Framework for “carbon-neutral buildings and sites”

Preview version

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1. Introduction

1.1. The DGNB and the Paris Agreement

Since its founding in 2007, the German Sustainable Building Council (DGNB e.V.), a non-governmental organisation, has been advocating a more sustainable construction and property industry. With around 1200 member organisations, it has set itself the task of transforming the way that our built environment is planned, constructed, renovated and used, and the way in which people live in it, in order to reconcile ecological and social issues with economic aspects. With its certification system for new and existing buildings, districts and interiors, the DGNB has been setting a high standard since 2008, which has been successfully implemented by market participants in over 3000 projects.

Climate protection is a vital aspect for the DGNB when it comes to recognising sustainable buildings and districts. For new buildings and renovated buildings, this aspect is reflected in the DGNB System in the shape of a “good life cycle assessment (LCA)”; when it comes to recognising sustainably operated buildings, this can be seen by a good carbon footprint for ongoing operation. The evaluation of the carbon footprint uses benchmarks that are geared towards political climate protection targets and best-practice solutions (target values) as well as the performance that is actually achieved (reference values). Carbon-neutral operation and a carbon-neutral construction are set as targets, for example, in the 2018 version of the DGNB certification system for new buildings. These targets will shortly be added for renovation projects. With these targets, the DGNB is specifically translating the Paris Agreement and the German Federal Government’s 2010 energy concept for building projects. The Paris Agreement was concluded at the end of 2015 and aims to lessen the impact of climate change and achieve extensive decarbonisation of all buildings and the global economy by the middle of this century.

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The creation of this framework is supported by numerous studies, such as “Klimapfade für Deutschland” [Climate Paths for Germany] (BCG & Prognos, 2018), which describes building stock that is virtually free of CO₂ emissions as a possible scenario. The study entitled “Szenarien für eine marktwirtschaftliche Klima- und Ressourcenschutzpolitik 2050 im Gebäudesektor” [Scenarios for a market-oriented climate and resource protection policy by 2050 in the construction sector] (dena and geea, 2017) illustrates possibilities for transformation, which indicate a massive reduction in emissions is achievable.

1.2. Objective of the framework

The aim of this framework for carbon-neutral buildings and sites is to make implementing the Paris Agreement achievable in the environment we build around ourselves and to enable this to be gauged on specific projects. In addition, application of this framework is intended to provide a reliable basis for making decisions regarding resource allocation for projects geared towards climate protection, in order to channel cost-efficient investments into future-proof buildings.

The DGNB aims to significantly contribute towards achieving carbon-neutral operation for a significant proportion of buildings as quickly as possible. This requires a clear definition of the term “carbon-neutral building operation” as regards accounting processes and the target value. The long-term objective – which is much more important – is to significantly contribute towards making all housing stock carbon-neutral by 2050. This requires the cooperation of all stakeholders, suitable instruments and effective incentives. The framework is freely available to anyone with an interest in the topic and is designed to move the discussion away from questions relating to “why?” and “how should the evaluation be performed?” towards specific action and to the question of “what must I specifically do?”

The framework is intended to reveal unexploited potential and lead the parties involved to a shared objective in order to:

■ Achieve a massive increase in the rate of buildings being renovated into emission-free buildings,

■ Exhaust all organisational measures taken by operators and in facility management,

■ Encourage users to take action to implement climate protection in their buildings and

■ Generate added value for the national economy and private sector by supporting and laying down requirements for making cost-efficient investments in existing buildings.
The DGNB wants to make carbon-neutral new buildings the standard as quickly as possible – without waiting until 2030. In addition, the DGNB has a vision that operation of existing building stock will be fully carbon-neutral by 2050, with the exception of listed buildings. And the DGNB’s third priority is to achieve extensive carbon neutrality in construction activities for new buildings and renovated buildings, in other words to reduce the “embodied CO₂ emissions” in construction materials and construction products.

1.3. Paradigm change in the accounting methodology

As opposed to the methodology for providing proof of legal minimum requirements by means of a building energy assessment in accordance with the German Energy Saving Ordinance (EnEV)/DIN V 18599, the framework has implemented the following fundamental changes to the accounting methodology:

- The target figure is the CO₂ emissions¹ and no longer the primary energy demand.
- The evaluation is performed on the basis of absolute CO₂ emission limit values instead of using the reference building method.
- The assessment boundary is extended: In addition to the energy demand for conditioning the building (building energy), the user electricity is also taken into consideration. The new assessment boundary is the property (site).

1.4. Clear designations for the market

The framework uses the term “carbon-neutral buildings and sites” for buildings and sites whose CO₂ emissions are zero or less in accordance with the defined accounting method. These are buildings and sites with an annual CO₂ footprint of zero for building operation. Buildings and sites with an annual CO₂ footprint that is permanently below a building-specific CO₂ limiting line (with annual maximum values) from now until 2050 and reaches zero by 2050 at the latest are designated by the addition of “carbon-neutral by 2050”².

1.5. Development process

Work began on developing this framework in September 2016. As part of this strategic development project, the DGNB is working together with experts to establish rules that are realistic and suitable for the market. They are also intended to be extremely attractive from an economic point of view and should lead to a significant demand for activities that promote climate protection. In parallel to the development work, the DGNB is also involved in the international joint project “Advancing Net Zero” established by the World Green Building Council. As part of this, valuable coordination work is carried out with experts from other countries.

The present preview version of this framework was published in May 2018. With this, initial applications can begin. The next version will be created when sufficient results are available from applications and discussions to enable the rules to be refined in line with market requirements.

1.6. Target groups of the framework

The framework is aimed at all political decision-makers who are working towards implementing the German climate protection targets and have the objective of decarbonising Germany’s economy. With this framework and the application thereof, we would like to encourage these decision-makers to pursue the correct approach, including in regulatory terms, to amend existing legislation and to effectively work towards achieving climate protection.

At an expert level, the framework addresses all designers and builders who take the issue of climate protection seriously and would like to specifically apply this to their own renovation or new-build projects. It is also aimed at all owners and operators of buildings who would like to address climate protection for their building and who are searching for a specific and practicable recommendation for action for their building.

In addition to subject matter experts and building owners, the framework forms the basis for funding agencies, investors and banks, who are looking for a simple decision-making tool for providing financing geared towards climate protection in corresponding projects. Following successful implementation of the framework, the DGNB will intensify interaction with relevant institutions and demonstrate and assist with opportunities for integrating the framework into decision-making processes.

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¹ For simplification purposes, this document uses the term “CO₂ emissions” and similar formulations throughout as a synonym for the total of CO₂ equivalents (total value of all emissions that are harmful to the climate, determined by means of characterisation factors that reflect the impact of emissions released into the atmosphere) in accordance with internationally recognised standards.

