ECO1.1

Life cycle cost

Objective

Our objective is sensible and conscious use of economic resources throughout the entire life cycle of a building. In the conception and planning phases of implementation of a building, there are areas of significant optimisation potential for later economic management. The parties involved in the planning process should regularly focus on possible follow-up costs associated with their design and implementation variants from an early stage in the planning phases.

Benefits

In addition to yields from the production and exploitation costs, the economic viability of a building depends on cost-efficient operation. To this end, the life cycle cost calculation enables the medium-term to long-term costs of a building to be taken into account. Carrying out the life cycle cost calculations and communicating them to the parties involved in planning more regularly and earlier in the planning process increases the likelihood of achieving solutions optimised for cost-efficiency in the long term. This method can also serve as a basis for determining a transparent cost comparison for buildings with similar usage and functionality, which can be used as a guide for the performance of the project under development. For this step, the life cycle cost calculation is performed on the basis of fixed parameters in accordance with defined conventions, and can then be used comparative assessment using appropriate benchmarks.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Moderate	7.1	Access to modern energy services	7.1.a/b	Resource conservation
	7.3	Energy efficiency	11.3	Residential
	12.2	Use of natural resources		
Low	1.1	Eliminating extreme poverty	1.1.a/b	Poverty
	1.2	Halving poverty		

Outlook

The current version of the criterion emphasises the importance of continuous monitoring of life cycle costs and assessment of variants at various points during the planning process in order to achieve cost-efficient buildings, and new indicators have been introduced to that end. The comparison calculation for the life cycle costs continues to be an essential instrument for providing the project team with guidance concerning how well their project compares to others.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Education** **Residential** **Hotel** **Consumer market** **Shopping centre** **Department stores** **Logistics** **Assembly buildings**	**10.0%**	**4**
Production	**12.9%**	**4**

EVALUATION

Regular checking of the life cycle costs for the current planning status throughout the entire planning process is acknowledged via indicator 1. The development and analysis of the life cycle costs of variants is evaluated via indicator 2. If the life cycle costs are determined in accordance with a fixed method and compared to a comparison value (benchmark), a result that moderately exceeds or, where appropriate, falls below the benchmark value can – depending on the level of deviation from the comparison value – be incorporated positively into the evaluation in indicator 3. A maximum of 80 points can be achieved in this indicator. A circular economy bonus can be incorporated into the evaluation with a maximum of 10 points (5 points per implemented solution). Without a bonus, a maximum of 100 points can be achieved, or a maximum of 110 points with bonuses (this also applies to consumer markets including possible additional points). The point distribution for **Assembly buildings** is differentiates from the other schemes due to the limited data for benchmark establishment.

NO.	INDICATOR	POINTS
1	**Calculations of the life cycle costs in the planning process**	
1.1	**Integration of calculations of the life cycle costs into the planning process**	**Max. 10**
	Assembly buildings	**Max. 20**
1.1.1	A life cycle costs system/ model is drawn up for the project in an early planning phase. The building variants included in the planning phase are compared with regard to their production costs and relevant follow-up costs, at minimum including the expected energy costs.	+5
	Assembly buildings	+10
1.1.2	The life cycle costs are determined at regular intervals during the planning process (adjusted to match the relevant planning status) and are communicated within the planning team. All relevant building-related follow-up costs are fully integrated into the calculations in HOAI service phase 4 at the latest. (HOAI - Official Scale of Fees for Services by Architects and Engineers. The service phases described under the chapter “terms and definitions” (T&D_01) of the document “Evaluation and structure of the DGNB system)	+5
	Assembly buildings	+10
2	**Life cycle cost optimisation**	
2.1	**Life cycle cost optimisation during the planning process**	**Max. 10**
	Assembly buildings	**Max. 20**
2.1.1	The effects of significant alternative decisions on the expected life cycle costs are determined for the building. This process is carried out as an extensive full consideration of the entire building.	**+ Max. 7**
	Assembly buildings	**+ Max. 14**
	■ Per alternative as part of a full consideration within the scope of service phase 2, service phase 3 or service phase 4	+3
	Assembly buildings	+6
	■ Per alternative as part of a full consideration within the scope of service phase 5, service phase 6 or service phase 7	+2
	Assembly buildings	+4
2.1.2	The effects of significant decisions on the expected life cycle costs are determined for the	**+ Max. 3**

building. This process is carried out as a partial analysis (section) for the relevant building components and follow-up costs.

Assembly buildings **Max. 6**

- Per alternative as part of a partial analysis within the scope of service phase 2, service phase 3 or service phase 4 +2

Assembly buildings +4

- Per alternative as part of a partial analysis within the scope of service phase 5, service phase 6 or service phase 7 +1

Assembly buildings +2

INNOVATION AREA **Same as 2.1**

Re 2.1 Explanation: Alternative approaches that achieve optimisation of the life cycle costs can also be selected and credited.

2.2 CIRCULAR ECONOMY BONUS – REUSE **+ Max. 10**

Explanation: If a significant portion of the relevant reference value of components is demonstrably reused or implemented in or on the building via business models that conform to the circular/sharing economy concept and ensure or significantly support recyclability, the bonus can be awarded (e.g. performance contracting with recovery or reuse strategy). For each circular economy solution implemented, 5 bonus points can be awarded. +5

NO.	CATEGORY 1	CATEGORY 2	CATEGORY 3	POINTS
3	**Building-related life cycle costs**			
3.1	**Assessment and comparison of the building-related life cycle costs** Costs are given as a net value per m² of gross floor area EUR/m²GFA$_S$ for selected structural and technical components in accordance with Appendix 1, for selected occupancy costs i.e. selected operation costs (supply and disposal, cleaning, energy consumption, operation, inspection, and maintenance) and selected maintenance costs (for details, see Appendix 2 and 3) based on a reference period of 50 years (**Logistics** and **Production** = 20 years). All specifications (if not marked separately) in EUR/m²GFA$_S$ (gross floor area “standard case” in accordance with the T&D_04).			
	Office **Education** **Residential** **Shopping centre** **Department stores** **Logistics** **Production** **Hotel**			**10–80**
	Assembly buildings			**10–60**
	Consumer market			**10–90**
3.1.1	**Office**	**Office buildings – medium standard**	**Office buildings – buildings with increased representativeness requirements**	**10–80**
		≤ 6447	≤ 6755	10
		≤ 5033	≤ 5536	40
		≤ 3661	≤ 4164	80
3.1.2	**Education**	**Day care**	**Schools**	**Institutional buildings**	**10–80**

		facilities/kindergartens			
		≤ 6477	≤ 6700	≤ 8255	10
		≤ 4986	≤ 5164	≤ 6578	40
		≤ 3815	≤ 3992	≤ 5406	80
3.1.3	**Residential**	**Residential buildings (at least 6 residential units)**			**10–80**
		≤ 5660			10
		≤ 4239			40
		≤ 3093			80

NO.		CATEGORY 1	CATEGORY 2	CATEGORY 3	POINTS
3.1.4	**Consumer market**	**Retail/ supermarket**			**+ (10–80)**
		≤ 4589			10
		≤ 3614			40
		≤ 2471			80
		Additional points that can be awarded when using refrigerated counters:			
		Annual energy consumption per linear metre of refrigerated counter			**+ (1–10)**
		≤ 3000 kWh/linear metre			1
		≤ 1200 kWh/linear metre			10
3.1.5	**Shopping centre**	**Shopping centre**			**10–80**
		≤ 7040			10
		≤ 5373			40
		≤ 3807			80
3.1.6	**Department stores**	**Retail parks**	**Department stores**		**10–80**
		≤ 5311	≤ 6476		10
		≤ 4096	≤ 5155		40
		≤ 3020	≤ 4079		80
3.1.7	**Logistics Production**	**Warehouses/logistics/ Production facilities with low requirements**	**Production facilities with increased requirements**		**10–80**
		≤ 2577	≤ 2718		10
		≤ 2004	≤ 2121		40
		≤ 1629	≤ 1747		80
	Alternatively :				
		Warehouses/logistics/ Production facilities with low requirements in €/m²GV (Gross Volume)	**Production facilities with increased requirements in €/m²GV (Gross Volume)**		

