Building the Future

Sustainable Building Strategies

Welcome

to the German Pavilion of the Federal Ministry of the Interior, Building and Community (BMI)

Sustainable building has been an integral part of planning and construction processes in Federal building projects for many years. It is a core element of the German Sustainable Development Strategy, which was updated in 2017 and will be updated again in 2021.

This is important in part due to the Federal State's duty to serve as a role model in its function as the largest public builder in Germany, but also because it is an essential component of current policy objectives. Key factors here are environmentally sound and climate-sensitive construction, energy and resource efficiency, cost-effectiveness, and the need to adapt to demographic change.

The methods set out in the Guideline for Sustainable Building have been mandatory for civilian construction projects carried out by the Federal Government since 2001. The comprehensive revision of the Guideline in 2013 introduced far-reaching changes to quality requirements for Federal Government building projects and specified the practical application of these.

The quality requirements have to evolve constantly to keep pace with the standards for modern Federal Government building projects. Building measures are to be documented and evaluated in a transparent way based on the criteria and assessment standards set out in the Assessment System for Sustainable Building. Certification obtained by the Federal Government up to now shows that a high level of sustainability can be achieved economically. The Federal Government remains committed to these high sustainability standards.

There is also growing awareness and appreciation of the approach set out in the Guideline for Sustainable Building even beyond its application in Federal Government construction projects. Some federal states have implemented the Assessment System for Sustainable Building in their areas of responsibility, while others are looking into its application or are already gathering experience with the help of pilot projects.

The growing acceptance of the approach among decision-makers and project heads at local authority level is also a very positive development. A range of very interesting examples, such as schools, childcare centres and administrative buildings, can be held up as very persuasive precedents at this level.

The Federal Ministry of the Interior, Building and Community very much welcomes these developments. We are committed to continuing to be a reliable partner for all stakeholders in our shared efforts to create and maintain a built environment that is a pleasure to live in.

Sustainable building is and will remain a priority.

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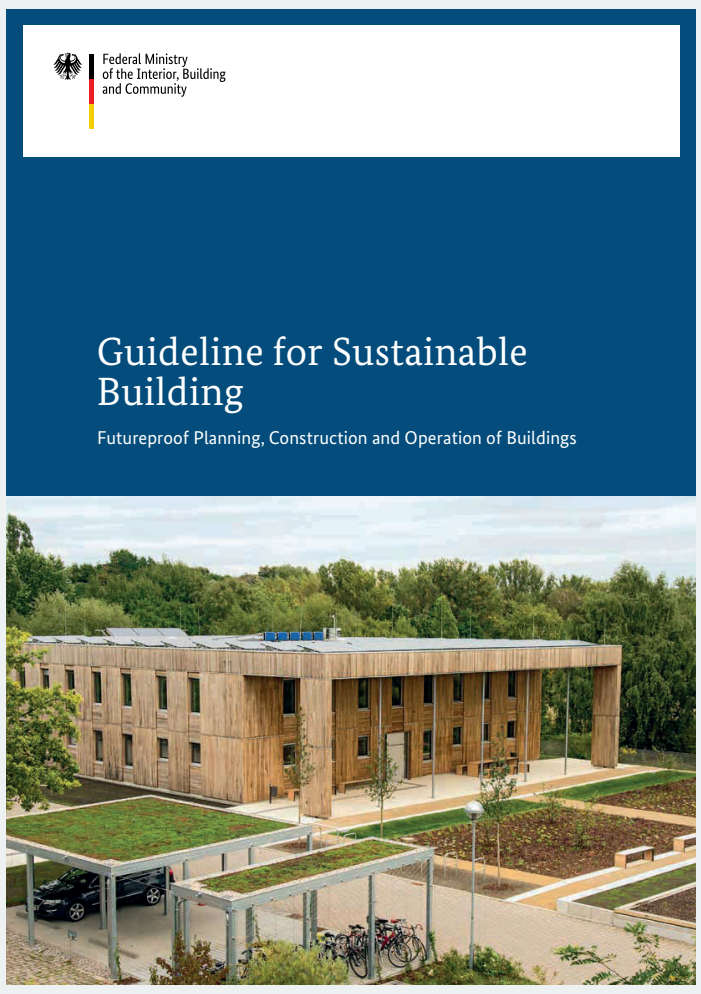
Guideline for Sustainable Building

Future-Proof Planning, Construction and Operation



Introduced in 2001 the Guideline for Sustainable Building is continually being under further development with regard to the Assessment System for Sustainable Building for Federal Buildings (BNB). The Guideline provides general principles and methods of sustainable design. It offers a specific practical aid for planning, construction, structural maintenance, operation and utilisation.

The application of the Guideline is mandatory for federal building measurements. Thereby the Federal German Government has set itself the binding quality level “Silver”. It can also be used by other building authorities for construction, such as the Federal States and municipalities as well as the private sector.

Content and Structure

The Sustainable Building Guide provides four sections, which are based on the life cycle of buildings.

Part A provides general principles and methods of sustainable design, construction, use and operation.
Part B presents concrete duties regarding to a sustainable building design. These refer equally to new building and modernisation.

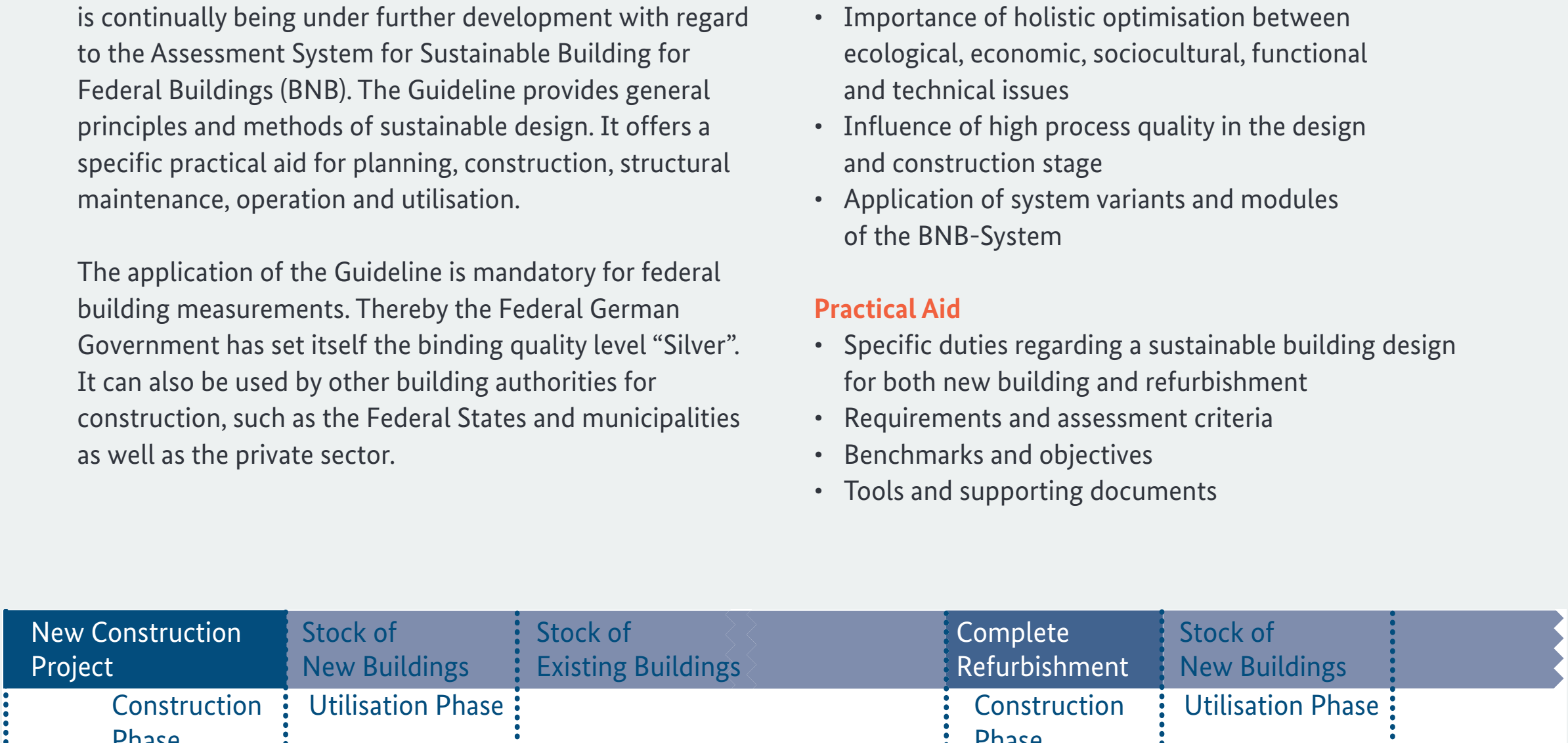
Part C describes recommendations for the optimisation of utilisation and management processes according to the criteria of the Assessment System for Sustainable Building.
Part D focuses on specific requirements of building stock and refurbishment. Thereby it is a complement of the basic principles and requirements of part A and B.

General Principles and Methods

- Interdependence between protective goods and objectives
- Importance of holistic optimisation between ecological, economic, sociocultural, functional and technical issues
- Influence of high process quality in the design and construction stage
- Application of system variants and modules of the BNB-System

Practical Aid

- Specific duties regarding a sustainable building design for both new building and refurbishment
- Requirements and assessment criteria
- Benchmarks and objectives
- Tools and supporting documents



Timeline of interaction between the Guideline for Sustainable Building (LFNB) and the Assessment System for Sustainable Building

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Tools for Sustainable Building

Guideline and Working Aids

Sustainable Building Information Portal

The Sustainable Building Information Portal provides general information and basics on sustainable building as well as a number of guides and tools, construction material and building databases along with information about research projects and events. Additionally, all criteria profiles of the BNB modules or system variants can be downloaded from the linked BNB portal.

Life Cycle Assessment (LCA)

Life cycle assessment (LCA) has an important function in the Assessment System for Sustainable Building (BNB). LCA calculates indicators of environmental impacts like global warming, acidification or the ozone hole.
The Federal Ministry of Building provides openly accessible data and tools for the life cycle assessment for buildings.

eLCA Software

The eLCA software is an online LCA tool for buildings based on ÖKOBAUDAT data. It standardises LCA calculations according to the rules of the BNB system. The main feature of eLCA is a component editor (Bauteileditor) where users can create building components very easily– supported by dynamic graphics and an integrated library of building elements.