² Initial applications will involve looking for a designation for buildings and sites that meet these conditions.
Finally, this framework is also a transparent tool for providing guidance to other countries, and thereby forms the basis for developing a common European framework.

### 1.7. Links to the DGNB System

The framework can explicitly be applied even without DGNB certification. With this option, the DGNB would like to encourage all stakeholders to discuss the framework, put it into practice and make their own projects better.

For the DGNB System, this framework also serves to define objectives and provides specific incentives for users to design and operate carbon-neutral buildings.

As part of DGNB certification, the climate protection achievement defined in accordance with this framework can be confirmed by an external party. The designations “carbon-neutral building” or “carbon-neutral portfolio”, as used in this framework, can be used after the required information has been provided and after the DGNB has confirmed that the content requirements have been checked. Being recognised by the DGNB or being awarded points for a certificate from the DGNB currently takes place as part of DGNB certification.

- **DGNB Renovated buildings (planned for the next version):** Bonus points in the criterion “Life cycle impact assessment” (ENV1.1)
- **DGNB New construction (version 2018):** Bonus points in the criterion “Life cycle impact assessment” (ENV1.1); this is likely to become a minimum requirement for a high certification level in a subsequent version
- **DGNB Buildings in use (2016 version):** CO₂ management and evaluation in the criterion “Resource efficiency”
- **DGNB Interiors (2018 version):** Bonus points in the criterion “Energy efficiency and climate protection” (ENV1.8)
- **DGNB Portfolio certification (planned):** Basis for the rating

One objective of DGNB recognition is for projects to receive tax advantages and other funding, or better financing and insurance conditions, if it can be proven that they have been planned and implemented in such a way as to protect the climate. The framework is designed to be used for assessing how worthy these future-proof projects are of receiving funding.
2. Applicability of the framework

### 2.1. CO₂ management and benchmarking

The framework makes it possible to subject the actually achieved climate protection to a binding check. As opposed to the currently applicable legal minimum requirements in accordance with EnEV/DIN V 18599, the DGNB framework uses a comprehensive scope of analysis, which involves recording user electricity in the assessment in addition to the energy flows for conditioning the building. This is an important step given that, in energy-optimised buildings, the CO₂ emissions resulting from user applications are often higher than those caused by all other aspects of building operation.

Calculating a building’s current and future CO₂ emissions in accordance with the rules laid down by this framework makes it possible to consistently benchmark the CO₂ intensity in comparison to other buildings. Project-specific CO₂ maximum values per year, up to the target year of 2050, enable investments to be planned in the long term. The gap between planned and actual CO₂ emissions when the building is in use – which has been typical in the past – is avoided by realistic calculations.

Fast and effective adjustment, increased quality of building handover documents from designers to operators and involving users in the process in order to achieve the target specifications: All of these are viable and extremely effective climate protection measures. This potential for cost-effectiveness and effective climate protection is still not yet exploited at present because measures mainly focus on building owners and can often only be implemented through major investments.

### 2.2. Communicating the CO₂ footprint, from improvements and the future viability of buildings (“Paris conformity”)

Thanks to the consistent and transparent calculation specifications, the framework assists with clear communication regarding the achieved and planned contribution towards climate protection by means of fundamental, regular comparison between target and actual values. In a market with a variety of “green labels”, it is essential to provide customers and interest groups with a reliable and non-commercial tool, which clearly aims to make a positive contribution towards climate protection by choosing a recognised standard. Part 2 of the framework (“Reporting”) provides a valid structure for this.

In addition, the framework acts as a tool for proving that buildings and sites are “compliant with the Paris Agreement” through reducing the CO₂ emissions by 2050.
The planned establishment of a scientific advisory board for this framework, which will be tasked with checking the extent to which compliance with the 2 degrees Celsius limit is actually supported, is intended to underline the validity. Part 3 of the framework, with its definition of a climate protection roadmap, offers the corresponding technical basis for this.

2.3. Recognition of requirements as part of DGNB certification

In future, proof of a “carbon-neutral building” as defined by this framework will be recognised as part of DGNB certification. The system of incentives offered by the DGNB in the 2018 version for new buildings and interiors specifically provides “bonus points” for these types of future-proof buildings. For the other system applications (renovated buildings and existing buildings, operation, districts), the DGNB will also gradually adapt the associated criteria sets so that the framework can be established in a standardised way in all DGNB system applications and schemes within the DGNB System.

2.4. Influencing supply chains/procurement geared towards climate protection

Climate protection measures must always be considered and assessed as a whole. This is why energy efficiency increases in buildings, for example, are just one sub-aspect of this. The procurement or selection of an environmentally friendly energy supply that is geared towards climate protection is a second aspect. The CO₂ intensity of the purchased electricity or the “climate-friendliness” of the heating and cooling supply depends on the energy supplier chosen or the technology used and the energy supplier’s energy sources. Many customers are unaware that long-distance district heating can be extremely CO₂-intensive under certain circumstances. This is why corresponding realistic emission factors must be used for CO₂ accounting. These factors must be proven to correspond to the actual CO₂ value per unit of energy, based on consistent and generally recognised calculation methods.

In future, the use of environmental protection, i.e. climate protection and waste prevention, as a decision-making criterion will be a crucial aspect when choosing construction materials for renovated buildings and new buildings.

2.5. Basis for financing options and tax advantages to promote climate protection

An important argument that explains why not enough is being done for climate protection in the building sector is that the connection between customary financing and funding conditions and the projects or measures to be financed is too weak. To achieve climate protection targets, it is crucial that the effectiveness of implementation and the extent of the contribution made towards CO₂ reduction by projects to be financed are included in the bankability evaluation. This framework provides a neutral and transparent decision-making tool for this, which uses regular monitoring of actual emissions to prove effectiveness and provides reliable and clear information using regular target/actual comparisons.

The DGNB’s objective is for the framework to become established among financial institutions as a criterion for the bankability of their green products. Another objective is to provide a reliable basis for a fair carbon tax and to offer financial incentives for reducing CO₂ emissions so that buildings and sites are designed to be carbon-neutral.
2.6. Basis for regulatory instruments

Elements of the development work for this framework were incorporated into a discussion paper relating to a “Building Emissions Law 2050” (GEG 2050), published by the DGNB in February 2018. This statement clearly and simply illustrates what should be included in legislation that systematically focusses on climate protection.