		≤ 258	≤ 272	10
		≤ 200	≤ 212	40
		≤ 163	≤ 175	80
3.1.8	**Hotel**	**Hotel – standard (0–3 stars)**	**Hotel – upscale (4 or more stars)**	**10–80**
		≤ 9809	≤ 12,041	10
		≤ 7483	≤ 9156	40
		≤ 4449	≤ 5477	80
3.1.9	**Assembly buildings**	**Assembly buildings**		**10–60**
		≤ 10563		10
		≤ 6670		30
		≤ 4609		60

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The life cycle cost value in accordance with the DGNB method can be communicated as key performance indicators (KPIs).
The LCC results and calculation basis can also be used for reporting in accordance with the "Level(s) – Common EU framework of core environmental indicators" (additional information regarding the EU framework is under the T&D_02).

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Building-related life cycle costs in accordance with the DGNB, corresponds to Level(s) indicator 6.1 "Life cycle costs" (simplified reporting option) Note 1: If the detailed assessment is carried out and the disposal costs are also calculated, the reporting corresponds to the "non-simplified" option. Note 2: In addition to the DGNB requirements, in accordance with Level(s), the expected servicing and repair costs must also be specified as irregular payments in addition to the regular payments. Note 3: The data sources must be specified in detail in accordance with Level(s) for all life cycle modules and elements in accordance with the defined method. Note 4: Information regarding the conventions for the calculation can be taken directly from the LCC method (e.g. discount rates, reference period)	[EUR/m² GFA*a]

Synergies with DGNB system applications

- **DGNB BUILDINGS IN USE:** The result of indicator 3.1 can be used as a basis for comparison in criterion ECO9.1 from the scheme for buildings in use.
- **DGNB RENOVATED BUILDINGS:** The calculation model and the result of indicator 3.1 can be used as a basis for comparison in criterion ECO1.1 from the scheme for renovated buildings.
- **DGNB DISTRICTS**: Certain input values and the result of indicator 3.1 can be used as a basis for comparison in criterion ECO1.1 from the schemes for urban districts, industrial sites and business districts.
- **DGNB INTERIORS:** The calculation model and the result of indicator 3.1 can be used as a basis for comparison in criterion ECO1.1 from the scheme for interiors.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

In addition to yields on the manufacturing and exploitation costs, the economic viability of a building depends on cost-efficient operation. To this end, the life cycle cost calculation enables the medium-term to long-term costs of a building to be taken into account. These figures can be used as a basis for a transparent cost comparison for buildings with similar usage and functionality in order to carry out further analyses and optimisation. The calculation is carried out in accordance with fixed parameters and implements a comparative assessment on the basis of benchmarks.

II. Additional explanation

Life cycle cost planning carried out alongside the process can be used to identify cost drivers as well as win-win solutions (e.g. measures that are worthwhile for both environmental reasons and economic reasons). This enables a life cycle cost calculation to contribute to a balanced analysis of measures across various topics in the DGNB certification system. Options and alternatives are examined in terms of their short-term, medium-term and long-term cost-efficiency and thereby potentially contribute to strengthening the economic viability of the building.

The life cycle costs normally include all costs that arise throughout the lifetime of a building:

- Construction or (initial) investment costs: Costs incurred in the production phase (costs for planning and implementation).
- Follow-up costs or selected operation costs: Property management, operation and repair costs.
- Recovery costs: Costs for demolition, dismantling, recycling and disposal (due to use of the net present value method, these costs currently make up an insignificant portion of the life cycle costs and are therefore not taken into account in the comparison costs method (indicator 3)).

The life cycle costs are organised by cost types, as this is the only way to enable replacement cycles for components and maintenance to be taken into account.

III. Method

Indicator 1: Calculations of the life cycle costs in the planning process
The objective of indicator 1.1 is to clearly present the complete life cycle costs from an early planning phase, tailored to the specific context or the point in time and planning scope.

An LCC model should be drawn up in an early planning phase (service phase 2–3). The most likely/preferred building variants included are compared with regard to their production costs and relevant follow-up costs, at minimum including the expected energy costs.

In addition, points can be included in the evaluation if an LCC model is created in service phase 4 and used for evaluation, containing the following follow-up costs at a minimum ("all relevant building-related follow-up costs"):

- Supply and disposal costs (water, fuels, energy, waste water)
- Cleaning costs
- Servicing and maintenance costs
- Repair costs

From service phase 4 onwards, the assessment of the life cycle costs should contain the scope of follow-up costs shown above. Additional building-related or use-related follow-up costs or expected yields can also be included in the assessment, such as recycling costs, conversion costs, revenues and personnel costs. This method can also take into account aspects that are not part of the DGNB calculation scope in accordance with indicator 3, such as the inclusion of exterior spaces or other cost types. It is likewise possible to factor conventions into the assessments, such as interest rates.

For assessment during the planning process and communication of the life cycle costs to the planning team, target values (tailored to the planning status) must be defined that are compared to the achieved values in various planning phases.

In principle, the calculation method can be freely chosen, but it should fulfil the objectives of the sub-indicators. At the very beginning of the planning process, simple tools can be selected depending on their use, such as the multiple of yearly rents (the "*Maklermethode*" or "estate agent's method"), as a starting point for calculation of yield properties with a combination of the energy costs.

Indicator 2: Life cycle cost optimisation
The objective of planning optimised for life cycle costs is to address the follow-up costs as early as possible in the planning process and to reduce or optimise them via variant calculations. Planning optimised for life cycle costs should be carried out at various suitable points in time.

Alternatively, full considerations (life cycle costs for the entire building in accordance with the scope of analysis of indicator 3 and the minimum scope of follow-up costs specified in indicator 1) or partial analyses (life cycle costs for a section of the scope of analysis) can be incorporated into the evaluation.

Optimisations should investigate the life cycle costs of significant alternatives for relevant decisions. Depending on the planning phase, these can vary greatly and affect aspects such as variants of the A/V ratio, duration of use of planned components or the use of operating materials.

Aspects that are not part of the scope of analysis of the "cost comparison" can also be taken into account for calculating variants in the life cycle costs (see indicator 3). This includes taking other cost types (external installations

or equipment), other energy consumers (such as lifts and user equipment), operating materials (such as refrigerants) or conversion, replacement or modernisation costs into account, for example. An expanded scope of analysis can also include the assessment of possible yields (including yields relating to personnel or customers) or cost reductions relating to personnel, such as intelligent planning of future conversion measures. Conventions that differ from the cost comparison defined below (see indicator 3), such as interest rates, rates of price increases, etc., can also be factored into the alternatives.

The findings of the planning optimised for life cycle costs should be incorporated into the decision-making process.

The number of alternatives for which comprehensive or partial calculations of the life cycle costs were carried out in early or later planning phases is evaluated.

Indicator 2.2: Circular economy bonus – reuse
If a significant portion of the relevant reference value (at least 80%, based on the relevant building components (on sub-level) according to Appendix 1) of components is demonstrably reused or implemented in or on the building via business models that conform to the circular/sharing economy concept and ensure or significantly support recyclability, a circular economy bonus can be awarded (e.g. performance contracting with recovery or reuse strategy). If more than one solution is implemented, these should, if possible, be in different components (on the sub-level) or be significantly different from one another.