Life Cycle Data Base

The life cycle assessment data are provided online in the ÖKOBAUDAT with generic and product-specific information on the environmental indicators of building materials. Combined with the generic information on the average service life of the building material (service life table), the impact of the building on the environment can be calculated.

Digital Assessment and Documentation Tool (eBNB)

The internet-based tool (eBNB) centrally collects complex building information for all certified federal buildings in the form of dynamised building data. It was developed as a project management system for implementing the BNB system in federal buildings.

The central goal is to harmonise verification and documentation processes in the BNB system, to ensure quality in the field of conformity testing and to improve the flow of information at federal building authorities. With the eBNB as a central database system, all the information required for a BNB assessment can now be systematically collected and documented. The necessary conformity tests can also be carried out digitally. The information is stored for scientific purposes and political consultancy.

Wecobis

The web-based ecological building material information system (wecobis) provides qualitative information to health-related and environmental issues of building material. The focus is on the avoidance of pollutants and risk substances. The requirements of the BNB system are explicitly taken into account with concrete practical information and tender aids.

Guidelines and Working Aids

Beside the Guideline for Sustainable Building the federal government provides federal guidelines and working aids with various topics.

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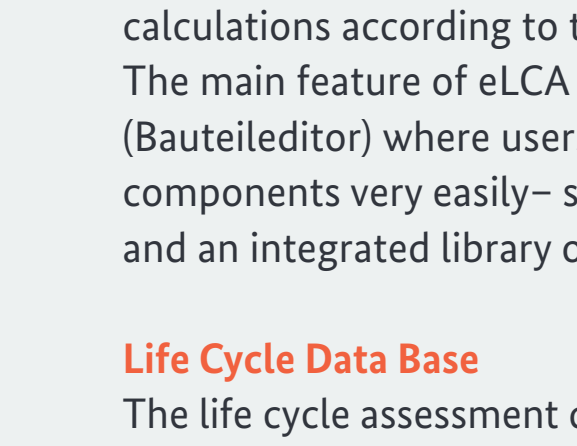
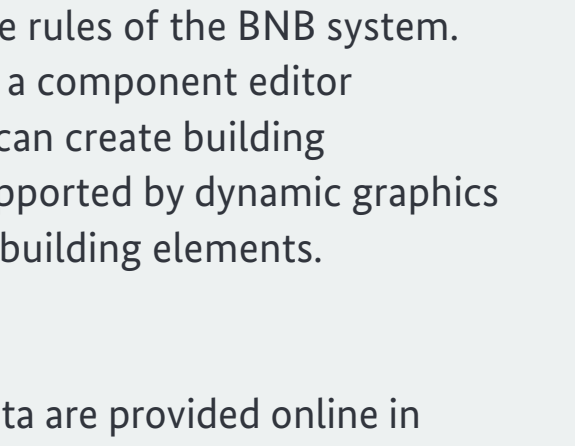
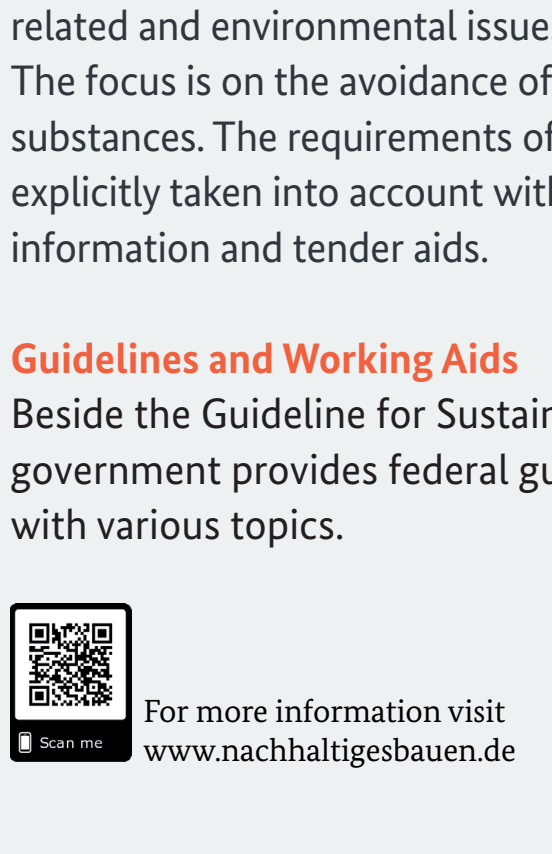
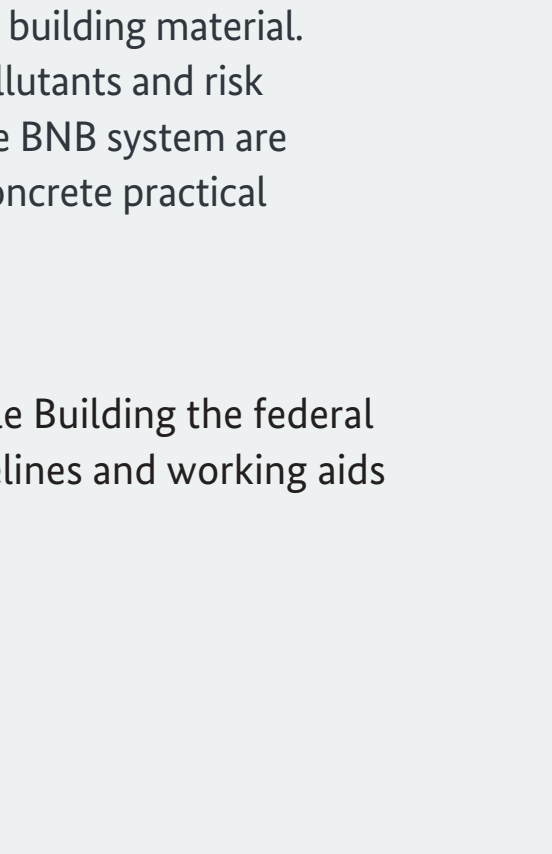
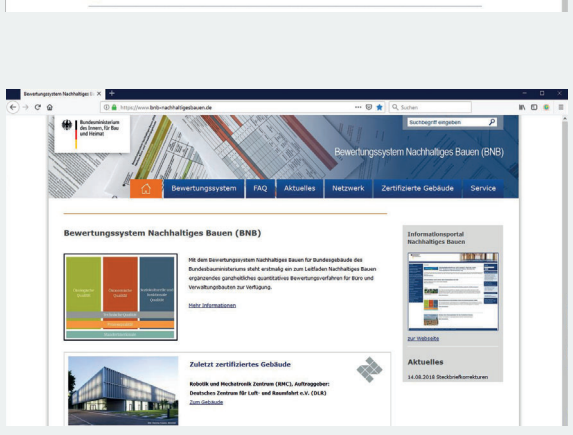
www.nachhaltigesbauen.de

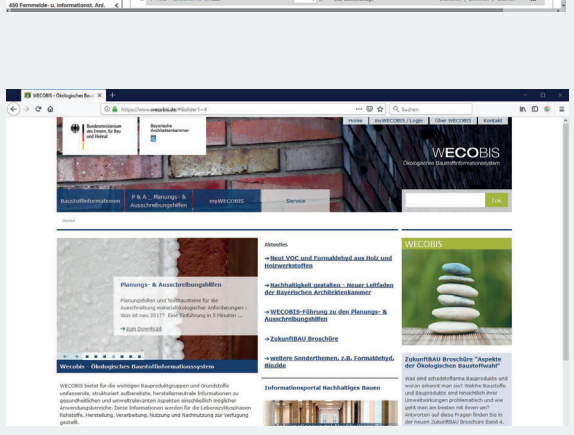


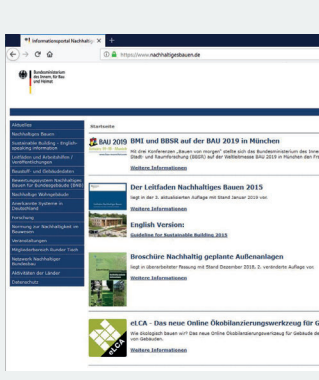


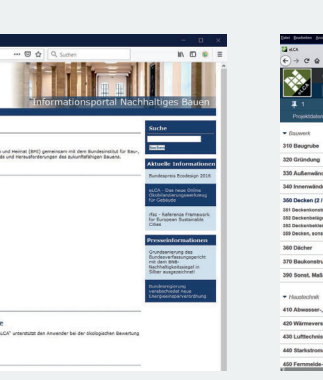


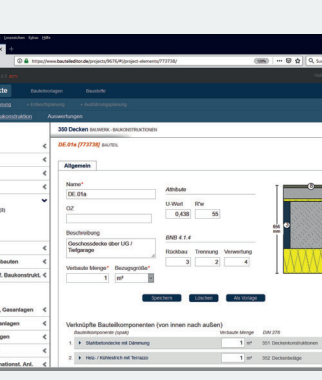


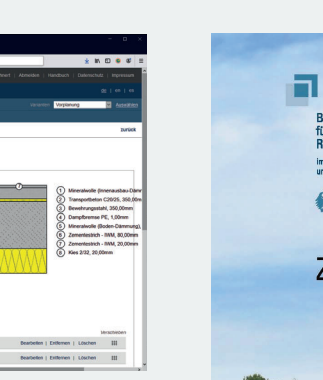












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eBNB

Electronic Rating System for Sustainable Building

Project Focus

The aim of the project “eBNB” is a uniform and efficient digital application of the rating system for sustainable building (www.bnb-nachhaltigesbauen.de).