The draft contains the following key points for legislation geared towards climate protection in the building sector:

- The target figure to be optimised is the CO₂ emissions that are relevant to the environment, and not the primary energy demand.
- The evaluation is completed using absolute CO₂ emission limit values, based on a customised climate protection roadmap up to 2050, and no longer by means of theoretical reference buildings.
- If target values are not met, a carbon tax is payable.
- In addition to calculations for planning that are as realistic as possible, consumption data measured in actual situations forms the basis of all evaluations, specifications and control mechanisms for existing buildings.

The DGNB believes that it is vital to completely realign funding policies and ultimately make renovation projects that promote climate change attractive and profitable. In order to provide political decision-makers with a realistic tool for advocating this type of legislative proposal, the DGNB will use this framework for carbon-neutral buildings and sites to demonstrate that the approach is effective and results in buildings that are necessary for climate protection reasons. The DGNB considers the introduction of an appropriate regulatory instrument for buildings to be imperative for achieving national climate protection targets.
3. Scope of application of the framework

3.1. A framework for all CO₂-emitting buildings

In principle, carbon-neutral buildings or sites require the following aspects to be optimised:

1. Minimisation of the energy demand
2. Efficient production of energy
3. Choosing energy sources with low CO₂ emissions

Although new buildings are simplest to operate in a carbon-neutral manner thanks to their structural and technically high-quality designs, and although these buildings form the foundation of carbon-neutral building stock, the main focus of this framework is on existing building stock, because this comprises a much larger number of buildings and is therefore the more significant influencing factor.

According to estimates, 70% of the building stock that will exist in 2050 has already been constructed at the present time. For new buildings, available climate protection solutions can be implemented relatively simply with intelligent planning. For example, new buildings can produce renewable energy for the building and its users, or for other users, who – based on the (cheap) availability of renewable energy – intelligently manage the energy flows or use energy sources and avoid producing CO₂ emissions at their own site or elsewhere. These solutions can and must be implemented in existing buildings, too. With a new building rate of less than 1%, it is critical that current and future building stock is carbon-neutral so that national and global climate protection targets can be achieved. However, at the current renovation rate of 0.7%, it would take more than 140 years to bring the building stock to a carbon-neutral level, provided every renovated building from now on would be made carbon-neutral. However, the actual “carbon-neutral renovation rate” is currently still 0%.

To overcome the major technical and financial hurdles involved in necessary energy renovation projects that must be undertaken to achieve carbon-neutral operation for existing building stock, the initial applications of this framework examine whether provisions must be made for compensation options to be used for new buildings and existing buildings and whether a distinction must be made between different compensation options for these buildings.

3.2. Applicability to different building types

The framework is equally applicable to all types of new buildings, renovated buildings (proof via planning values) and existing buildings (proof via actually measured data).

New buildings or renovated existing buildings at the time of completion

This framework can be used when no measured values are yet available for buildings or sites. In addition to the results or the interpretation of the CO₂ footprint, the addition “planning values” or “planned” must be used for communication (designation), e.g. “carbon-neutral building (planned)”.

Existing buildings

Real and valid measured data, ideally from at least three consecutive years, must be used for applying the framework to existing buildings or sites. In this case, the addition “measured values” or “measured” must also be used – in addition to the results or the interpretation of the CO₂ footprint – for communication (designation) of the results and to ensure that the results are reliable, e.g. “climate-neutral building (measured)”.

3.3. Requirements for comfort
Statutory minimum requirements for comfort must be complied with for summer heat protection. These requirements stipulate that the operative temperature in summer must be largely limited by passive measures. Proof as part of planning can be provided using a simplified process in accordance with DIN 4108-2 (2013) by limiting the sunlight radiation values or, alternatively, by means of a realistic simulation calculation. DIN 15251 category 3 must be complied with for buildings with simulation calculations.

3.4. Recommended guide values for system and building efficiency
The building's technical properties can be based on stipulated values for certain system and efficiency requirements. These are defined as part of the initial applications. An initial selection can be found in the appendix (figures 7 and 8 on page 22). The only requirement is that the CO₂ footprint is regularly improved as planned. No further requirements are made beyond this so that all future developments can use any type of different technology. The final energy demand or consumption is to be determined as a total value or characteristic value per energy reference area for information purposes only.

The stated guide values are in line with the actual status in technology. Since, in future, other solutions that are not yet known today will become possible, an approach that is open to new technologies is a crucial requirement for effective and efficient solutions.

3.5. Grid support
A high level of grid support must be achieved in order to use buildings as active elements in the implementation of the energy transition in Germany. The calculation is restricted to energy flows into and out of the "property". Energy produced on the property should predominantly be used on the property itself. Energy produced and stored on the property can be traded to reduce inefficient peak loads if overproduction occurs despite this energy being used intensively on the property itself. The grid support of the property or building should be determined with its own characteristic value, which should not drop below a minimum threshold.

The “grid support coefficient” is ideal for this purpose. Calculations should be based on electricity prices per quarter hour.

3.6. Energy production
The DGNB provides detailed CO₂ emission factors for CO₂ accounting of the energy sources used. These are split into “current emission factors” and “predicted emission factors” and published on the DGNB’s website. The latter must be used in the calculations for creating a climate protection roadmap so that future developments are taken into consideration, e.g. for the use of mains power or where credit is received for this.

3.7. Recommendation for monitoring buildings’ energy consumption data and CO₂ emission values
Monitoring energy consumption data and CO₂ emission values is recommended so that effective optimisation of the building or site is possible. Monitoring can be carried out by recording the bills for heating, cooling and electricity on a monthly basis. If the bills are recorded in different ways, this means that deviations from target values can be counteracted more effectively. The use of key energy figures where data is lacking can also help with optimisation. It is also useful to participate in a management system in accordance with ISO 50001 or energy audits in accordance with Article 8 of the EU Energy Efficiency Directive. Professional energy management balances the target values and actual values for energy consumption, either on the basis of planning or through the measurement of building or system functions.
4. Elements of the framework

4.1. Overview of the elements of the framework
This framework consists of three main elements:


Part 2: Rules for CO₂ reporting of buildings (“carbon disclosure rules”)

Part 3: CO₂ management method and climate protection roadmap (“carbon management rules”)

4.2. Fundamental principle relating to application
The main elements can be applied separately and in line with the requirements and objective. Part 1 addresses energy planners and other specialist planners and includes the calculation specifications that are to be implemented for consistent CO₂ accounting. Part 2 builds on the content of Part 1 and describes the minimum requirements for reporting on and communicating the results calculated in Part 1.

Part 3 is the key element for predicting future CO₂ emissions with changing general conditions. It is the basis for producing a valid roadmap that defines renovation measures, modernisation measures or operational optimisation measures for the building and displays them in the form of calculated results. According to the definition at the beginning of this document, a building can be designated “carbon-neutral by 2050” if it has not yet achieved carbon neutrality but a carbon protection roadmap is in place which aims to achieve carbon neutrality and convincingly and correctly demonstrates that the CO₂ emissions are below the annual limit values.