Indicator 3: Building-related life cycle costs
The assessment method corresponds to the explanations of ISO 15686-5:2008. In order to establish a consistent method for the DGNB documentation, there are additional specifications based on the content of the standard.

The following building components are incorporated into the assessment of the life cycle costs and the evaluation in this criterion:

Selected production costs in accordance with Appendix 1 (general description is also under the T&D_05)

- Structural Components – construction works
- Technical Components – services (in accordance with Appendix 3)

Selected operation costs in accordance with Appendix 2, 3 and 4

- Supply and disposal costs
  - Water
  - Fuels, energy
  - Sewerage
- Cleaning and maintenance of buildings
- Operation, inspection, servicing
  - Inspection and servicing of the structures
  - Inspection and servicing of the installations
- Repair costs
  - Structural repairs
  - Repair of the installations

Other costs, including the cost of the plot, planning costs, capital costs, taxes, insurance and costs for demolition and disposal of the building, are not currently included in the evaluation of the indicator.

Net present value (NPV) method

The life cycle costs that occur as a result of the production and operation costs, distributed across a specified time frame, are capitalised over the year of certification and expressed as a net present value. The net present value method enables different cost/time progressions to be compared to one another. This makes it possible to weigh up initial expenditures and later follow-up costs or even savings. Application of the net present value method requires both the details of costs and information regarding the payment date. This method takes into account both price developments (price increases) and the effective interest rate.

The net present value represents the current capital value of the costs accumulated during the reference period.

The cost levels of the benchmarks are defined as a reference point for the certification.

The effective interest rate is specified by the DGNB. This expresses the expected returns for the capital invested, which incorporates inflation and the risk of the investment, among other aspects.

Conventions

The life cycle cost assessment is fundamentally open-ended and can be adjusted to suit the application situation in many places. However, a requirement for using the application as an indicator to evaluate the determined parameters as part of benchmarking is that the method is precisely defined and that a wide range of parameters are explicitly specified. This is the only way to ensure that the calculation results can be compared, which is an absolute requirement.

Conventions concern the following points:

- Reference period
- Life cycle phases
- Building components included
- Calculations included
- Price development for different cost types
- Effective interest rate
- reference value
- Permitted simplifications and cut-off rules
- Partial results that are to be shown and associated descriptions
- Level of detail of the calculations and the documentation
- Timing of payments per period

These conventions are specified for indicator 3 of this criterion. In special cases or for particular schemes, deviations from these standard conventions may be appropriate. These deviating specifications are indicated depending on the scheme. The benchmarks to which the life cycle costs are compared have been determined on the basis of the same conventions.

Adaptation to German price benchmarks

General principles

DGNB has developed a LCC online tool suitable for this purpose to simplify the audit procedure (for the transition period an excel tool will be used as an alternative solution). Costs are entered into the DGNB LCC tool in local currency and adapted to German prices. DGNB conducted a worldwide comparison of building construction costs to arrive at a factor to compare German prices to other countries.
This process is automatically completed when the relevant country and its related adaptation factors are entered in the

'cost calculation' chart. The country adaptation factors for construction costs are listed in Appendix 6.

NOTE: the adaptation factors for countries not listed in Appendix 6, are to be agreed with the DGNB.

The reference year and quarter for the current version is Q3 2017. The tool generates project specific costs per square metre in local currency as well as in Euro and calculates the checklist points to be entered into the evaluation matrix (Euro (€) to local currency exchange rates see Appendix 7).

Evaluation
Evaluation in the certificate requires an assessment based on the following documents:

- The weighted life-cycle costs in €/m²GFA$_S$ for selected structural and technical building components (according to Appendix 1) and for selected costs of operation and maintenance (according to the Appendix 2, 3 and 4), based on a 50-years period (only for Logistics and Production = 20 years).
- Final energy demand of the building from the energy performance certificate (or from the energy demand simulation/calculation) for the completed building (same as from the criterion ENV1.1)
- Clear assignment to energy sources (as above, same as in criterion ENV1.1), possible details of feed-in volume and feed-in tariff:
  for the first **20 years**: the feed-in tariff can be included as a credit.
  For the following **30 years**: the feed-in tariff can no longer be included. The electricity demand of the building can be reduced with onsite produced el. energy up to a total el. energy demand of the building, unless onsite energy production is already included in the EPC calculation.
- Values from the calculations regarding water demand and waste water from the specifications of criterion "ENV2.2 – Potable water demand and waste water volume"
- Details of the servicing, inspection and repair costs using the generalised percentages specified in Appendix 3, or alternatively based on accessible and documented reference values (such as contracts, manufacturer specifications or similar)
- Assessment of the cleaning costs (see Appendix 2) on the basis of the areas and materials from the building elements catalogue for the life cycle assessment or alternatively based on accessible reference values (such as manufacturer specifications or similar)

In addition, the following documents are required for assessment in accordance with the detailed method:

- Building elements catalogue for the life cycle assessment (criterion "ENV1.1 – Building life cycle assessment")
- Durations of use of components in accordance with Appendix 3
- Detailed breakdown of production costs that can be assigned to the components in the building elements catalogue that clearly demonstrate assignment to the product-specific duration of use

Simplified method
In the simplified method, the costs for inspection, servicing and repair are shown as percentages in relation to the production costs. The production costs and the operating costs for energy demand, cleaning and water/waste water are recorded in detail.

The reference period for the building components that are to be taken into account and the calculation parameters are specified in the "Conventions" section (see usage-specific description) and the appendices.

The applicable percentages for the generalised representation must be taken from Appendix 3. This appendix

depends on the scheme in question.

Detailed method
The detailed method expands the breakdown of the production costs from the simplified method on the sub-level in accordance with Appendix 1 (including reference values and building specification). The detailed method can only be applied in full, which means that if foundation is considered in detail, the entirety of structural components must be shown in detail. This is intended to prevent elements with a long duration of use being shown "in detail" while the generalised average from the simplified method is used for other elements.

The following applies for the analysis of the repair costs: Depending on the installation situation and usage situation of an element, either an appropriate and plausible assignment of the duration of use from Appendix 3 must be reached, or, as an alternative, accessible reference values, manufacturer specifications or similar must be used. In addition, a breakdown of the production costs that goes beyond sub-level in accordance with Appendix 1 may be necessary.

For all other costs taken into account, the approaches used in the simplified method (including working with accessible reference values, manufacturer specifications or similar) continue to apply in exactly the same way.
The DGNB provides a tool for submission of documentation that calculates the LCC data and transfers the results for the subsequent conformity check. When using this tool, the production costs which are project-specific for time of completion, must be adjusted to reflect the reference price levels using relevant price indices for the country in question. The corresponding information must be entered in the "Basic data" tab under reference values. The reference year and quarter for the current version is **Q3 2017**.