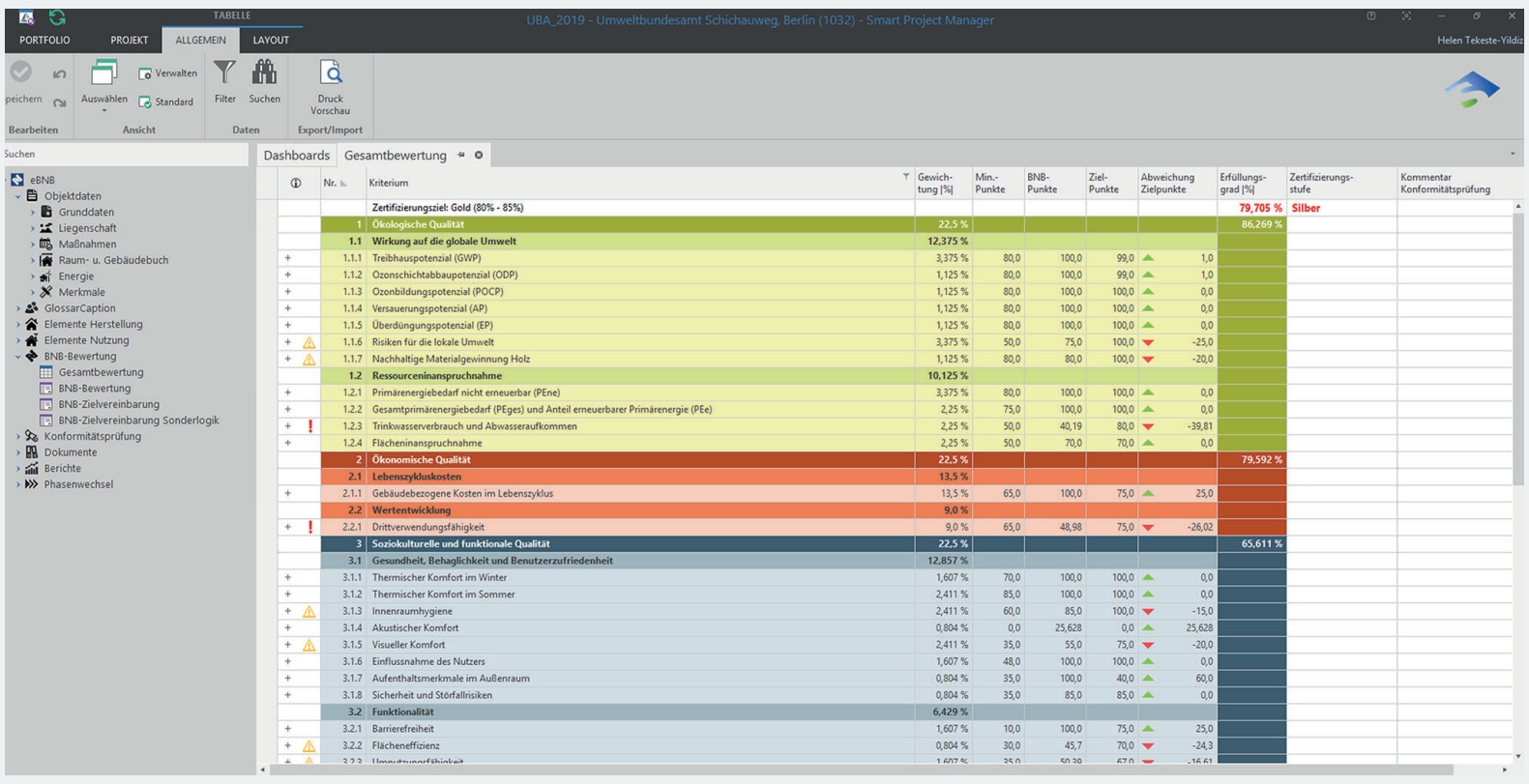
With the introduction of the BNB in federal as well as in parts of the Federal Buildings, the task of collecting building information from 16 federal administrations is centralised.

In order to map the quality requirements described in the BNB, a proprietary logic model was developed in the framework of ‘Zukunft Bau Forschung’ (lit. built future research) and implemented in the Smart Project Manager (SPM, developed by the company Smart Enterprise Solutions).

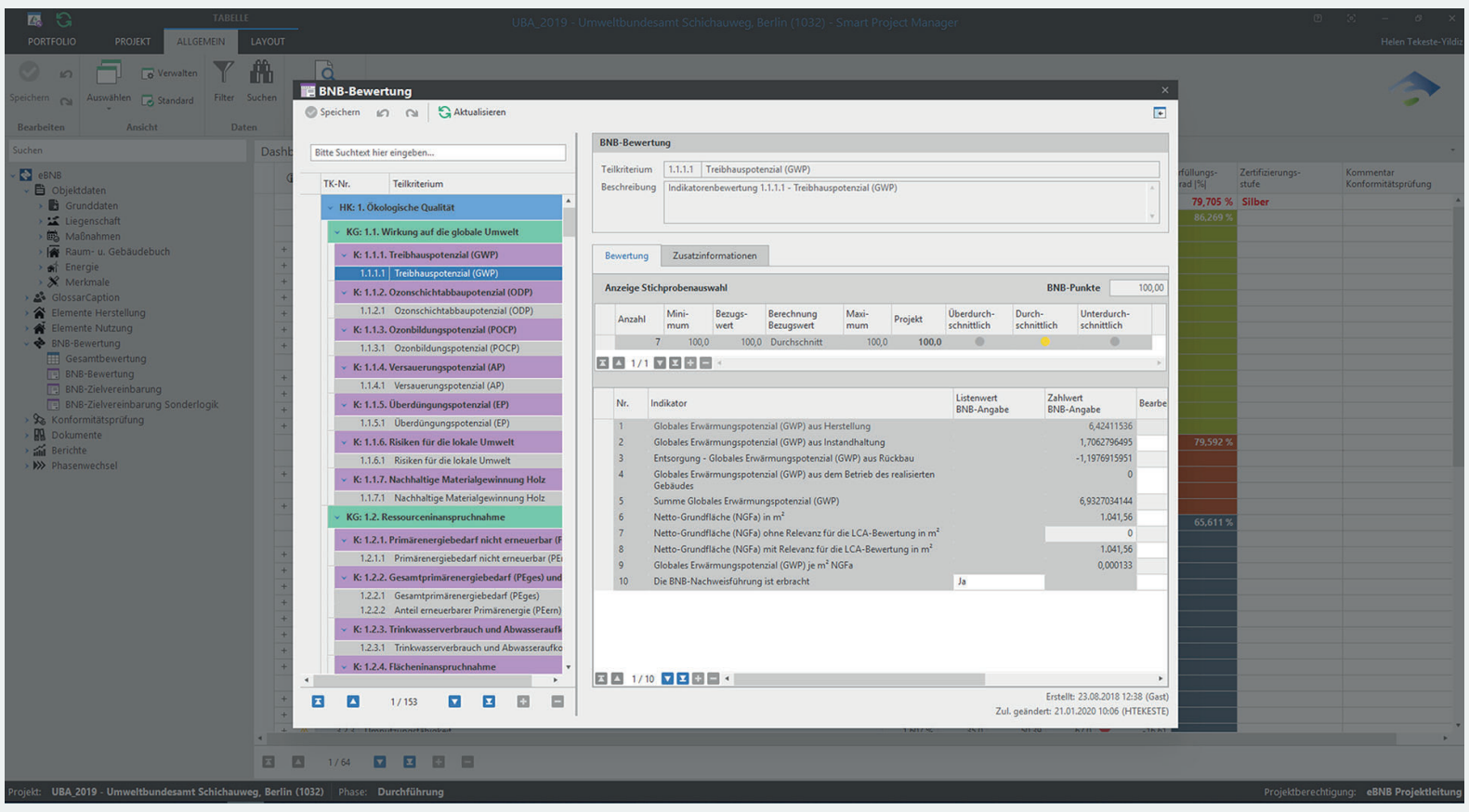
Added Value

In addition to the pure BNB application, the chosen approach allows for the first time a permanent scientific evaluation of centrally collected building data.

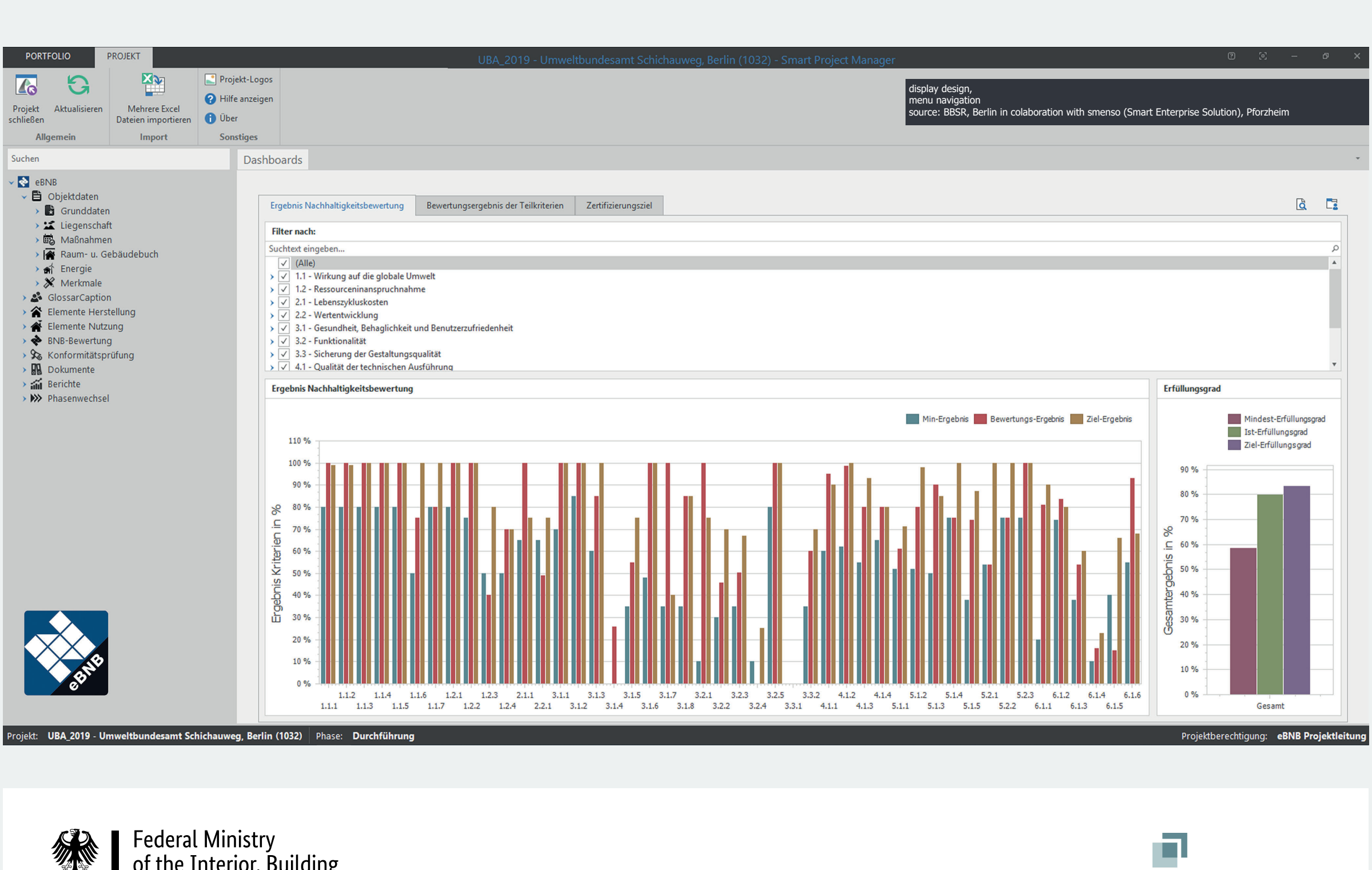
The added value of the eBNB goes well beyond the field of sustainable building. The first digital interfaces are currently under development.