The three elements of the framework build on each other. Part 1 can be used to determine the current CO₂ footprint, which can be verified on this basis. Part 2 defines how the results of the CO₂ footprint are to be communicated and which designations can be used for the building or site. Part 3 describes how a climate protection roadmap can be drawn up for non-carbon-neutral buildings and how CO₂ management should be implemented for these buildings.

Fig. 2 – Fundamental functional principle of the framework for “carbon-neutral buildings and sites”

5.1. Fundamental principles of accounting

The same fundamental principles are applied as in the internationally recognised “Greenhouse Gas Accounting Protocol”⁴. The accounting rules are based on the principles of relevance, completeness, consistency, transparency and accuracy. With this in mind, the following fundamental rules must be noted by users, too:

■ **Relevance:** All relevant CO₂ emission sources must be recorded using the defined scope of accounting. The scope can be extended by the DGNB if there is a generally accepted, scientifically based reason for doing so and if this extension is made transparent and communicated openly (e.g. recognising CO₂ sinks). The scope of accounting cannot be reduced.

■ **Completeness:** All emissions and reductions must be recorded in full for the defined scope of accounting. Reducing the scope of accounting is not permitted, even if reasons for doing so are given.

■ **Consistency:** Methods, data and assumptions must be applied consistently in order to produce reliable results over time.

■ **Transparency:** The information required for accounting must be documented. All relevant assumptions and estimates must be disclosed. All methodical sources and external sources used for specific data must be documented.

■ **Accuracy:** Uncertainties in the calculations should be avoided as far as possible in order to ensure consistency. The results should be as accurate as possible and serve as a reliable decision-making tool.

Initial applications serve to evaluate whether it should be recommended or required to have the accounting checked by an independent third party in order to safeguard these aspects.

5.2. Accounting versions for different scopes of accounting (accounting levels)

The assessment can be drawn up for two different accounting levels. Different scopes of assessment are defined for each specific case.

■ **Accounting level 1 “Operation”:** The scope of assessment encompasses the CO₂ emissions resulting from operation of the building.

■ **Accounting level 2 “Operation and material”:** The scope of assessment encompasses the CO₂ emissions resulting from operation of the building (as in 1) and additionally the embodied CO₂ emissions and resulting from construction ("grey emissions" produced by production, maintenance, demolition, recycling).

Users are free to choose which of the two accounting options they would like to use. The version chosen must be clearly stated when presenting the results.

Accounting level 2 should be applied in the event that an imminent decision is to be made as to whether an existing building is to be demolished and a new building constructed in its place, or as to whether the building is to be renovated. Only this process provides the necessary transparency relating to the total CO₂ emissions, i.e. including emissions for new buildings and for the materials required in renovation projects. This generally makes it possible to exploit major potential for reductions in extremely early stages of project development.

If appropriate methods become available in future, decreases through natural CO₂ sinks such as green spaces or forested areas can be incorporated into the accounting process when decisions are taken regarding whether construction should take place on greenfield sites or in urban areas.

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5.3. Accounting rules for accounting level 1 “Operation”

5.3.1. Scope of analysis for ongoing operation
The entire building or several buildings at the same site must be analysed. The assessment must include the direct CO₂ emissions produced on the site resulting from the total energy consumption⁴ and the indirect CO₂ emissions resulting from the entirety of the required energy production⁵. A site may comprise more than one building, i.e. a district. In this case, accounting is performed for the entire site.

CO₂ sinks on the site or outside the site are not currently part of the scope of assessment. They can only be counted in the assessment if their effect for binding CO₂ can be determined using accepted and scientifically based calculation methods. The requirements to be applied for inclusion in the assessment are likely to be incorporated into this framework.

5.3.2. Scope of assessment for ongoing operation
The scope of assessment for ongoing operation (accounting level 1) comprises the following elements:

1. Direct CO₂ emissions from energy production on the property resulting from biogenic and fossil-based heat production, cooling and electricity generation
2. Indirect CO₂ emissions from energy production outside the property (e.g. mains power, long-distance district heating, long-distance district cooling)
3. Avoided CO₂ emissions (credits) through exported energy (heating energy, cooling energy, electricity, etc.)

In order to calculate CO₂ emissions, the complete energy consumption must be documented resulting from the building and its users for heating, cooling, hot water, lighting, auxiliary energy, lifts, escalators, building automation, power for production, communication and information technology, household appliances, user equipment, etc.

5.3.3. Accounting method for ongoing operation
In principle, a distinction is made between two versions: A method incorporated into the planning process, and one that is based on measured values as soon as the building has been in use for at least three years.

5.3.3.1. Accounting method when planning buildings
When planning buildings, the principle for calculating the CO₂ emissions and final energy demand must be a calculation method suitable for building physics. This involves setting realistic parameters, such as the actual interior temperature and total electricity consumption including user electricity, in order to produce a calculation that largely matches the values recorded by actual measurements. The calculation methods suitable for building physics are determined and recommended as part of the initial applications. The calculation method must calculate the results on a monthly basis as a minimum.

The CO₂ emissions are accounted for as a total of all emissions (= direct and indirect emissions) and credits for avoided CO₂ emissions by exported energy per year.

The current CO₂ emission factors must be applied for accounting in each case. The CO₂ emissions determined are to be calculated as a total of CO₂ equivalents.

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⁴ Corresponds to “Scope 1” in accordance with the GHG Protocol (WRI & WBCSD, 2004)
⁵ Corresponds to “Scope 2” in accordance with the GHG Protocol (WRI & WBCSD, 2004)
The calculation in CO₂ equivalents is carried out by means of scientifically based CO₂ emission factors for all emissions that are released into the air and have an impact on the climate, as defined by the UNFCCC/Kyoto Protocol⁶. The indicator to be used is the global warming potential (GWP) over 100 years in kilograms CO₂ equivalents. The CO₂ emission factors are likely to decrease each year as the proportion of energy consumption from renewable sources increases.

5.3.3.2. Accounting method based on measured values from buildings

In order to calculate CO₂ emissions in ongoing operation, energy consumption and energy production data must be gathered and converted into an annual value for the entire site or building using time-dependent CO₂ emission factors. All the specifications outlined in 5.3.3.1 additionally apply here.

5.3.4. CO₂ emission factors to be used for ongoing operation

The CO₂ emission factors for supplied and exported energy to be used within the meaning of this framework will be regularly published by the DGNB – likely on an annual basis – in accordance with the scope of assessment defined above. As a possible reference data source for the emission factors, ÖKOBAUDAT⁷, GEMIS⁸ and other possible data sources, such as environmental declarations in accordance with DIN EN 15804, are examined for their applicability, quality and technological and temporal representativeness and then defined and published.