The following data must be determined in order to retrieve the construction cost index:

- Year: Project-specific
- Quarter: Project-specific
- Measured figures with/without VAT: Indices including VAT
- Building type: Project-specific
- Form: Construction work on the building

Appendices depending on scheme

- Appendix 1: Building Components to be included in accordance with this appendix
- Appendix 2: Cleaning costs
- Appendix 3: Parameters for servicing and maintenance
- Appendix 4: Applicable unit prices for energy sources, fresh water and waste water

IV. Usage-specific description

Conventions

Office **Education** **Residential** **Consumer market** **Shopping centre** **Department stores** **Hotel**

The following conventions must be assumed for assessment of the life cycle costs:

Table 1: Conventions for the calculation of the life cycle costs (various schemes)

CONVENTIONS	
Reference period	50 years
Life cycle phases	Construction, use
Costs	Selected building components: **Production costs in accordance with Appendix 1** Structural Components – construction works Technical Components – installations (incl. maintenance in accordance with Appendix 3) **Operation costs in accordance with Appendix 2** Supply and disposal costs Water Fuels, energy Sewerage Cleaning and maintenance of buildings Inspection and servicing of the structures Inspection and servicing of the installations Repair costs Structural repairs Repair of the installations
Calculations included	Final energy demand, water demand and waste water, cleaning areas
Price development for different cost types	General construction price increase 2% Costs for water and waste water 2% Costs for energy 5%
Effective interest rate	3%[1]
reference value	m² GFA_S / **Department stores**: m² GFA
Permitted simplifications, cut-off rules	Current cost level with an estimate of the costs for the final

[1] Determination: On the one hand, the used guide value for determining the cost-optimal levels for energy efficiency calculations in accordance with "Guidelines accompanying Commission Delegated Regulation (EU) No 244/2012 of 16 January 2012 supplementing Directive 2010/31/EU of the European Parliament and of the Council on the energy performance of buildings by establishing a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements" was used for determining the effective interest rate. On the other hand, assessments carried out in-house in 2017 show that an effective interest rate of 3% constitutes a justified assumption.

	invoice for completion of the building. Representation of the entire building or, for partial buildings, in accordance with the system limits Cost information on main-level of structural components, on sub-level of technical components in accordance with Appendix 1 in the simplified method For the detailed method, documentation of the components in the same way as for the simplified method of the life cycle assessment (criterion "ENV1.1 – Building life cycle assessment")
Partial results that are to be shown and associated descriptions	Net present value divided into: ■ Structural components production costs in accordance with Appendix 1 ■ Technical components production costs in accordance with Appendix 1 Separate operating costs for: ■ Water, ■ Energy, ■ Waste water, ■ Cleaning and maintenance Operation costs divided into: ■ Inspection and servicing ■ Repair (separately for structural and technical components in accordance with Appendix 1 and 3)
Level of detail of the calculations and the documentation	See description for the simplified and detailed method
Timing of the payment per period	In arrears

Logistics **Production**

In contrast to the requirements of the other schemes, the final energy demand may be determined via a thermal simulation as an alternative to the building energy performance certificate. See also criterion "ENV1.1 – Building life cycle assessment".

The reference period comprises 20 years.

For industrial buildings with a clear room height greater than 12 m, [m³ GV*a] must be selected as the unit of reference for the calculation of the evaluation points. For single-storey and multi-storey industrial buildings with a clear room height less than 12 m, the reference value [m² GFAs* a] must be selected.

The following conventions must be assumed for assessment of the life cycle costs:

Table 2: Conventions for the calculation of the life cycle costs (**Logistics** and **Production**)

CONVENTIONS	
Reference period	20 years
Life cycle phases	Construction, use
Costs	Selected building components: **Production costs in accordance with Appendix 1** Structural components – construction works Technical components – installations (incl. maintenance in accordance with appendix 3) **Operation costs in accordance Appendix 2** Supply and disposal costs Water Fuels, energy Sewerage Cleaning and maintenance of buildings Inspection and servicing of the structures Inspection and servicing of the installations Repair costs Structural repairs Repair of the installations
Calculations included	Final energy demand, water demand and waste water, cleaning areas
Price development for different cost type	General construction price increase 2% Costs for water and waste water 2% Costs for energy 5%
Effective interest rate	3%[2]
reference value	m² GFA_S or m³ GV
Permitted simplifications, cut-off rules	Current cost level with an estimate of the costs for the final invoice for completion of the building. Representation of the entire building or, for partial buildings, in accordance with the system limits Cost information on main-level of structural components, sub-level of technical components in accordance with Appendix 1 in the simplified method.

[2] See footnote 1

	For the detailed method, documentation of the components in the same way as for the simplified method of the life cycle assessment (criterion ENV1.1)
Partial results that are to be shown and associated descriptions	Net present value divided into: ■ Production costs of the structural components in accordance with Appendix 1 ■ Production costs of the technical components in accordance with Appendix 1 Separate operating costs for: ■ Water, ■ Energy, ■ Waste water, ■ Cleaning and maintenance Operation costs divided into: ■ Inspection and servicing ■ Repair (separately for structural and technical components in accordance with Appendix 1 and 3)
Level of detail of the calculations and the documentation	See description for the simplified and detailed method
Timing of the payment per period	In arrears

Special conditions and additional expenses

In the event of justified additional expenses due to special requirements and conditions, these may be deducted from the statement of life cycle costs. A plausible, clear and justified statement of the additional expenses is required for this.

Typical cases where additional expenses are considered neutral for the evaluation include:

- Difficult foundation soil conditions
- Supporting adjacent structures
- Special requirements under construction law, such as historic preservation orders
- Innovations that are prototypical in nature

The additional expense associated with the special conditions must be quantified (e.g. documentation of the costs on the sub-level in accordance with Appendix 1 with associated reference values and building specification). The substantiated additional expense (not the overall costs) may be subtracted from the production costs.

The additional expenses, costs resulting directly from an innovation (in accordance with Appendix 1 on the sub-level or individual element) must be documented.

Alternatively, in the event of a significant discrepancy between the building evaluated as part of the certification process and the assumptions used as a basis for the production costs of the reference value, target value and limit value definition (benchmarks), the benchmarks for the "production costs" benchmark element can be adjusted on a project-specific basis following agreement with the DGNB. The underlying assumptions for calculation of the

benchmarks are shown in Appendix 5. The country-specific / project-specific adjustment is permitted for all uses and is recommended for the various climatic zones and structures such as high-rise buildings and high-bay warehouses.

Categorisation

Office **Residential**

For the purposes of evaluation, the building must be plausibly and clearly categorised into one of the following three categories:

Category 1: New buildings are generally evaluated in category 1.

Category 2: Buildings with above-average requirements in terms of representativeness are evaluated in category 2. The measures and features that help achieve the required level of representativeness must be described in order to justify classification into category 2.

Classification into category 2 must be justified in detail and verifiably documented. If this is not done, the building is categorised into category 1 as standard.

The following must be considered to constitute above-average requirements in terms of representativeness:

- High-quality, high-durability materials (in floors and walls) in terms of materiality and construction
- Requirements resulting from a location of category A (lucrative, high-traffic (business) location in the centre of a town or city)
- Advanced technical facilities

Education

For the purposes of evaluation, the building must be plausibly and clearly categorised into one of the following three categories:

- Day care facilities, kindergartens
- Schools
- Institutional buildings

Consumer market

Consumer markets are evaluated in category 1. If the building contains refrigerated counters, additional points can be awarded if the associated annual energy consumption per linear metre of refrigeration units falls below the reference value of 3000 kWh/linear metre.

Table 3: Energy consumption of refrigerated counters

ANNUAL ENERGY CONSUMPTION PER LINEAR METRE OF REFRIGERATED COUNTER	POINTS
≤ 3000 kWh/linear metre	1
≤ 1200 kWh/linear metre	10

Linear interpolations can be carried out between the specified values.

Shopping centre

For shopping centres, fit-out carried out by the tenant in the rental areas is excluded from the analysis.

Shopping centres are evaluated in category 1.

If the building includes underground garages or multi-storey car parks, the life cycle costs can be adjusted for the costs of these areas. Areas 7.4 (vehicle parking areas), 9.4 (vehicle circulation areas) and 9.9 (other circulation areas (such as driving lanes)) in accordance with the space and area description under the chapter T&D_04 must be taken into account.
This deduction can be carried out using a detailed method via documentation of the actual costs incurred for these areas, or alternatively using cost parameters from the German Information Centre for Construction Costs adapted to the local construction costs (adaptation factors according to Appendix 6).

Table 4: Lump sum cost deduction for the areas 7.4, 9.4 and 9.9 in accordance with T&D_04.