View of the overall evaluation table
source: BBSR Berlin



View of the BNB profile rating
source: BBSR Berlin



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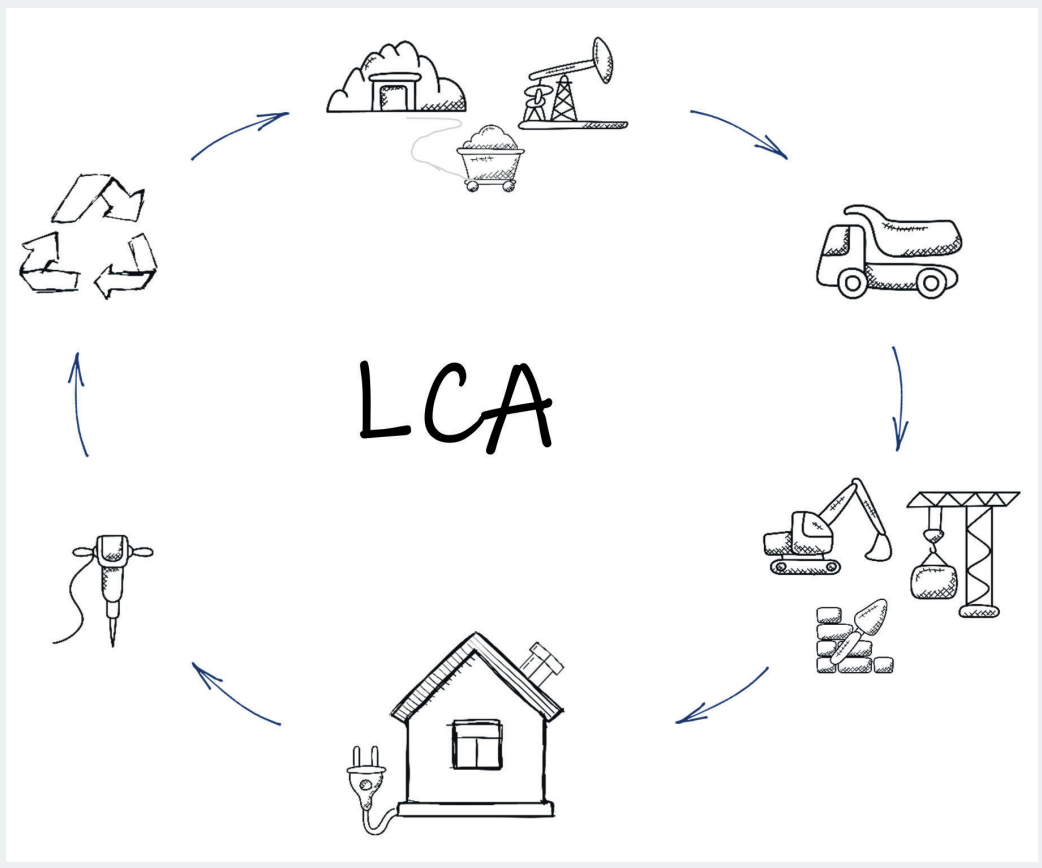
Digital Sustainable Construction

The Use of BIM to Simplify Whole Building LCA



Digital building models offer a great potential to link external LCA and material databases for sustainable assessments and their live visualization. This contributes to achieving climate targets.

Save the Planet - Use LCA

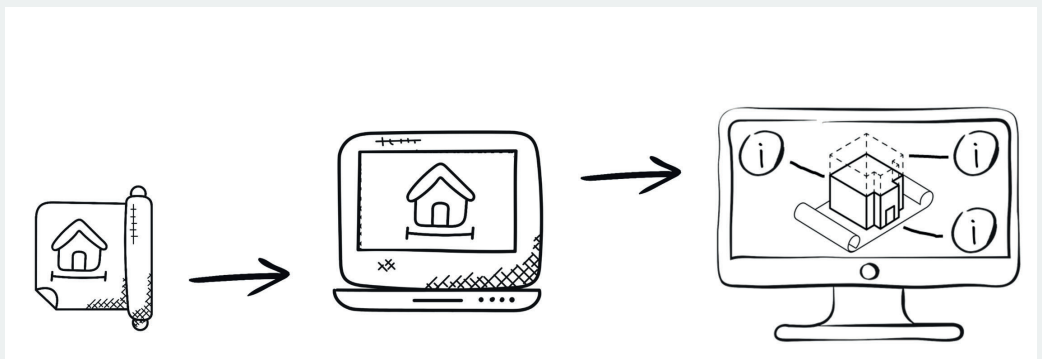
The construction and operation of buildings is the largest emitter of CO_2 in the world, consumes a large amount of resources and generates 25% of solid waste.
Life Cycle Assessment (LCA) is a method for the holistic evaluation of the environmental impact of buildings. However, this method is quite complex and time-consuming because energy and material flows are extracted manually from 2D drawings and building descriptions.

Digitalization as a Tool

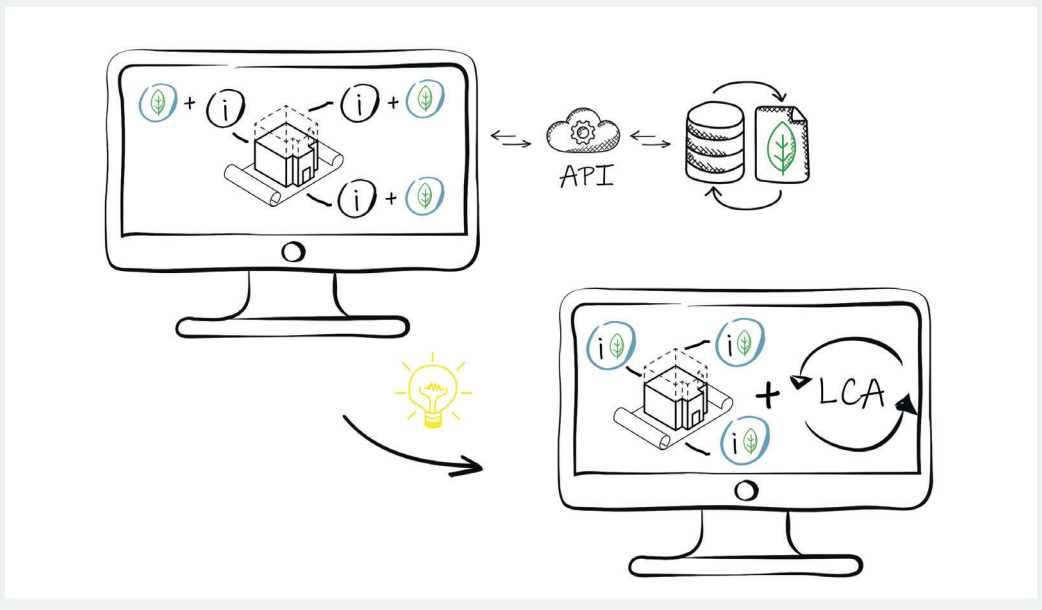
Building Information Modeling (BIM) has a high potential to integrate LCA into day-to-day planning more efficiently. This digital planning method enables the design of buildings as digital 3D models of information depth.

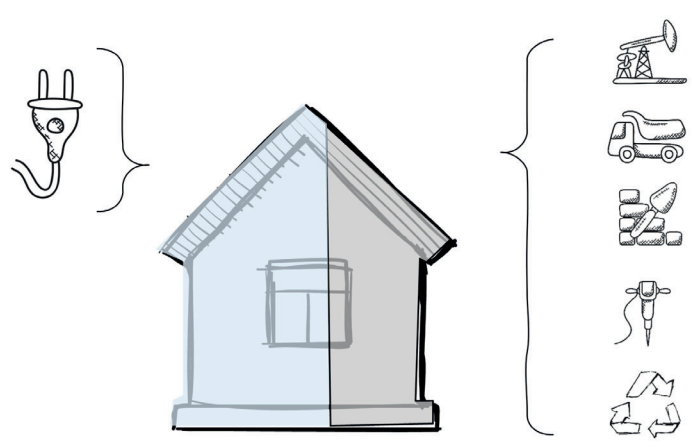
Method: Linking LCA Data with Digital Building Models

By using digital models, the information required for the LCA calculation can be provided earlier, more structured and easier to access. Combined with a new method, developed in this project, the LCA data sets of the German open source LCA database ÖKOBAUDAT are integrated into the model and linked to the data of geometry.

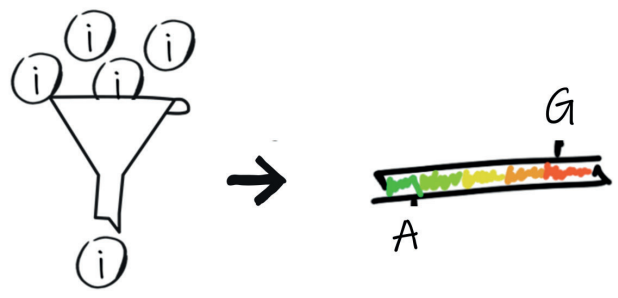


This is done by using an Application Programming Interface (API) which enables a mapping of ÖKOBAUDAT LCA data sets per Universally Unique Identifier (UUID). As a result, a very fast calculation of the whole building LCA is possible and provides a foundation for automated sustainable assessments in multiple ways.