For calculating predicted CO₂ emissions (e.g. for a climate protection roadmap), CO₂ emission factors are determined, which include future changes to the technologies used or to the statistical representativeness. These are also published by the DGNB.

5.3.5. CO₂ compensation measures, green electricity and avoided CO₂ emissions for ongoing operation

Carbon-neutral operation means that CO₂ emissions produced are offset by credits resulting from real avoidance of CO₂ emissions and CO₂ reductions. In dense development structures, the potential to receive credit through energy production on the site itself is limited. The initial applications will involve specifically formulating the conditions under which avoided CO₂ emissions and CO₂ reductions are permitted to be recorded in the assessment for the framework and the application thereof. This may include the purchase of CO₂ compensation certificates and the recognition of purchased green electricity.

If CO₂ emissions are avoided by export/a surplus of power or heat from renewable sources that is produced in the building/at the site itself, this surplus can be included in the assessment. Power generated on the site from sun, wind or other renewable sources, which is either fed to the mains grid or made available to other consumers, can be recognised. Heat generated on the site from sun, wind or other renewable sources, which is made available to other consumers, can also be included in the calculation. The generated annual surplus can be incorporated into the assessment in the form of a CO₂ credit by being multiplied by negative CO₂ emission factors.

The DGNB publishes the CO₂ emission factors that are to be used for the credits.

Initial applications will define whether power or heat produced near the site, with a direct, legally bound link to the building or site, can be appropriately incorporated into the accounting process.

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⁶ The gases regulated in accordance with the Kyoto Protocol are currently: Carbon dioxide (CO₂), methane (CH₄), nitrogen monoxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF₆), nitrogen trifluoride (NF₃) and fluorinated greenhouse gases (F-gases).

⁷ ÖKOBAUDAT is an online database created by the German Federal Ministry of the Interior, Building and Community (BMI), which can serve as a standardised database for assessing the life cycle of buildings. It is used by the DGNB as a reference database for a life cycle assessment that must be performed for DGNB certification.

⁸ The data from GEMIS (Global Emissions Model for integrated Systems) originates from a freely available life cycle and material flow analysis model with integrated database for energy, material and transportation systems. It is regularly published by IINAS (International Institute for Sustainability Analysis and Strategy).
5.3.6. Overall assessment for accounting level 1 – ongoing operation

The objective of the overall assessment of CO₂ emissions for accounting level 1 is carbon neutrality. Carbon neutrality results if the conditions of the following calculation are met:

\[
\text{Indirect CO}_2 \text{ emissions from supplied energy} + \text{direct CO}_2 \text{ emissions from energy production} < \text{avoided CO}_2 \text{ emissions from exported energy}
\]

The overall assessment of CO₂ emissions for accounting level 1 must be determined using the following formula:

\[
\text{Annual CO}_2 \text{ emission footprint} = \text{indirect CO}_2 \text{ emissions from supplied energy} + \text{direct CO}_2 \text{ emissions from energy production} - \text{avoided CO}_2 \text{ emissions from exported energy}
\]

5.4. Accounting rules for accounting level 2 “Operation and material”

5.4.1. Scope of assessment for embodied CO₂ emissions resulting from materials that are in use and are intended to be used

In addition to the elements to be calculated for accounting level 1, the scope of assessment for the embodied CO₂ emissions also includes the following elements:

- Life cycle assessment results for the global warming potential of modules A1, A2, A3, B1, B2, B4, C3, C4 and D, as defined in DIN EN 15978, for all components used in the building from cost groups 300 and 400, as defined in DIN 276
The modules defined in DIN EN 15978 designate a building’s life cycle phases in a clearly defined manner. Modules A1, A2 and A3 are part of the production stage involving elements of raw material supply, transport and production. Module B1 depicts the emissions resulting from the use or application of materials, module B2 represents maintenance and module B4 illustrates the predicted replacement of materials during a building’s use stage. The end of life stage is represented by modules C3 (waste processing) and C4 (disposal). Possible benefits and loads beyond the system boundary are represented by module D, which records the potential for reuse, recovery and recycling in an assessment.

5.4.2. Accounting method for embodied CO₂ emissions

If the aim is to achieve accounting level 2, the overall assessment must include the components used in the construction and their embodied CO₂ emissions for new buildings and, for renovated buildings, the newly installed components and their embodied CO₂ emissions by means of a life cycle assessment calculation in accordance with DIN 15978.

The DGNB method for assessing the life cycle of buildings, as defined in the 2018 version of the DGNB System, must be used to determine the embodied CO₂ emissions of new buildings. Both the simplified and detailed methods are permitted for this purpose. The basis for this is described in the criterion “ENV1.1 Life cycle impact assessment” in the DGNB’s criteria set “New Construction”. For renovation projects, the DGNB’s method developed in compliance with this must be used.

With this method, only the components introduced as part of the renovation project must be assessed over their life cycle.

When reporting the accounting results, a clear distinction must be made between CO₂ emissions that have already occurred (modules A1, A2 and A3) and CO₂ emissions from scenario calculations (all other modules).

If the scope of assessment is more extensive than the above-described modules or building elements (e.g. refrigerant leakage, mobility, transport to the construction site, installation, exterior components), it is no longer possible to compare the calculated CO₂ emission values with those from other buildings or sites. The CO₂ emissions of these additional modules or building elements must be accounted for separately as total or individual values and subtracted from the assessment.

The compensation options, inclusion of green electricity and avoided CO₂ emissions discussed in Section 5.3.5 can only be incorporated into the accounting for the embodied CO₂ emissions if conclusive rules have been defined for this.

