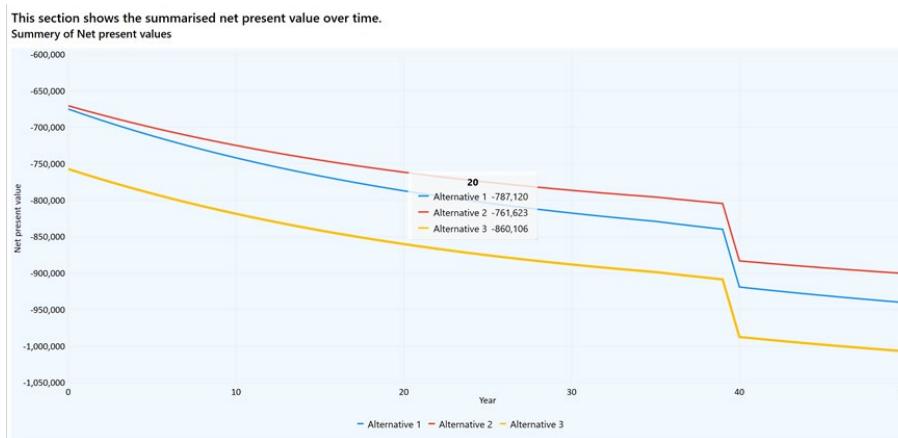


FIGURE 30. Report section: ‘Summary net present value’.

### Cost groups

‘Cost groups’ shows the annual cost of alternatives throughout the calculation period. The values are comparable in that they appear on the same graph.

### Annual discounted costs

The annual cost is defined as an annuity of the present value. The annual cost expresses the average amount of money to be allocated each year during the calculation period. The graph shows the residual value for each year for the entire calculation period.

### 3.11 Export of report

When you are satisfied with your choices, you can generate a report by tapping on 'Report' in the top menu bar (Figure 31). This opens a new screen where you select where you want to save the report in the usual way. When the application has saved the project file, you will be asked if you want to open the saved file. Click 'Yes' to see the report immediately. Click 'No' if you want to wait to see the report.

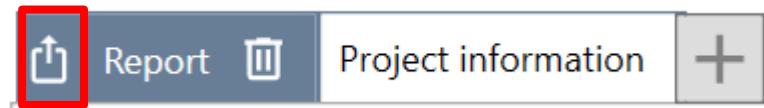


FIGURE 31. Export of report.

The report is saved as a PDF document, which can be sent to, for example, decision-makers and others who are only interested in reading the report. If the recipient also needs to be able to continue with the calculations, you should instead send the project file, which is saved in XML format (lccxml) and can be reloaded in the application with the recipient. You can do this by clicking 'File -> Save As' or using the shortcut key Ctrl+S (Learn more in the Main menu bar). Similarly, you can save project information as a standalone PDF file.

LCCbyg is a calculation tool for lifecycle cost calculations for buildings or building parts. LCCbyg produces a clear overview of the building's lifecycle costs and revenues seen over the selected calculation period with regard to acquisition, operation, maintenance, supply, cleaning, etc. LCCbyg can support decision-makers in comparing two or more alternative solutions and choose the most economical solution in the long run. This publication describes how to install LCCbyg version 3.1 on a computer depending on the operating system and how to use the various functions of the application.

1<sup>st</sup> edition, 2020  
ISBN 978-87-563-1960-7



**DEPARTMENT OF THE BUILT ENVIRONMENT**  
AALBORG UNIVERSITY