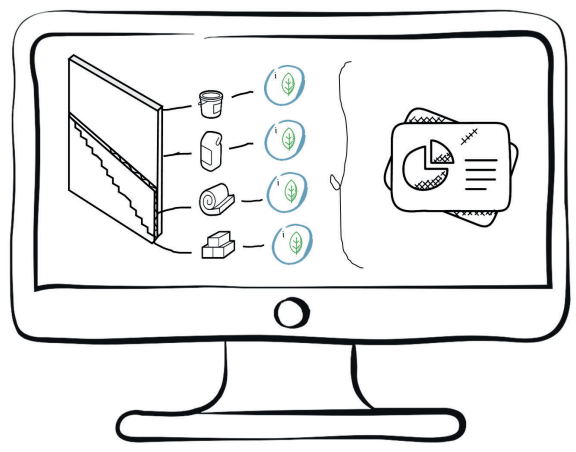




See the whole picture and understand how much energy and emissions are embodied in buildings.



Translate and visualize complex LCA results as understandable assessment formats, e.g. CO_2 in costs.



Use BIM models linked with LCA Data and material databases to create a material passport, indicating e.g. recycling potential.

Sebastian Theißen, Jannick Höper, Reinhard Wimmer, Anica Meins-Becker, Michaela Lambertz

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Assessment Systems in Germany

Public and Private Providers

The Federal Ministry of Building, as part of a two-year collaboration with the German Sustainable Building Council (DGNB), has developed an initial criteria checklist for the comprehensive assessment of sustainability aspects for construction. With the resulting Assessment System for Sustainable Building a first holistic assessment procedure was available for newly constructed office and administration buildings. The Assessment was implemented for Federal Buildings by the BNB-System and for private clients by the German Sustainable Building Council (DGNB).

The existing assessment system has been further developed for application with other types of building and kinds of utilisation. Additional providers offer assessment systems for special applications. All German assessment systems require a holistic optimisation of the life cycle assessment and life cycle costing.

BNB-System

The Assessment System for Sustainable Building for Federal Buildings (BNB-System) was developed primarily for use of the German Federal Government. There is also an interdependence with the requirements for federal construction measures and the Guideline for Sustainable Building.

Nachhaltiges Bauen

The assessment system is mandatory for new construction and complete refurbishment of German federal buildings. The further development of system variants primarily takes into account the building tasks of the federal government. The application is also possible for the private sector. The review of the documents then takes place via officially recognized conformity assessment bodies.

DGNB-System

The German Sustainable Building Council (DGNB) provides certification systems for many different building categories from office and administration via residential and educational buildings to hotels and industrial buildings.

There is also the possibility to certify urban quarters and perform serial certifications. In addition, there are offers for training and further education, topic-related events and further information, such as DGNB Navigator for construction products.

BNK-System

The building institute BiRN provides the Assessment System for Sustainable Building of small residential buildings (BNK).

Primarily single-family and two-family houses of private builders are evaluated. The system is based on the BNB system and has been adapted to the specific requirements.

NaWoh-System

The Assessment System for Sustainable Housing (NaWoh) was developed jointly by the German Housing Association (GdW) and the German Federal Government.

The focus addresses the requirements for sustainable and cost-effective housing. The results are awarded a seal of quality that documents compliance with defined requirements. Special features of the projects are presented in a distinguishing strength-profile.

Federal Ministry of Education and Research, Berlin
BNB: Office and Administration | New Construction | Gold
Design: Heinle, Wischer und Partner | Audit: WSGreenTechnologies GmbH

© BMBF / Hans-Joachim Rickel

HOWOGE Treskow-Höfe, Berlin
NaWoh: Seal of Quality
Design: Ligne Architekten | Audit: HOCHTIEF Building GmbH

© Andreas Süß

Department of Urban Development and Environment, Hamburg
DGNB: Office and Administration | New Construction | Platin
Design: Sauerbruch Hutton | Audit: solidar planungswerkstatt

© Sprinkenhof AG

Fischerhaus Musterhaus, Günzburg
BNK: Very Good
Design: Fischerhaus GmbH & Co. KG | Audit: Rainer Limbrunner

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Assessment System BNB

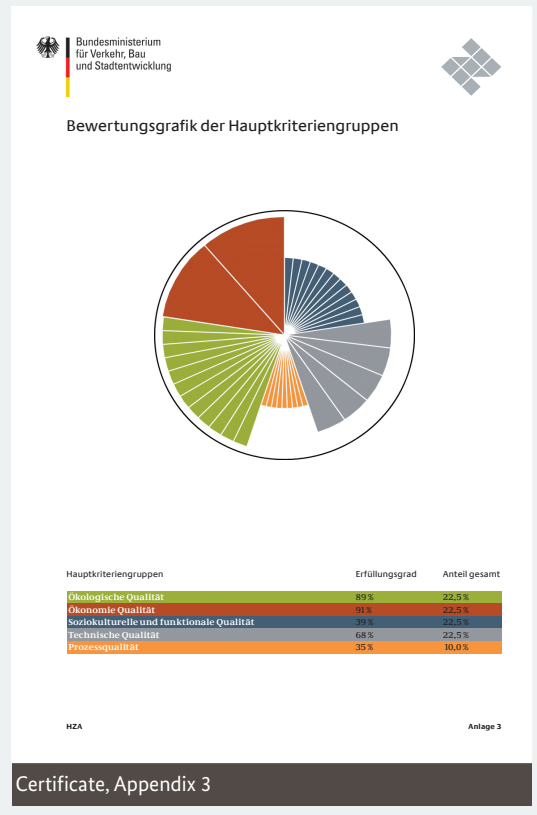
Interaction between Guideline and Assessment System

With the Guideline for Sustainable Building Germany introduced the Assessment System for Sustainable Building (BNB) mandatory for federal buildings in 2011. The Guideline serves as a set of binding rules for the use of the BNB.

The BNB is a “second-generation”, i. e. a holistic, assessment system providing a more far-reaching assessment of the building that covers its entire life cycle including all sustainability dimensions.

Certificate, Front Page

Certificate, Appendix 2



Certificate, Appendix 3

The previous three columns of sustainability were extended to five quantifiable sustainability qualities, which represent the five main criteria groups of the BNB. Besides ecological, economic, sociocultural and functional qualities, the BNB considers also technical and process quality.

The degree of fulfilment in the respective main criteria group is calculated from the individual results of the criteria. By means of fixed relevance factors, the degree of fulfilment of the five main criteria groups are allocated to the final level of fulfilment and the final score. According to the final degree of fulfilment respectively, the quality standards will result in Gold, Silver or Bronze. The location profiles are evaluated separately without impact on the score.

The BNB is also a quality assurance system for building design, construction, use and operation. It can be used as a checklist, decision support, planning tool and structure for a description of major building components and features.

Objectives

- Protection of common property such as environment, resources, health, culture and capital
- Quality management system for building design, construction, use and operation
- Practical aid for the total life cycle
- Quality assurance and evaluation
- Assessment of ecological, economic, sociocultural qualities, technical and process related issues
- Separate note for location profile
- Transparent rules and objectives, essentially quantitative methods
- Adjustment for specific requirements of different kinds of building categories

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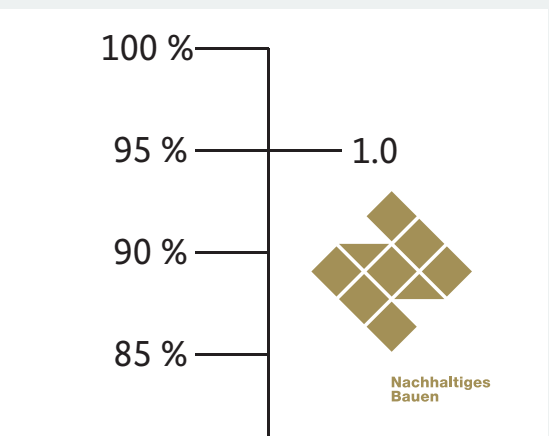
1. Main Criteria Group: Ecological Quality					Degree of Fulfilment	Weighting 22.5 %
1. 1. Criteria Group: Effects on Global and Local Environment						
1. 1. 1 Criterion partial criterion1 partial criterion 2 ... 1. 1. 2 Criterion	Assessment methodology: Calculation, quality level	Qualities: such as quality level 2	Conversion in assessment scale: Defined target, reference, and limit values	Weighting by means of significance factor: Defined from 1 to 3	Based on the main criteria group as the ratio of the achieved and the maximum possible score	Fixed weighting of the result of the main criteria group for the overall score
2. Main Criteria Group: Economic Quality					Degree of Fulfilment	Weighting 22.5 %
3. Main Criteria Group: Sociocultural and Functional Quality					Degree of Fulfilment	Weighting 22.5 %
4. Main Criteria Group: Technical Quality					Degree of Fulfilment	Weighting 22.5 %
5. Main Criteria Group: Process Quality					Degree of Fulfilment	Weighting 10.0 %
Location Profile					Degree of Fulfilment	Weighting 0 %



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Assessment System BNB

System Variants and Module Applications

The dimensions, principles and qualities of sustainable building described in the Assessment System for Sustainable Building (BNB) equally apply to all types of buildings.

However, different types of buildings have many type-specific characteristics. This may call for a different focus, other individual aspects or a different weighting factor in the sustainability assessment.

System Variants for Different Building Types

System variants consider the special requirements of different building categories.

The following variants are available:

- Office and Administration Building
- Educational Building
- Laboratory
- Outdoor Facility

Office and Administration Buildings account for the largest part of federal buildings. Therefore this type was starting point for the basic development of the BNB.

Hence the overall basis for all variants derives from the “New Construction” BNB module with the system variant “Office and Administration Buildings”.

Buildings for science, research and development activities are a key building task. The variant for Laboratory Buildings provides specially adapted criteria profiles for instance with the so-called virtual laboratory building for the ecobalance and life cycle costs assessment and the consideration of the quality of the technical building systems.

Education is an important part of our society. Educational Buildings are part of the public stage and can be a link between different social groups. They also must adapt continuously to changes in society. The BNB variant for Educational Buildings must hence offer sufficient flexibility.

In addition sustainability requirements must be addressed regarding outdoor facilities on federal properties.