5.4.3. Overall assessment for accounting level 2
“Operation and material”

The objective of the overall assessment of CO₂ emissions for accounting level 2 is carbon neutrality. Carbon neutrality for accounting level 2 results if the conditions of the following calculation are met:

Indirect CO₂ emissions from supplied energy
+ direct CO₂ emissions from energy production
+ embodied CO₂ emissions from materials
< CO₂ emissions from exported energy

The overall assessment of CO₂ emissions for accounting level 2 must be determined using the following formula:

Annual CO₂ emission footprint =
indirect CO₂ emissions from supplied energy
+ direct CO₂ emissions from energy production
– avoided CO₂ emissions from exported energy
+ embodied CO₂ emissions from materials

5.5. Documentation and quality assurance of accounting

In order to ensure that the accounting process complies with the rules laid down by this framework, the calculations may have to be checked by an independent third party depending on the application. The information described in the following table and actually used in the accounting process must be available and comprehensible for this type of check. The table also illustrates the fundamental calculation rules and options that form the basis of the accounting process.
### DIRECT, INDIRECT OR AVOIDED EMISSIONS

<table>
<thead>
<tr>
<th>NO.</th>
<th>DIRECT, INDIRECT OR AVOIDED EMISSIONS</th>
<th>QUANTITY (CALCULATED, MEASURED, PURCHASED)</th>
<th>CALCULATION METHOD FOR THE CO₂ EQUIVALENTS</th>
<th>INCLUSION IN THE ASSESSMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Direct emissions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Fuel oil, diesel, natural gas</td>
<td>Calculation from simulation (planning) or measured value</td>
<td>Quantity multiplied by reference or individual CO₂ emission factor</td>
<td>Partial quantity of direct emissions</td>
</tr>
<tr>
<td>1.2</td>
<td>Biogas, wood pellets, biomass or similar</td>
<td>Calculation from simulation (planning) or measured value</td>
<td>Quantity multiplied by reference or individual CO₂ emission factor</td>
<td>Partial quantity of direct biogenic emissions</td>
</tr>
<tr>
<td>1.3</td>
<td>Power from renewable sources that is produced and used in the building/on the site itself</td>
<td>Calculation from simulation (planning) or measured value</td>
<td>Quantity multiplied by reference or individual CO₂ emission factor</td>
<td>Partial quantity of direct emissions (if emission factor &gt; 0)</td>
</tr>
<tr>
<td>1.4</td>
<td>Heating or cooling from renewable sources that is produced and used in the building/on the site itself</td>
<td>Calculation from simulation (planning) or measured value</td>
<td>Quantity multiplied by reference or individual CO₂ emission factor</td>
<td>Partial quantity of direct emissions (if emission factor &gt; 0)</td>
</tr>
</tbody>
</table>

| 2.  | Indirect emissions                   |                                             |                                           |                            |
| 2.1 | Power from Germany’s mains grid      | Calculation from simulation (planning) or measured value | Quantity multiplied by reference CO₂ emission factor | Partial quantity of indirect emissions |
| 2.2 | Green electricity (purchased) used in the building/on the site itself | Calculation from simulation (planning) or measured value | Quantity multiplied by reference or individual CO₂ emission factor | Inclusion in the assessment still pending |
| 2.3 | District heating or district cooling  | Calculation from simulation (planning) or measured value | Quantity multiplied by reference or individual CO₂ emission factor | Partial quantity of indirect emissions |

| 3.  | Avoided emissions                    |                                             |                                           |                            |
| 3.1 | Green electricity (purchased) surplus | Calculation from simulation (planning) or measured value | Quantity multiplied by individual CO₂ emission factor | Inclusion in the assessment not possible |
| 3.2 | Power from renewable sources that is produced in the building/on the site itself and exported | Calculation from simulation (planning) or measured value | Credit: Quantity multiplied by negative (factor -1) reference CO₂ emission factor | Partial quantity of avoided CO₂ emissions through electricity export (avoided CO₂ emissions are subtracted from the total emissions) |
| 3.3 | Heating or cooling that is produced from renewable sources in the building/on the site itself and exported | Calculation from simulation (planning) or measured value | Credit: Quantity multiplied by negative (factor -1) reference CO₂ emission factor | Partial quantity of avoided CO₂ emissions through export of heating or cooling (avoided CO₂ emissions are subtracted from the total emissions) |
| 3.4 | CO₂ compensation                     | Proof of certificates acquired and their qualification | Credit: Number of acquired certificates multiplied by a negative (factor -1) | Inclusion in the assessment still pending |
| 3.5 | CO₂ sinks (on the site, nearby, far away) | Proof of calculation | Calculation via valid CO₂ emission factors (absorption) | Inclusion in the assessment not possible at present |

| 4.  | Bound emissions                      |                                             |                                           |                            |
| 4.1 | Production, maintenance, recycling, disposal | Life cycle assessment calculation | Mass calculation of the components used, including usage and end-of-life scenario in accordance with DGNB (modules A–D) | Partial quantity of indirect emissions: Embodied CO₂ emissions resulting from the materials |

**Fig. 4 – Documentation of accounting (planning and measured values)**
6. Part 2: Rules for CO₂ reporting ("carbon disclosure rules")

6.1. Reporting options

In order to publicly present the information that is relevant to climate protection for a building or site, indicators are defined for key performance figures which are to be provided in the form of an emissions certificate. This certificate lists key performance figures – numerous ones that must be disclosed and others that can optionally be disclosed. These must be collected once a year. The emissions certificate is valid for one year.

6.1.1. REPORTING FOR VARIOUS ACCOUNTING LEVELS

The emissions certificate must be based on the accounting process formulated in Part 1. Accounting levels 1 and 2, as described and defined in Part 1, can be used here. The emissions certificate must state which method was applied.

6.1.2. REPORTING FOR PLANNING OR MEASURED VALUES

The emissions certificate must also indicate whether the key performance figures are based on planning calculations or measured values. Buildings that have been in use for at least three years have to use measured data.

- New building – planning values: Calculation results are based on data immediately after completion
- Existing building – measured values: Calculation results are based on data after at least three years of use

6.1.3. REPORTING WITH CLIMATE PROTECTION ROADMAP

If a climate protection roadmap, as described in Part 3, is drawn up for a building or site, and the aim is to be designated as "carbon-neutral by 2050", the annual CO₂ limit values up to 2050 must also be disclosed in the emissions certificate.

6.2. Key performance figures for reporting

Figure 5 illustrates the required key performance figures for the various options as part of reporting. It must be noted here that, in addition to the CO₂ emissions for buildings for which characteristic values relating to people can be determined (typical number of regular users) and in addition to the overall assessment of the building or the site, the characteristic value “CO₂ emissions per person” must be determined and stated. The average occupancy rate must be used as the reference value in most cases. Exceptions can be made for certain building types (e.g. industrial buildings). In addition, the characteristic value “CO₂ emissions per energy reference area” can be determined from heated or cooled residential floor area or usable floor area.

6.3. Designations of buildings or sites within the meaning of the framework

If an annual value of ≤ 0 kg CO₂ equivalents is reached for the key performance figure of “Accounting result for total CO₂ emissions resulting from the building or site – ongoing operation”, the building or the site can be designated as “carbon-neutral in ongoing operation” within the meaning of the framework.

If an annual value of less than or equal to 0 kg CO₂ equivalents is reached for the total produced by the key performance figures of “Accounting result for total CO₂ emissions resulting from the building or site – ongoing operation” and “Embodied CO₂ emissions”, the building or the site can be designated as “carbon-neutral throughout the life cycle” within the meaning of the framework.