TYPE OF CAR PARK	DEDUCTION IN ACCORDANCE WITH THE GERMAN INFORMATION CENTRE FOR CONSTRUCTION COSTS 2017 (NET) ADAPTED TO THE LOCAL COSTS
Underground garages	673 €/m² GFA_S / Country adaptation factor
Multi-storey car parks	543 €/m² GFA / Country adaptation factor

Department stores

If the building includes underground garages or multi-storey car parks, the life cycle costs can be adjusted for the costs of these areas. Areas 7.4 (vehicle parking areas), 9.4 (vehicle circulation areas) and 9.9 (other circulation areas (such as driving lanes)) in accordance with T&D_04 must be taken into account.
This deduction can be carried out using a detailed method via documentation of the actual costs incurred for these areas, or alternatively using cost parameters from the German information centre for construction costs adapted to the local construction costs (adaptation factors according to Appendix 6)

Table 5: Lump sum cost deduction for the areas 7.4, 9.4 and 9.9 in accordance with T&D_04.

TYPE OF CAR PARK	DEDUCTION IN ACCORDANCE WITH THE GERMAN INFORMATION CENTRE FOR CONSTRUCTION COSTS 2017 (NET) ADAPTED TO THE LOCAL COSTS
Underground garages	673 €/m² GFA_S / Country adaptation factor
Multi-storey car parks	543 €/m² GFA / Country adaptation factor

Logistics **Production**

For the purposes of evaluation, the building must be plausibly and clearly categorised into one of the following two categories:

- **Category 1:** Warehouses/logistics buildings as well as production facilities with low requirements are generally evaluated in category 1

- **Category 2:** Production facilities with increased requirements

In principle, logistics buildings and production facilities must be assigned to the following categories depending on the type of air conditioning they use:

I: No air conditioning
II: Heated; indoor air temperatures between 0 °C and 12 °C
III: Heated; indoor air temperatures between 12 °C and 19 °C
IV: Heated; indoor air temperatures > 19 °C
V: Heated, cooled; indoor air temperatures > 19 °C
VI: Air conditioned; indoor air temperatures > 19 °C
VII: Refrigerated; indoor air temperatures < -5 °C

For properties of category VII, the building technology system components of the refrigeration technology including production costs and associated servicing, inspection, repair and disposal costs – must be taken into account in the LCC calculation.

The final energy demand for refrigeration must be determined separately and calculated over a reference period of 20 years, but is not incorporated into the LCC calculation.

Hotel

For the purposes of evaluation, the building must be clearly categorised into one of the following two categories depending on its designation in accordance with the World Tourism Organization (UNWTO) hotel classification system or classification system in cooperation with the ECC-Net (The European Consumer Centres' Network):

- **Category 1:** 0 to 3 stars
- **Category 2:** 4 or more stars or higher level of facilities (swimming pool, spa, etc.)

Assembly buildings

If the building includes underground garages or multi-storey car parks, the life cycle costs can be adjusted for the costs of these areas. Areas 7.4 (vehicle parking areas), 9.4 (vehicle circulation areas) and 9.9 (other circulation areas (such as driving lanes)) in accordance with T&D_04 must be taken into account.
This deduction can be carried out using a detailed method via documentation of the actual costs incurred for these areas, or alternatively using cost parameters from the German information centre for construction costs adapted to the local construction costs (adaptation factors according to Appendix 6)

Table 6: Lump sum cost deduction for the areas 7.4, 9.4 and 9.9 in accordance with T&D_04.

TYPE OF CAR PARK	DEDUCTION IN ACCORDANCE WITH THE GERMAN INFORMATION CENTRE FOR CONSTRUCTION COSTS 2017 (NET) ADAPTED TO THE LOCAL COSTS
Underground garages	673 €/m² GFA_S / Country adaptation factor
Multi-storey car parks	543 €/m² GFA / Country adaptation factor

Appendix 1

The following components must be included in the respective cost calculations:

The following building components and facilities are included:

PRODUCTION COSTS	RENOVATION	MAINTENANCE	ENERGY	WATER/WASTE WATER	CLEANING	BUILDING COMPONENTS (MAIN AND SUB-LEVELS)		CONTENT
							Site	
							Clearance and development	Cost of all preparatory measures required to enable construction work on the site
							Structural building components	Costs of works and supplies relating to the construction of the building but not including services. This group comprises fitments permanently fixed to the building fabric and designed for its particular function, as well as other general measures undertaken in connection with the construction works.
X	X	X					**Excavation**	Soil removal (primary excavation), excavation including working space excavation and slope cutting, storage, backfilling, transport to and from site
X	X	X					**Foundations**	The following costs comprise the associated earthworks and bindings.
X	X	X		X	X		**External walls**	Walls and columns that are exposed to external atmosphere or adjoin the soil or other structures
X	X	X		X	X		Load-bearing external walls	Load-bearing external walls, including horizontal damp-proofing
X	X	X					Non-load-bearing external walls	External walls, parapets, infillings, but not including claddings
X	X	X					External columns	Columns and piers with a slenderness ratio of 1:5 or less
X	X	X		X	X		External doors and windows	Windows and display windows, doors and gates, including sills, frames, fittings, actuating systems, ventilation components and other built-in elements
X	X	X		X	X		Cladding units	External claddings of external walls and columns, including plaster coats, damp-proofing, insulating and protective layers
X	X	X					Internal linings (of external walls)	Internal linings of external walls and columns, including plaster coats, damp-proofing, insulating and protective layers
X	X	X		X	X		Prefabricated façade units	Prefabricated façade units, consisting of external walls, windows, doors, claddings
X	X	X		X	X		Solar protection	Roller shutters, awnings, blinds, including actuating systems
X	X	X					External walls, other items	Gratings, railings, buffers, and handrails
X	X	X					**Internal walls**	Internal walls and columns
X	X	X					**Floors and ceilings**	Floors and ceilings, stairs and ramps above the foundations and beneath the roof area

X	X	X					Floor structures	Floors, stairs, ramps, balconies, loggias, including suspender beams and joists, and infill elements such as hollow blocks, false floors, fills, but not including coverings and linings
X	X	X		X	X		Floorings	Coverings on floors, including screeds, damp-proof courses, insulating and protective layers, wearing surfaces; false floors for services and floating floors
X	X	X					Ceiling linings	Linings of ceilings, including plastering, damp-proof courses, insulating and protective layers; false ceilings for lighting and other services
X	X	X					Floors and ceilings, other items	Covers, manhole tops, gratings, railings, buffers, handrails, fixed ladders, foldaway ladders
X	X	X					**Roofs**	Flat or sloping roofs
X	X	X					**Structural fitments**	Costs of fitments permanently fixed to the building fabric, but exclusive of fitments designed for its particular function. The principal criterion for distinguishing this costs from furnishing costsis that the nature of the fitments and the method by which they are fixed require technical and planning measures (e.g. preparation of plant layout plans, structural analyses and other calculations, connection to services)
X	X	X					**Other construction-related activities**	Construction work and general types of construction work that cannot be assigned to individual cost groups relating to the building structure nor included in other cost groups
							Technical building components	Costs of all services or parts thereof installed in, connected or permanently fixed to the building fabric The individual services comprise the associated supports, fixings, valves, thermal insulation, provisions for noise control and fire protection, covers, cladding, paintwork, marking and measurement and control systems.
X	X	X		X			**Sewerage, water and gas systems**	
X	X	X		X			Sewerage systems	Gullies, drains, sewers, sewage treatment systems, sewage lifting plants
X	X	X	X	X			Water supply systems	Water extraction and conditioning plants, pressure boosters, pipework, water heaters, sanitary appliances
X	X	X					Gas supply systems	Gas supply systems for industrial heating: Gas storage and generation plants, supply meter points, pressure control equipment and gas pipes, unless included in costs for heat supply systems
X	X	X					Fire-fighting installations	Sprinklers, gas extinguishing systems, extinguishing water pipes, wall hydrants, fire extinguishers
X	X	X		X			Sewerage, water and gas systems, other items	Plumbing units, sanitary blocks
X	X	X	X				**Heat supply systems**	
X	X	X	X				Heat generators	Fuel supply, heat supply meter point, heat generation based on fuel or on renewable energy sources, including chimney connections, central water heaters