Modules and their Application

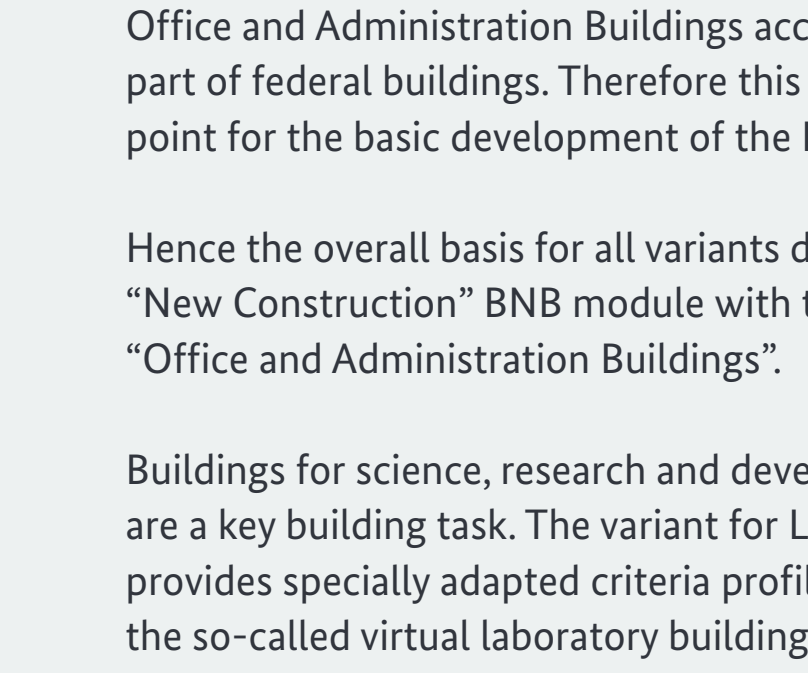
A building as well as its use and operation processes can undergo major changes during its life cycle. For this purpose the BNB has a modular structure. The BNB modules reflect the cases planning and erecting new buildings, using and operating buildings, as well as planning and performing refurbishment and conversion projects.

The following modules are available:

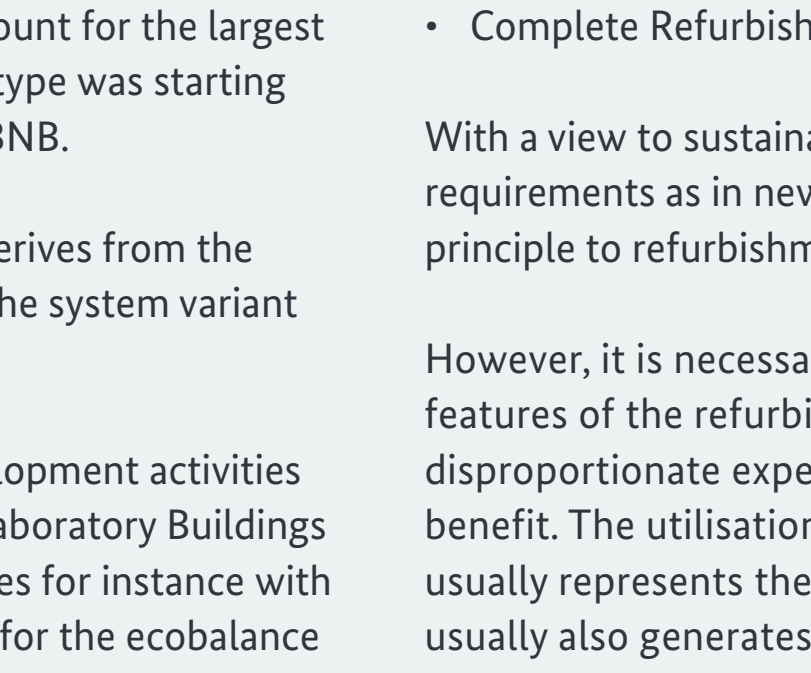
- New Construction
- Use and Operation
- Complete Refurbishment

With a view to sustainable development, the same requirements as in new buildings are to be applied in principle to refurbishment projects.

However, it is necessary to meet cope with the specific features of the refurbishment project, while avoiding disproportionate expenses compared to its later use benefit. The utilisation and operation of a building usually represents the longest phase in its life cycle and usually also generates the most intensive economic and ecological effects.



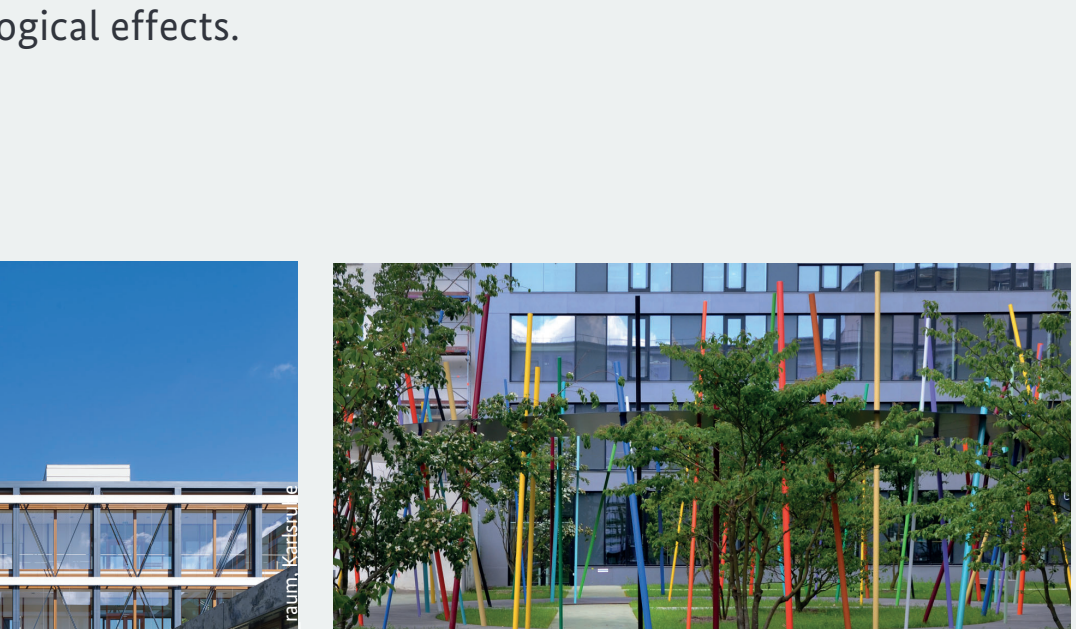
Federal Environment Agency, Berlin-Marienfelde
BNB: Office and Administration | New Construction | Gold
Design: Braun-Kerbl-Löffler | Audit: Nicolas Kerz, BBSR



Federal Constitutional Court, Karlsruhe
BNB: Office and Administration | Refurbishment | Silver
Design: Assem Architekten | Audit: ikl Ingenieurbüro

Bundestag, Inner Courtyard
BNB: Outdoor Facilities | Bronze
Design: Hager Partner AG | Audit: LA.BAR Landschaftsarchitekten bdla

Primary School Niederheide
BNB: Educational Building | New Construction | Gold
Design: IBUS | Audit: sol·id·ar planungswerkstatt



Max-Planck-Institut, Köln
BNB: Laboratory Building | New Construction | Silver
Design: hammeskrause architekten | Audit: ee concept GmbH

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Federal Institute for Research on Building, Urban Affairs and Spatial Development
within the Federal Office for Building and Regional Planning

Assessment System BNB

Application in Architectural Competitions

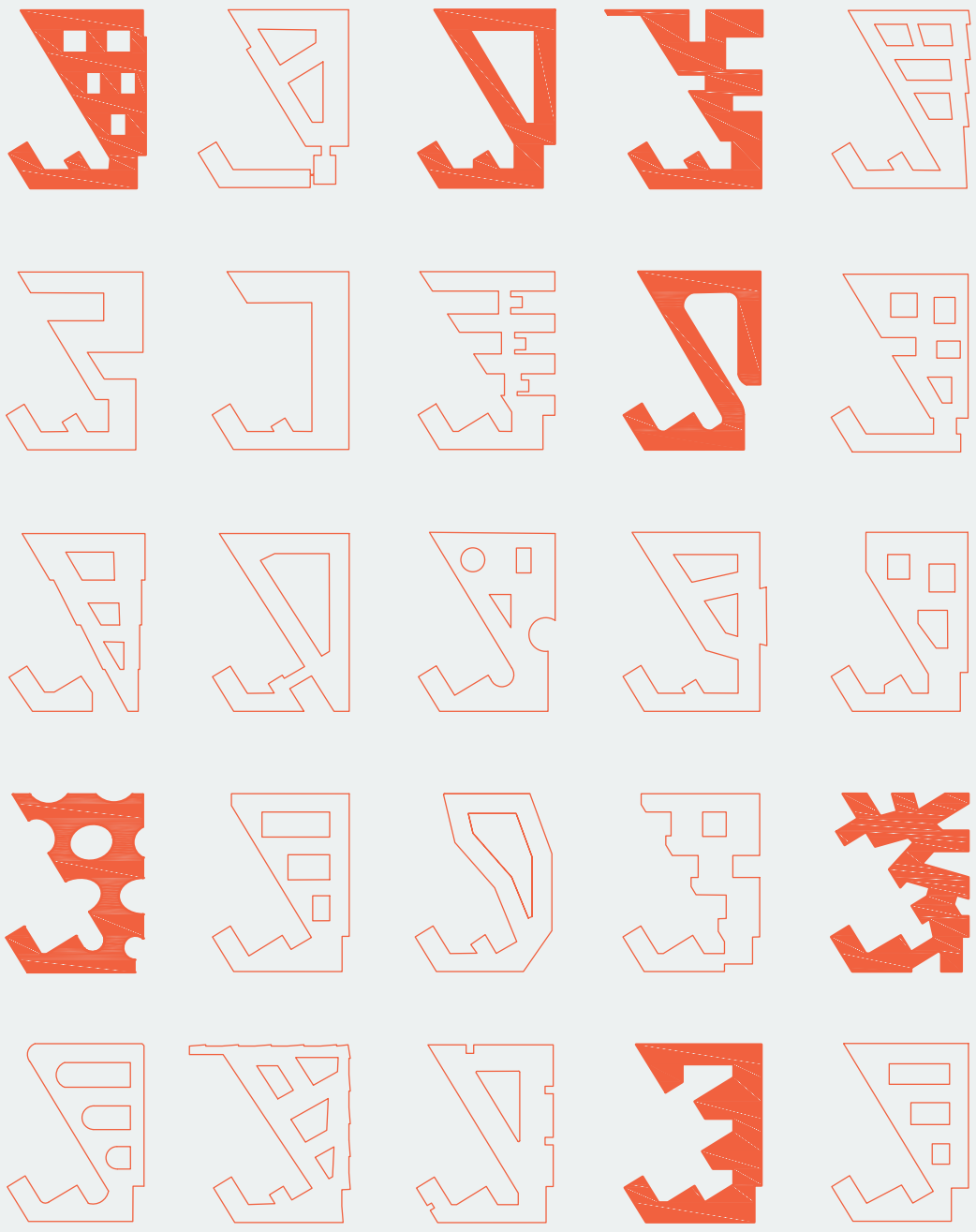
Guideline Framework SNAP

Since 2013 a guideline framework for sustainability requirements in architectural planning competitions (short title: SNAP) based on the Assessment System BNB is published. It is currently being updated and revised.