If the key performance figure of “Accounting result for total CO₂ emissions resulting from the building or site – ongoing operation” is less than or equal to the key performance figure of “Annual limit value according to the climate protection roadmap”, the building or the site can be designated as “climate-neutral by 2050” within the meaning of the framework (preliminary designation).
<table>
<thead>
<tr>
<th>INDICATORS</th>
<th>ACCOUNTING LEVEL 1</th>
<th>ACCOUNTING LEVEL 2</th>
<th>CLIMATE PROTECTION ROADMAP</th>
<th>NEW BUILDINGS – PLANNING VALUES</th>
<th>EXISTING BUILDINGS – MEASURED VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Year of issue of the emissions certificate</td>
<td>Mandatory</td>
<td>Mandatory</td>
<td>Mandatory</td>
<td>Year</td>
<td>Year</td>
</tr>
<tr>
<td>2. Accounting result for total CO₂ emissions resulting from the building/site – ongoing operation</td>
<td>Mandatory</td>
<td>Mandatory</td>
<td>Mandatory</td>
<td>Calculated target values, in kg CO₂ equivalents</td>
<td>Determined actual values, in kg CO₂ equivalents</td>
</tr>
<tr>
<td>3. Characteristic value CO₂ emissions per person – ongoing operation</td>
<td>Mandatory</td>
<td>Mandatory</td>
<td>Mandatory</td>
<td>Calculated target values, in kg CO₂ equivalents/person or suitable reference value</td>
<td>Determined actual values, in kg CO₂ equivalents/person (or suitable reference value)</td>
</tr>
<tr>
<td>4. Characteristic value CO₂ emissions per energy reference area – ongoing operation</td>
<td>Mandatory</td>
<td>Mandatory</td>
<td>Mandatory</td>
<td>Calculated target values, in kg CO₂ equivalents/m²</td>
<td>Determined actual values, in kg CO₂ equivalents/m²</td>
</tr>
<tr>
<td>5. Annual limit value according to climate protection roadmap</td>
<td>Mandatory</td>
<td></td>
<td></td>
<td>Calculated target values, in kg CO₂ equivalents</td>
<td>Calculated target values, in kg CO₂ equivalents</td>
</tr>
<tr>
<td>6. Year that the climate protection roadmap was created or revised</td>
<td>Mandatory</td>
<td></td>
<td></td>
<td>Year</td>
<td>Year</td>
</tr>
<tr>
<td>7. Embodied CO₂ emissions</td>
<td>Mandatory</td>
<td></td>
<td></td>
<td>Calculated, in kg CO₂ equivalents</td>
<td>Calculated, in kg CO₂ equivalents</td>
</tr>
<tr>
<td>8. Final energy demand</td>
<td>Mandatory</td>
<td>Mandatory</td>
<td></td>
<td>Calculated target values</td>
<td>Determined actual values</td>
</tr>
<tr>
<td>9. Potentially: Proportion of renewable energy that is produced on the site/in the building</td>
<td>Optional</td>
<td>Optional</td>
<td></td>
<td>Calculated target values</td>
<td>Determined actual values</td>
</tr>
<tr>
<td>10. Potentially: Grid support coefficient (GSC)</td>
<td>Optional</td>
<td>Optional</td>
<td></td>
<td>Calculated target values</td>
<td>Determined actual values</td>
</tr>
<tr>
<td>11. Potentially: Peak electricity demand</td>
<td>Optional</td>
<td>Optional</td>
<td></td>
<td>Calculated target values</td>
<td>Determined actual values</td>
</tr>
<tr>
<td>12. Potentially: Storage capacity</td>
<td>Optional</td>
<td>Optional</td>
<td></td>
<td>Calculated target values</td>
<td>Determined actual values</td>
</tr>
<tr>
<td>13. Potentially: Use of refrigerants</td>
<td>Optional</td>
<td>Optional</td>
<td>Type and GWP factor</td>
<td>Type and GWP factor</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 5 – Indicators (key performance figures) for the key performance figures provided in an emissions certificate in accordance with the reporting options

7.1. Objective of a climate protection roadmap

A climate protection roadmap must be drawn up if a building or site is to be designated as or designed to be “carbon-neutral by 2050” in accordance with the accounting rules and reporting rules in Part 1 and Part 2 of this framework. This also applies to buildings or sites that are already designated as “carbon-neutral” at the current point in time. The reason for this is that the CO₂ footprint of buildings with surplus energy, which are considered “carbon-neutral” at a specific point, significantly depends on the development of the emission factors used in the accounting process for the avoided emissions in the future.

The climate protection roadmap must demonstrate that the building or site achieves the set objective for 2050 of “zero CO₂ emissions in ongoing operation” and that, until that point in time, the annual CO₂ emissions are also under the building-specific or site-specific limit value line.

The definition for buildings is that their maximum available CO₂ budget is reduced from the actual CO₂ value currently measured to the value of 0 kg CO₂ emissions by 2050 via a linear function. This limit can be adjusted if this becomes necessary due to further scientific findings. Since great advances can be made in technology and the specific CO₂ factors for energy supply will not drop linearly according to current studies, the DGNB considers choosing a straight line to represent the limit as a reasonable approximation of the content of the objective specified by the IPCC.

Other functions (such as steps or curves) or a CO₂ budget approach formulated as a figure would pose major challenges for users. The communication aspect and ease of comprehensibility play a major role here.

There is a plan to establish a scientific advisory board for this framework, which is intended to evaluate this fundamental principle. Its recommendations will be incorporated as this framework is further developed.

Fig. 6 – Diagram illustrating the principle of a climate protection roadmap with straight lines representing limits for individual buildings or sites
In addition to a chart or table depicting the CO₂ footprint up to 2050, the basis for these calculations and assumptions, the climate protection roadmap must clearly illustrate the individual planned measures with their reduction effects. Profitability calculations by means of life cycle cost calculations, for example, are recommended.

For major construction projects, certain requirements for materials with regard to their constituents and their ethical and environmentally friendly procurement must be defined as secondary conditions for the building or site and associated processes must ensure that these requirements are met. The criteria for DGNB certification ENV1.2 “Local environmental impact” and ENV1.3 “Sustainable resource extraction” must be used to a modest extent for the project.

In addition, planning must take aspects relating to deconstruction and disassembly into consideration. Criterion TEC1.6 “Ease of recovery and recycling” must be used for this purpose.

All structural measures must be evaluated in accordance with the sufficiency principle in order to ensure that the target for CO₂ reduction does not result in any new problem areas in future or make existing ones worse.