X	X	X	X				Heat distribution networks	Pumps, distributors; pipework for space heating, HVAC systems and other heat consumers
X	X	X	X				Space heating	Radiators, panel heating systems
X	X	X	X				Heat supply systems, other items	Chimneys, unless included in other cost groups
X	X	X	X				**Air treatment systems**	Systems with and without ventilation functions
X	X	X	X				Ventilation systems	Exhaust air systems, supply air systems, exhaust/supply air systems with or without a thermodynamic air treatment function, mechanical smoke extraction systems
X	X	X	X				Partial air conditioning systems	Systems with two or three thermodynamic air treatment functions
X	X	X	X				Air conditioning systems	Systems with four thermodynamic air treatment functions
							Process air plants	Paint mist separation systems, process exhaust air systems, suction plants
X	X	X	X				Refrigerating plants	Refrigerating plants for air treatment systems: chilling and recooling plants, including pumps, distributors and pipework
X	X	X	X				Air treatment systems, other items	Ventilated ceilings, cooling ceilings, exhaust air windows; false floors for services, unless included in other cost groups
X	X	X					**Power installations**	
X	X	X					High and medium voltage plants	Switchboards, transformers
X	X	X					Independent power supply installations	Power generating units, including cooling, exhaust systems and fuel supply, central storage batteries and uninterruptible power supply systems, photo-voltaic systems
X	X	X					Low-voltage switchgears	Low voltage main distributors, reactive power compensators, peak reading indicators
X	X	X					Low voltage installation equipment	Cables, conduits, sub-distributors, installation systems and appliances
X	X	X	X				Lighting systems	Fixed luminaires, safety lighting
X	X	X					Lightning protection and earthing systems	Lightning rods, lightning conductors, connections to earth, equipotential bonding
X	X	X					Power installations, other items	Frequency converters
X	X	X					**Telecommunications and other communications systems**	The individual systems comprise the associated distributors, cables and wiring.
X	X	X					**Transport systems**	
X	X	X					Lifts	Passenger lifts, goods lifts
X	X	X					Escalators, moving pavements	
X	X	X					Inspection and maintenance conveyors	Window-cleaning cradles and other inspection and maintenance conveyors
X	X	X					Conveying plants	Automatic goods transport systems, office dumbwaiters, pneumatic tube conveyors
X	X	X					Cranes	Including lifting appliances
X	X	X					Transport systems, other items	Lifting platforms

X	X	X					**Building automation**	Costs of automation including associated distributors, cables and wiring
X	X	X					**Other services-related work**	Services and general measures in connection with services that cannot be assigned to separate cost groups for services or cannot be recorded in other cost groups
							External works	Costs of construction work and supplies relating to the construction of ground surfaces and circulation areas, structures and services outside of the building, unless included in costs for Clearance and development
								The individual cost groups comprise the associated work such as earth-works, substructures and foundations.
							Furnishings, furniture and artistic appointments	Costs of all movable or easily fixed furnishings and appointments re-quired for the commissioning of the structure, for general use, or for the decoration of the structure and the outdoor areas.
							Incidental building costs	Costs arising during planning and execution based on fee structures, fee scales or in accordance with other contractual agreements

Appendix 2

Cleaning costs

COST TYPES	CONTENT	€/M²A
1	**External doors and windows**	
	Easily accessible (without aids)	2.25
	Average value (e.g. façade inspection and maintenance conveyors and cleaning bridges)	3.00
	Difficult to access (e.g. cherry-pickers or climbing harnesses)	4.50
2	**Cladding units**	
	Natural stone (soft)	2.83
	Aluminium, stainless steel, copper cladding, steel (corrosion-protected)	1.42
	Ceramics, artificial stone, ashlar, natural stone (hard)	0.71
	Solar protection	2.13
3	**Internal doors and windows**	
	Internal doors	3.60
	Internal windows	2.25
4	**Floorings**	
	Artificial stone, natural stone, screed, flexible floors or similar	6.30

	Textile or similar	7.08
	Wood or similar	6.30
5	**Sanitary areas**	
	Up to 10 m²	89.25
	Up to 30 m²	59.50
	Up to 30 m²	44.63

The adaptation to local conditions could not be considered since the final benchmarks are given in accordance to German pricing index

Additional information

	€/H (NET)
Hourly charge for cleaning	17.00
Hourly charge for glass cleaning	22.50

The adaptation to local conditions could not be considered since the final benchmarks are given in accordance to German pricing index

Appendix 3

Parameters for servicing and maintenance

The following table must be applied for the LCC statement in accordance with the simplified method. The detailed method can be used to represent building components of sub-level or beyond, and involves replacing the specifications from the simplified method with specific details that must be documented. These specific details must be selected to be consistent with the information from the life cycle assessment (see also explanations of durations of use in ENV1.1).

BUILDING COMPONENTS	ASSUMED DURATION OF USE IN YEARS	EXPENDITURE FOR SERVICING/ INSPECTION IN % PER YEAR	EXPENDITURE FOR REPAIRS IN % PER YEAR
Structural building components			
	In accordance with the document "Guideline for Sustainable Building" on behalf of Ministry of Transport, Building and Housing Germany	0.1	Irregular repair: Replacement investment after expiry of the duration of use or lump sum repair cost of **0.35%** for all structural building components
Technical building components			
Sewerage, water and gas systems	50	1.01	0.98
Heat supply systems	25	0.41	0.66
Air treatment systems	25	0.96	1.10
Power installations	25	0.60	0.70
Telecommunications and other communications systems	25	1.04	1.04
Transport systems	25	1.76	1.78

Building automation	25	1.16	0.76

On the basis of VDI 2067:2000 and supplement on the basis of the values for the duration of use for components as well as AMEV 2013, adjusted (without operation)

The details regarding repair of the building technology (technical building components) should be considered to refer to "ongoing repairs". A replacement investment after expiry of the duration of use must also be taken into account, but this currently does not include demolition and disposal.

Simplified method:
As an alternative to the simplified method, a detailed list can also be compiled.
For technical building components, it is permissible to assume a replacement investment after 20 years across all components.

Appendix 4

Applicable unit prices for energy sources, fresh water and waste water

MEDIUM	TYPE	NET PRICE/UNIT
Electricity	electricity power generation mix	0.25 €/kWh
Oil		0.06 €/kWh
Natural gas		0.06 €/kWh
Wood pellets		0.05 €/kWh
Woodchips		0.03 €/kWh
Long-distance district heating/CHP	Fossil	0.09 €/kWh
	Renewable	0.07 €/kWh
Fresh water		2.01 €/m³
Waste water	Used water	2.14 €/m³
	Precipitation	1.10 €/m³

Source for electricity price: BDEW 2017, approx. four-year average, net

The adaptation to local conditions could not be considered since the final benchmarks are given in accordance to German pricing index

Appendix 5

Basis of the LCC benchmarks

Production costs:
As a general rule, the target value and reference value of the production costs are assumed to be equal ("sustainable construction does not cost more than the present standard").