The extension of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety office building in Berlin-Mitte is a current lighthouse project to implement the goals of climate protection and sustainable construction in Germany in an exemplary manner.

The sustainability potential was assessed in the architectural competition procedure at the end of 2019 and in the further course of 2020 in order to support the jury and to be able to accompany and ensure the desired implementation of the BNB standard in gold at an early stage.

The sustainability potential of the contributions was derived from 17 sustainability criteria of the Assessment System BNB on the basis of individually selected indicators relevant to the preliminary design. The preliminary assessment was carried out by Division II.5 ‘Sustainable Building’ of the BBSR.



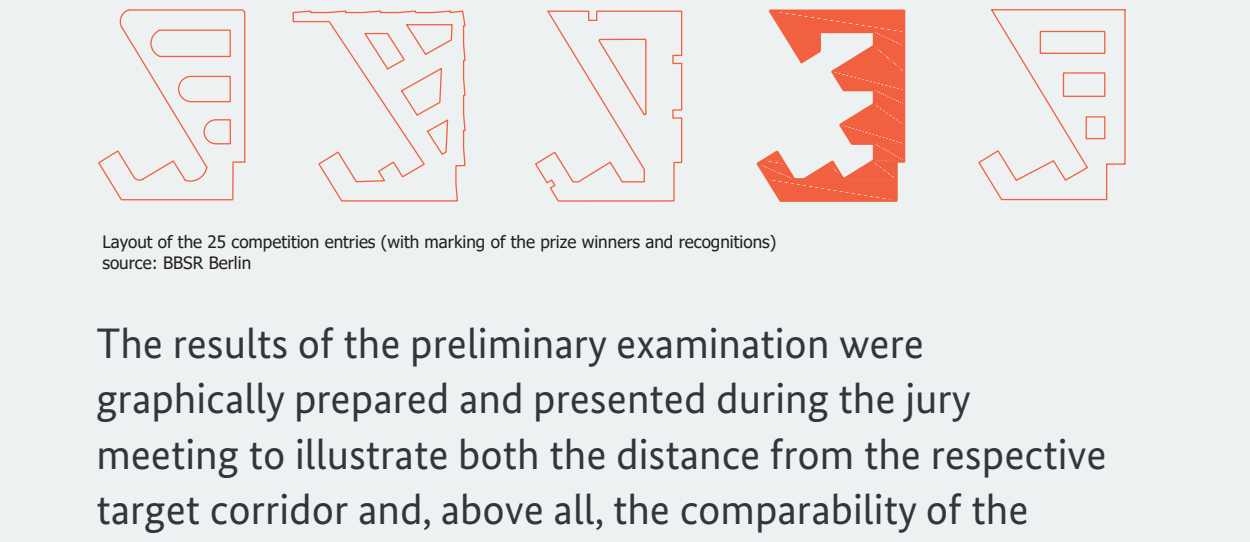
Layout of the 25 competition entries (with marking of the prize winners and recognitions)
source: BBSR Berlin

Individual Focus

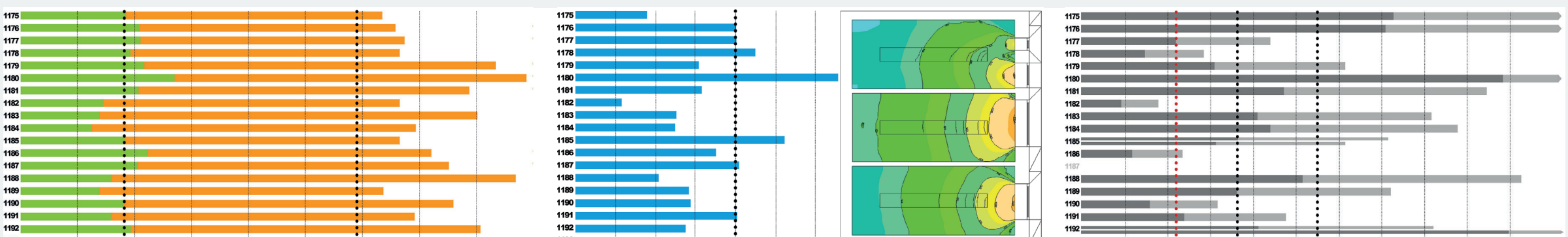
In order to accentuate the specific nature of the competition – which focuses on a distinctly low-tech strategy – three topics were given priority in addition to the overall consideration: the quantitative determination of the environmental footprint (expressed as the global warming potential), of the indoor air hygiene (expressed as the outdoor air volume flow rate) and of the daylight availability (expressed as the daylight factor).

The results of the preliminary examination were graphically prepared and presented during the jury meeting to illustrate both the distance from the respective target corridor and, above all, the comparability of the competition entries with each other. The observations on sustainability potential were documented in the written appreciation of the prize winners and were an essential part of the decision-making process.

1st prize - model view of the extension building
design: C. F. Møller Architects, Aarhus and C. F. Møller Landscape Architects, Aarhus
source: BBR/photographer: Winfried Mateyka



1st prize - perspective view of the extension building
design: C. F. Møller Architects, Aarhus and C. F. Møller Landscape Architects, Aarhus
source: draft author



from left to right: chart of the 25 competition entries in terms of the global warming potential of the overall building design, the daylight factor and the air volume flow rate in the representative offices
source: BBSR, Berlin

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SNAP

System for Sustainability Requirements in Architectural Planning Competitions

Initiating architectural competition is of outstanding importance in order to combine sustainability with architectural development early in planning process. Therefore, the „Classification for Sustainability Requirements in Planning Competitions (SNAP)“ was published in 2013 as a result of a research project.

Accordingly the ongoing research project collects and evaluates the practical experience that has been gained in the meantime and is still developing the SNAP methodology. Thus, the „SNAP update“ should help to ensure that sustainability aspects are taken into account as an obvious part of public and private planning competitions.

Theme	No.	**Criteria**
functionality	01	infrastructure
	02	public accessibility
	03	accessibility
	04	safeness
	05	communication
comfort und cosiness	06	sound insulation
	07	daylight
	08	indoor climate
economics	09	space efficiency
	10	flexibility of use
	11	life cycle costs
resources and energy	12	land take
	13	building materials
	14	energy demand
	15	energy demand coverage

Determine the direction
- BNB objective agreement and analysis of the central sustainability aspects
- Feasibility check of programme, construction site and objectives
- Selection of competent participants in the competition

Accentuating impulses
- Clarification of the sustainability requirements

Comprehensive assessment
- Concise communication of the results of the preliminary reviews
- Consideration of the assessment and sustainability criteria during evaluation rounds
- Written assessment of the shortlist including sustainability qualities and deficits

preparation → competition call → questions + colloquium → preliminary examination → Jury → completion of the competition

Increase hit rate
- Pre-design sustainability requirements as an inherent part of the competition call
- Provision of suitable planning bases („predefined energy concept or renewable energy potentials“)

Grasp the essentials
- Identifiying the relevant sustainability characteristics
- Adjustment of the pre-testing methods (especially energy, LCA, LCC)
- Condensed and graphically plausible sustainability evaluation

Promoting solutions
- Presentation of the competition objectives and results in form of press release, exhibition and documentation

The 15 pre-design criteria (see table) provide essential guidance. These are defined on the basis of the BNB system, to which further indicators, planning aspects and benchmarks are assigned to. Accordingly, the requirements are formulated in the outline of the competition, evaluated in the preliminary examination and finally explained by the jury by analysing main design characteristics of all submissions.

In addition, the recommendations on the procedure (see chart) clarify which relevant factors or tasks have to be observed in which specific process phase.

The integrated approach of the method ensures that the competition participants consider the following premises:

- Focussing on actual preliminary, design-oriented aspects
- Derivation of the understanding of sustainability based on the BNB system
- Consideration of the entire planning process – from the competition call, through out the preliminary review to the jury meeting
- Involvement of the responsible actors in the respective competition and decision-making process
- Proof of compliance with the sustainability requirements within the framework of regular competitive work
- Definition of phase-specific planning parameters or estimates that can be checked simply in advance
- Graphical clarity of the results in the preliminary assessment report (without weighting or overall score)
- Adaptation of sustainability requirements, preliminary examination methods and presentation of results to the specific procedure

ee concept gmbh

Leonardo-da-Vinci-School, Berlin
1st Prize: huber staudt architekten bda
Sustainability objective: BNB-Silver

Science building for biodiversity, Berlin
1st Prize: Glass Kramer Löbbert Architekten
Sustainability objective: BNB-Gold

Universal building University of Applied Sciences, Dresden
1st Prize: Rohdecan Architekten GmbH
Sustainability objective: BNB-Gold

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within the Federal Office for Building and Regional Planning

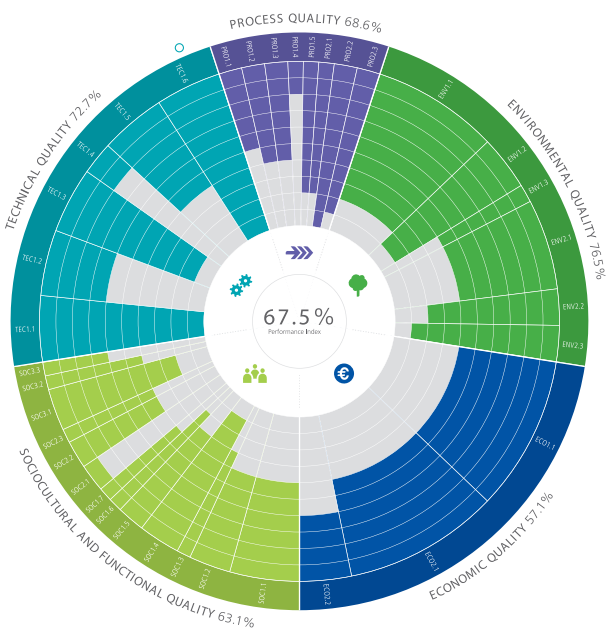
THE DGNB CERTIFICATION SYSTEM FOR SUSTAINABLE BUILDINGS AND DISTRICTS

A consistent international approach to evaluating the built environment

DGNB AND BNB: A SHARED METHOD

Building in Germany is increasingly focused on sustainability. Both public and private sectors use the method developed and shared by BMUB and DGNB to evaluate building's sustainability.
The evaluation system focuses on the entire life cycle of the built environment, covering all aspects from planning and implementation to building operation with a view to optimising overall performance.