7.2. Content of a climate protection roadmap

The climate protection roadmap must clearly state all of the planned steps that will lead to climate neutrality for ongoing operation. In addition, calculations in accordance with the accounting rules, as defined in Part 1 of this framework, must be available for these steps. These calculations must show the predicted CO₂ footprint for the building or site for the remaining period up to 2050. The CO₂ emission factors published by the DGNB must be used for the calculation.

The climate protection roadmap can include all planned measures and all measures that are considered feasible for the building or the site: From improvements to the building envelope through to the technical facilities, right up to organisational measures or digitisation measures. In addition to a technical evaluation of feasibility performed by an energy consultant, the building owner should also confirm that the measures have been implemented and that the limit values have not been reached.

An “individual renovation roadmap” (iSFP) in accordance with the German Federal Ministry for Economic Affairs and Energy is one example of a useful tool that can be used to draw up the climate protection roadmap.

The possibility of builders themselves drawing up an initial, simplified climate protection roadmap based on software using multiple-choice questions is currently being reviewed.

In addition to a chart or table depicting the CO₂ footprint up to 2050, the basis for these calculations and assumptions, the climate protection roadmap must clearly illustrate the individual planned measures with their reduction effects. Profitability calculations by means of life cycle cost calculations, for example, are recommended.

For major construction projects, certain requirements for materials with regard to their constituents and their ethical and environmentally friendly procurement must be defined as secondary conditions for the building or site and associated processes must ensure that these requirements are met. The criteria for DGNB certification ENV1.2 “Local environmental impact” and ENV1.3 “Sustainable resource extraction” must be used to a modest extent for the project.

In addition, planning must take aspects relating to deconstruction and disassembly into consideration. Criterion TEC1.6 “Ease of recovery and recycling” must be used for this purpose.

All structural measures must be evaluated in accordance with the sufficiency principle in order to ensure that the target for CO₂ reduction does not result in any new problem areas in future or make existing ones worse.

7.3. Quality assurance and review

The climate protection roadmap must be drawn up by qualified individuals, e.g. energy consultants. The calculation principles can also be reviewed by way of comparison with the annual measured results. We recommend having an independent third party review the calculation principles and the feasibility of the planned measures.

The roadmap should be reviewed and updated every three years. In addition, the actual CO₂ footprint and the deviation from the annual limit value must be calculated each year using measured values.

All criteria are available to download on the website dedicated to the DGNB System, version 2018 (www.dgnb-system.de).
8. Summary and outlook

The framework forms the basis for achieving climate neutrality for buildings or sites. It contains rules, which are based on recognised standards, for accounting for emissions that impact on the climate. In addition, the framework provides specifications for initial and comparable reporting of CO₂ emissions resulting from buildings or sites, and rules for designating buildings or sites within the meaning of this framework. A site can also comprise several buildings, which means that accounting for districts is also possible. The third element of the framework is defining a climate protection roadmap that offers a forecast of the CO₂ emissions expected to result from the building or site in future.

Specialist discussions are still being held relating to CO₂ emission factors, compensation and green electricity, as well as the details of the climate protection roadmap. The results of these discussions will be incorporated into any updates to this framework.

It is also permissible to recognise green electricity, if certain quality features can be ensured for green electricity. These features can include the fact that, at the same time, the generated power does indeed completely originate from renewable energy sources, that no conventional power is re-labelled by purchasing certificates, that the provider of green electricity directly supports the construction of renewable production systems and that the green electricity is produced only in Germany. The CO₂ emission factors from green electricity should be compensated for using the system of emission factors from the German energy mix so that the positive effects of green electricity are not disproportionately counted twice. It generally holds true that decisions relating to individual buildings should not be extrapolated to the total building stock without taking account of the effects this may have. This would cause the achievable results to be distorted.

In addition, discussions are still taking place and decisions are still pending as to whether CO₂ sinks by means of compensation instruments can be incorporated into the assessment. These also include land use, land use changes, the build-up or breakdown of biomass, or the rematerialisation of CO₂ by means of suitable processes.
9. Appendix

**Properties/Design of the Building Envelope**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Guide Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>External wall</td>
<td>U-value [W/(m²K)]</td>
<td>≤ 0.24</td>
</tr>
<tr>
<td>External wall in contact with the ground</td>
<td>U-value [W/(m²K)]</td>
<td>≤ 0.30</td>
</tr>
<tr>
<td>Roof</td>
<td>U-value [W/(m²K)]</td>
<td>≤ 0.20</td>
</tr>
<tr>
<td>Basement ceiling, base slab</td>
<td>U-value [W/(m²K)]</td>
<td>≤ 0.30</td>
</tr>
<tr>
<td>Windows</td>
<td>U-value [W/(m²K)]</td>
<td>≤ 1.0</td>
</tr>
<tr>
<td>Thermal heat bridge correction factor</td>
<td>U-WB [W/(m²K)]</td>
<td>≤ 0.05</td>
</tr>
<tr>
<td>Airtightness</td>
<td>n50 value</td>
<td>≤ 1.0 h⁻¹</td>
</tr>
</tbody>
</table>

Fig. 7 – Guide values for an optimised building envelope

**Systems for Energy Production/Energy Conversion**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Guide Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventilation system with heat recovery, basic ventilation</td>
<td>Effective heat recovery</td>
<td>≥ 80 %</td>
</tr>
<tr>
<td>Heat pumps for heating, cooling, hot water</td>
<td>Annual performance factor</td>
<td>≥ 3.0</td>
</tr>
<tr>
<td>Grid support</td>
<td>Grid support coefficient (GSC)</td>
<td>≤ 1.0</td>
</tr>
</tbody>
</table>

Additional systems will be added

Fig. 8 – Guide values for system efficiency (note: Guide values for system efficiency only apply when the systems are installed. They do not represent any “obligation” for such systems to be installed.)
Deutsche Gesellschaft für Nachhaltiges Bauen – DGNB e.V.

Founded in 2007, the DGNB today constitutes Europe’s largest network for sustainable construction with around 1200 member organisations. The association aims to promote sustainability in the construction and real estate industry as well as anchoring this in the consciousness of the general public. Through the DGNB certification system, the independent non-profit organisation has developed a planning and optimisation tool for assessing the sustainability of buildings and districts, which helps to increase real sustainability in construction projects. This means that the DGNB system is based on an integrated understanding of sustainability that incorporates the environment, people and the economy in equal measure. Additionally, through the DGNB Academy education and training platform, more than 3000 people in over 30 countries have already been qualified as experts in sustainable construction.

Authors and contributors:
Dr. Anna Braune, Dietmar Geiselmann, Dr. Christine Lemaitre Stefan Oehler

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