Basic data for establishing benchmarks for the schemes: Total of production costs for building structural and technical components (all data in EUR/m² GFA_S – net)

Office	**Buildings of medium standard**		**Buildings with increased representativeness requirements**	
Reference and target value	1723	Average value of medium and high standard for office buildings in accordance with the German information centre for construction costs 2017 (details in T&D_06)	2052	High standard in accordance with the German information centre for construction costs 2017 (details in T&D_06)
Limit value	2052	High standard in accordance with the German information centre for construction costs 2017	2258	10% above reference value

Education	**Day care facilities/kindergartens**		**Schools**		**Institutional buildings**	
Reference and target value	1383	Average value of medium and high standard for day care facilities in accordance with the German information centre for construction costs 2017	1447	General education schools in accordance with the German information centre for construction costs 2017	2037	Institutional buildings in accordance with the German information centre for construction costs 2017
Limit value	1494	High standard for day care facilities in accordance with the German information centre for construction costs 2017	1592	10% above reference value	2240	10% above reference value

Residential	**Buildings of medium and higher standard**			
Reference and target value	939	High standard for apartment buildings (6–19 residential units) in accordance with the German information centre for construction costs 2017 * factor of 1.1		
Limit value	1024	10% above reference value		
Consumer market	**Retail/supermarket**		**Shopping centre**	
Shopping centre				
Reference and target value	1300	DGNB evaluation	1152	Department stores with no residential function in accordance with the German information centre for construction costs 2017 * factor of 1.2
Limit value	1500	DGNB evaluation	1267	10% above reference value
Department stores	**Retail parks**		**Department stores**	
Reference and target value	922	Consumer markets in accordance with the German information centre for construction costs 2017	1547	Department stores, in-house assessments
Limit value	1014	10% above reference value	1701	10% above reference value
Logistics **Production**	**Warehouses/logistics/production facilities with low requirements**		**Production facilities with increased requirements**	
Reference and target value	908	Average value for logistics buildings not intended for mixed use and skeleton construction of	1019	Solid construction of production buildings in accordance with the German

		production buildings in accordance with the German information centre for construction costs 2017		information centre for construction costs 2017
Limit value	1089	20% above reference value	1223	20% above reference value
Hotel	**0–3 stars**		**4 or more stars**	
Reference and target value	938	In-house assessments for hotels	1263	In-house assessments for hotels
Limit value	1031	10% above reference value	1389	10% above reference value
Assembly buildings	**Assembly buildings**			
Reference and target value	2150	Mean value of buildings for cultural and musical purposes according to German information centre for construction costs 2019		
Limit value	3529	Max. value of buildings for cultural and musical purposes according to German information centre for construction costs 2019		

Water/waste water:
Office: A flat rate of 1.20 EUR/m²a is used for the reference value, derived from typical assumptions regarding potable water demand and costs. A reduction of 30% compared to the reference value is used for the target value, while an increase of 40% compared to the reference value is used for the limit value.
Residential: A flat rate of 7.27 EUR/m²a is used for the reference value, derived from typical assumptions regarding potable water demand and costs. A reduction of 30% compared to the reference value is used for the target value, while an increase of 40% compared to the reference value is used for the limit value.
Education: A flat rate of 1.11 EUR/m²a is used for the reference value, derived from typical assumptions regarding potable water demand and costs. A reduction of 30% compared to the reference value is used for the target value, while an increase of 40% compared to the reference value is used for the limit value.
Hotel: A flat rate of 13.63 EUR/m²a is used for the reference value, derived from typical assumptions regarding potable water demand and costs. A reduction of 30% compared to the reference value is used for the target value, while an increase of 40% compared to the reference value is used for the limit value.

Department stores, shopping centres, consumer markets: Derived from the FM benchmarking report 2016, 3.03 EUR/m²a is used for the reference value, the value for the first quantile is used for the target value, and the value for the third quantile is used for the limit value.
Logistics, production: Derived from the FM benchmarking report 2016, 3.01 EUR/m²a is used for the reference value, the value for the first quantile is used for the target value, and the value for the third quantile is used for the limit value. **Assembly buildings**: Derived from the FM benchmarking report 2019 “Retail Real Estate”, 0.86 EUR / m²a is used as the reference value, the value for the 1st quantile for the target value and the value for the 3rd quantile for the limit value.

Rainwater:
All uses: The 0.81 EUR/m² floor area per year is used for the reference value, derived from 736 mm of precipitation per year, typical number of storeys = 4 (all uses except for production and logistics, where instead number of storeys = 1) and waste water costs for rainwater of 1.1 €/m³. 0 EUR/m² is used for the target value, the limit value is equal to the reference value.

Operation costs (Structural and technical components): Regular/irregular
All uses: The reference, target and limit values used are 0.35% of the production costs per year for structural and technical components, an individual value is determined and used for each scheme.

Cleaning costs:
The average values typical for the use of the building from the FM.benchmarking report 2016 are used for the reference values. The values from the first quartile are used for the target values and the values from the third quartile are used for the limit values (example for office: Target value of 5.04 EUR/m²GFA$_S$, reference value of 8.08 EUR/m²GFA$_S$, limit value of 12.41 EUR/m²GFA$_S$).

Energy:
Determined and averaged final energy values from certified buildings, increased by a factor of 1.2, are used for the reference values for energy (see table below). For specific schemes, typical distributions of energy and heat are used, likewise derived from certifications. For calculation of the energy costs, typical combinations of energy sources are also used for each scheme likewise derived from certified buildings. The target value for the final energy demand is determined by reducing the reference value by a factor of 0.6. The limit value is determined by increasing the final energy demand reference value by a factor of 1.4. The data used as a basis for calculation of the energy costs corresponds to the specifications above. 25 ct/kWh of electricity is used as the value for electricity, while the values for heat, derived from the combinations determined for the energy sources used, are 9 ct/kWh of heat (all uses other than logistics and production), or 7 ct/kWh of heat for logistics and production.

Table: Input variables for final energy values used for establishing benchmarks (in kWh/m² GFA/a)

	Target value	Reference value	Limit value
Office	45	110	150
Education	50	120	170
Consumer markets	30	70	100
Shopping centre	55	130	180
Department stores	45	110	150
Logistics	45	110	150
Production buildings	45	110	150
Hotel	100	240	330
Residential	30	70	100
Assembly buildings	60	110	150

Appendix 6

Adaptation factors

(see also chart in LCC-Tool)

Adapting local construction costs to German price levels

For the calculation of building related life cycles, we propose the following approach:
The construction costs for single building components or technical systems have to be adapted to German prices. Therefore, we created a comparison regarding the costs for constructing costs in other countries to get a coefficient that describes the relation between German prices in comparison to other countries.

The project's cost of manufacture has to be multiplied with the coefficient from the table to get a weighted cost of manufacture that is comparable. This step is automatically completed by the LCC tool.

COUNTRY	FACTOR CONSTRUCTION COSTS FROM Q3 2017	
	Office **Education** **Hotel** **Residential** **Consumer market** **Shopping centre** **Department stores** **Assembly buildings**	**Logistics** **Production**
ARGENTINA	1.73	1.64
AUSTRALIA	1.03	1.28
AUSTRIA	0.94	0.94
BAHRAIN	1.49	1.46
BELGIUM	1.02	1.00
BRAZIL	2.04	1.31
BULGARIA	2.06	1.81
CANADA	1.16	1.08
CHILE	1.56	1.07

CHINA	2.71	2.23
COLOMBIA	2.25	1.93
CROATIA	1.59	1.48
CZECH REPUBLIC	1.65	1.38
DENMARK	0.73	0.76
EGYPT	1.88	1.88
FINLAND	0.72	0,68
FRANCE	0.95	0,94
GERMANY	**1.00**	**1.00**
GREECE	1.11	1.04
HONG KONG	0.63	0.40
HUNGARY	1.38	0.97
INDIA	3.69	1.96
INDONESIA	2.35	1.88
IRELAND	0.90	1.00
ITALY	1.10	1.25
JAPAN	0.83	0.51

KENYA	3.41	3.31
KUWAIT	1.39	1.36
LUXEMBURG	0.88	0.84
MALAYSIA	2.63	2.35
NETHERLANDS	1.23	1.07
NEW ZEALAND	1.14	1.14
NORWAY	0.76	0.66
PHILIPPINES	3,21	2.89
POLAND	1.32	1.55
PORTUGAL	1.48	1.30
ROMANIA	1.95	1.55
RUSSIA	2.13	1.25
SAUDI ARABIA	1.34	1.34
SERBIA	1.88	1.88
SINGAPORE	1.22	1.04
SOUTH AFRICA	2.29	2.16
SOUTH KOREA	1.31	0.95

SPAIN	1.17	1.36
STATE OF QATAR	1.22	1.05
SWEDEN	0.70	0.81
SWITZERLAND	0.69	0.59
THAILAND	2.21	1.64
TURKEY	2.89	1.82
UAE	1.24	1.24
UNITED KINGDOM	0.72	0.93
USA	0.76	0.72
VIETNAM	2.73	2.40
Adaptation factors for further countries to be agreed with the DGNB		

Appendix 7

Local currency rates

COUNTRY	LOCAL CURRENCY	CURRENCY EXCHANGE RATE FROM Q3 2017
ARGENTINA	ARS	17.92
AUSTRALIA	AUD	1.49
BAHRAIN	BHD	0.44
BRAZIL	BRL	3.71
BULGARIA	BGN	1.96
CANADA	CAD	1.47
CHILE	CLP	755,09
CHINA	CNY	7.84
COLOMBIA	COP	3495.28
CROATIA	HRK	7.43
CZECHIA	CZK	26.06
DENMARK	DKK	7.44
EGYPT	EGP	20.83
GERMANY	**EUR**	**1.00**
HONG KONG	HKD	9.18

HUNGARY	HUF	306.20
ICELAND	ISK	124.30
INDIA	INR	75.54
INDONESIA	IDR	15660.09
IRAN	IRR	38822.39
ISRAEL	ILS	4.19
JAPAN	JPY	130.34
KAZAKHSTAN	KTZ	391.19
S.KOREA	KRW	1330.19
KUWAIT	KWD	0.35
MALAYSIA	MYR	5.01
MEXICO	MXN	20.93
NEW ZEALAND	NZD	1.61
NORWAY	NOK	9.34
PHILIPPINES	PHP	59.72
POLAND	PLN	4.26
ROMANIA	RON	4.58

RUSSIA	RUB	69.34
SAUDI ARABIA	SAR	4.41
SINGAPORE	SGD	1.60
SOUTH AFRICA	ZAR	15.48
STATE OF QATAR	QAR	4.28
SWEDEN	SEK	9.55
SWITZERLAND	CHF	1.13
THAILAND	THB	39.20
TUNISIA	TND	2.89
TURKEY	TRY	4.13
UAE	AED	4.32
UKRAINE	UAH	30.41
UNITED KINGDOM	GBP	0.90
URUGUAY	UYU	33.77
USA	USD	1.17
Adaptation factors for further countries to be agreed with DGNB		

Main sources: The International Monetary Fund (IMF) and European central bank (ECB)

APPENDIX B – DOCUMENTATION

I. Required documentation

A range of different forms of documentation is listed below. The documentation submitted must comprehensively and clearly demonstrate compliance with the requirements for the target evaluation of the individual indicators.

Indicator 1: Calculations of the life cycle costs in planning
It must be proven that a life cycle cost model was drawn up for the building and used as part of the planning process.

Indicator 1.1.1: It must also be proven that the model was drawn up in service phase 3 at the latest and that the most likely/preferred building variants available were compared in terms of production costs and relevant follow-up costs, comprising at minimum the expected energy costs.

Indicator 1.1.2: It must also be proven that the scope of analysis contains all relevant building-related follow-up costs in accordance with the definition.

For this indicator, the target values used for the comparison and adequate documentation of the communication to the planning team must be produced.

Indicator 2: Life cycle cost optimisation
It must be proven that planning optimised for life cycle costs has been carried out. Proof regarding the following aspects must be provided:

- Type of analysis (full consideration or partial analysis),
- Time of analysis (specification of work phase(s))
- Number of alternatives
- Type of alternatives with documentation that significant decisions were investigated.

Indicator 2.2: Circular economy bonus – reuse
For the circular economy bonus, appropriate documentation must be produced proving the relevance of the implemented solution (share of the relevant reference value) and additionally proving either that the solution was reused or that it was not acquired via a leasing model or similar but that its use is instead an integral part of the contract.

Indicator 3: Building-related life cycle costs
A range of different forms of documentation is listed below. The documentation submitted must comprehensively and clearly demonstrate compliance with the requirements for the target evaluation of the individual indicators.

- Table showing the production costs via cost calculation in accordance with Appendix 1
- Table showing the operation costs via cost calculation in accordance with Appendix 2
- Documentation of the life cycle costs for the entire reference period with regard to m² NFA, m² GFA and m³ GV
- Final energy demand of the building in accordance with building energy performance certificate or energy simulation (referring to the criterion ENV1.1)
- Data for the referenced energy sources (in order to take building systems that feed energy into the grid into account, documentation of the feed-in rate achieved must be enclosed).
- Water demand and waste water values taken from criterion ENV2.2

- Sources used for application of generalised values or reference
- Values used for the detailed method for servicing and maintenance on the sub-level of structural and technical components or beyond.

The justification and description of classification into category 1, 2 or 3 should be documented in accordance with the following specifications:

Category 1 / Special conditions and additional expenses:

- E.g. difficult foundation soil conditions: Via documentation from the expert report regarding the foundation soil
- E.g. supports: Suitable photo documentation or design plans
- Documents and/or specifications required under construction law
- Innovation: reference values and building specification

Category 2:

- Materials or technical facilities used with installation location and quantities
- Expert report regarding the location/site

Category 3:

- Floor plan and cross-section with dimensioning

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
all	General and evaluation: scheme “Assembly buildings” has been added	16.09.2021
236	Evaluation: benchmarks for the scheme “Consumer market” updated	16.09.2021
243	Evaluation: clarification regarding the onsite el. energy production and distribution rules	16.09.2021

II. Literature

- ISO 15686-5. Buildings and constructed assets – Service-life planning – Part 5: Life-cycle costing. Berlin: Beuth publisher. June 2008
- Nachhaltiges Bauen [Sustainable building] guide by the Federal Ministry of Transport, Building and Urban Development (Bundesministerium für Verkehr, Bau und Stadtentwicklung) (2013)
- German information centre for construction costs (BKI): BKI Baukosten 2017 Neubau – Statistische Kostenkennwerte für Gebäude [BKI construction costs 2017, new buildings – Statistical cost parameters for buildings]. Stuttgart 2017
- Sustainable Development Goals icons, United Nations/globalgoals.org
- FM.benchmarking report 2016: Published by Prof. Uwe Rotermund, Ingenieurgesellschaft mbH & Co KG. Höxter, 2016
- European Construction Intelligence 2018, construction cost index, RLB – Euro Alliance.
- International construction costs 2017, Arcadis Consulting, 2016
- Annual Construction Cost Handbook Singapore 2018, Arcadis Consulting, 2018
- Construction Cost Handbook Malaysia 2018, Arcadis Consulting, 2018
- Exchange Rate Report – IMF, International monetary fund, 2017
- International construction market survey 2018, Turner & Townsend, April 2018
- Hotel Classification Systems, UNWTO World Tourism Organization, 2015
- Classification of hotel establishments within the EU, ECC The European Consumer Centres' Network 2009

Guideline for Sustainable Building, Federal Office for Building and Regional Planning, Ministry of Transport, Building and Housing Germany, 2001