DGNB EVALUATION GRAPH



DGNB AWARDING SYSTEM

DGNB **PLATINUM** – 80 %

DGNB **GOLD** – 65 %

DGNB **SILVER** – 50 %

THE DGNB CERTIFICATION SYSTEM: SUSTAINABILITY WORLDWIDE

Internationally approved and proved quality standard **„Made in Germany"**

More than **5,000 certificates** in over 30 countries

Europe-wide market leader in district certification

Only system worldwide for **vertical cities**

Europe's biggest network of experts for sustainable buoilding

Experts in 40 countries

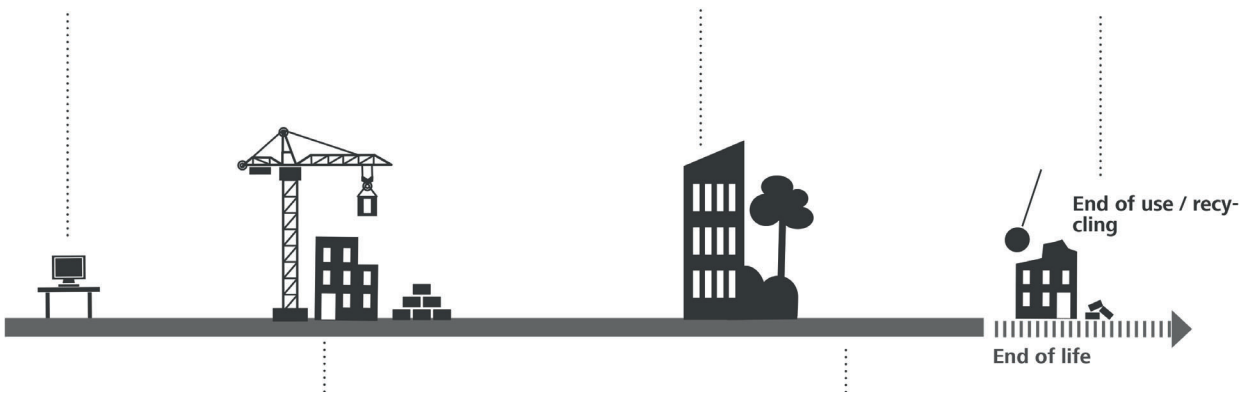
1,200 member organizations worldwide

DGNB QUALITY IN THE WHOLE BUILDING LIFECYCLE

Planning
- DGNB pre-certificate for new constructions
- DGNB pre-certificate for districts
- DGNB certificate for districts (planning / development)

Operation
- DGNB certificate for buildings in use

End of life
- DGNB certificate for dismantling



Construction
- DGNB certificate for new constructions
- DGNB certificate for interiors
- DGNB certificate for districts

Inventory | Conversion | Renovation
- DGNB certificate for existing buildings
- DGNB certificate for renovated buildings
- DGNB certificate for interiors

THE DGNB CERTIFICATION SYSTEM FOR ALL KINDS OF BUILDINGS AND DISTRICTS

The DGNB System is continually evolving and improving. It can be used to certify a wide range of new and existing buildings, as well as many kinds of disticts.

Existing Buildings
- Buildings in use
- Existing buildings
- Renovated buildings

New Construction
- Educational buildings
- Offices
- Healthcare buildings
- Retail buildings
- Hotel buildings
- Industrial buildings
- (Small) apartment buildings
- Laboratory buildings
- Mixed Use
- Multistorey car parks
- Sports halls
- Apartment buildings
- Buildings used for meetings/ assemblies/ gatherings

Interiors
- Offices
- Retail
- Hotels
- Restaurants

Districts
- Urban districts
- Business districts
- Commercial areas
- Industrial sites
- Event areas
- Resorts
- Vertical cities

DGNB System

www.dgnb-system.de

info@dgnb.de

DGNB System

THE DGNB CERTIFICATION SYSTEM FOR SUSTAINABLE BUILDINGS AND DISTRICTS

A consistent international approach to evaluating the built environment

Oberbillwerder
Hamburg, Germany | Urban Districts
DGNB Platinum Pre-Certificate

© IBA Hamburg / ADEPT mit Karres + Brands

Alnatura Arbeitswelt
Darmstadt, Germany | New Construction Offices
DGNB Platinum Certificate

© Roland Halbe

Experimenta Heilbronn
Heilbronn, Germany | New Construction Assembly Buildings
DGNB Platinum Certificate & DGNB Diamond Award

© experimenta GmbH

Eisbärhaus Bauteile A+B
Kirchheim unter Teck, Germany | Buildings in Use
DGNB Platinum Certificate & DGNB Climate Positve Award

© BANKWITZ planen planen bauen GmbH

DGNB System

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Assessment System BNB

Application of the Assessment System in Germany

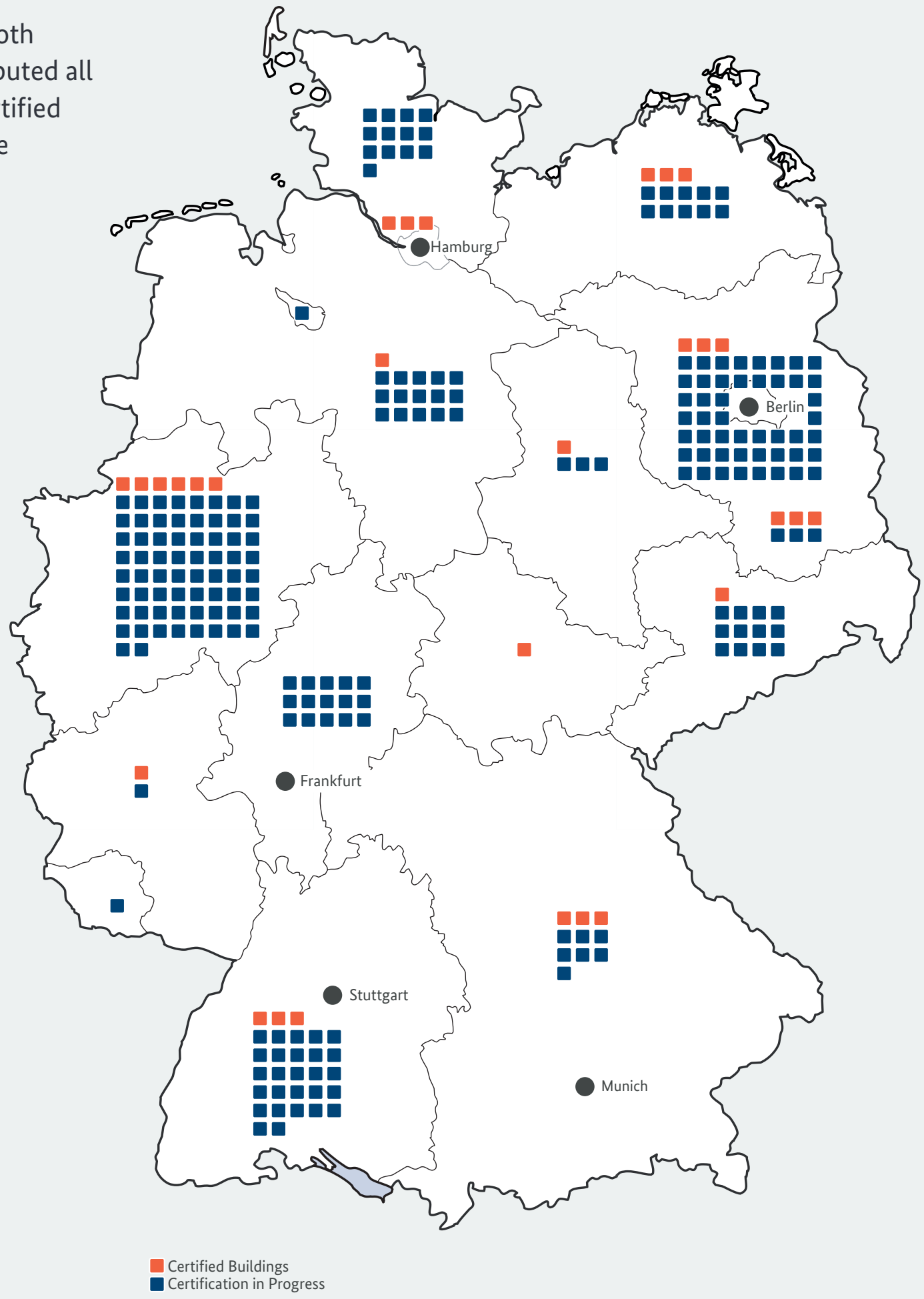
The adjacent map shows BNB-certified projects - both finished and still in progress. The projects are distributed all over the federal states of Germany. There are 29 certified projects so far, but more than 200 projects are in the process of implementation.

Most projects are federal properties, but there is also a growing number of municipal and private buildings implementing the certification with the BNB-System.

The 29 certificates address the following building categories:

- 12 office and administration buildings
- 10 educational buildings
- 7 laboratories

Most buildings reached the silver level, seven buildings were awarded in category gold, five reached the categorie bronze.



German Aerospace Center e.V. (DLR)
BNB: Office and Administration | New Construction | Silver
Design: Birk Heilmeyer und Frenzel | Audit: Landesbaudirektion Bayern

© Henning Koepke, München

German Center for Neurodegenerative Diseases (DZNE)
BNB: Laboratory Building | New Construction | Gold
Design: Wulf Architekten | Audit: DS-Plan Ingenieurgesellschaft mbH

© Steffen Vogt für wulf architekten

University of Applied Sciences Erfurt - lecture hall and laboratory building
BNB: Educational Building | New Construction | Silver
Design: Gerber Architekten | Audit: Jürgen Norwig, TMBLV

© Jürgen Landes

University of Regensburg - Auditorium and Disposal Building
BNB: Educational Building | New Construction | Silver
Design: Ferdinand Heide | Audit: Oberste Baubehörde im Bayerischen Staatsministerium des Innern

© Ferdinand Heide Architekt

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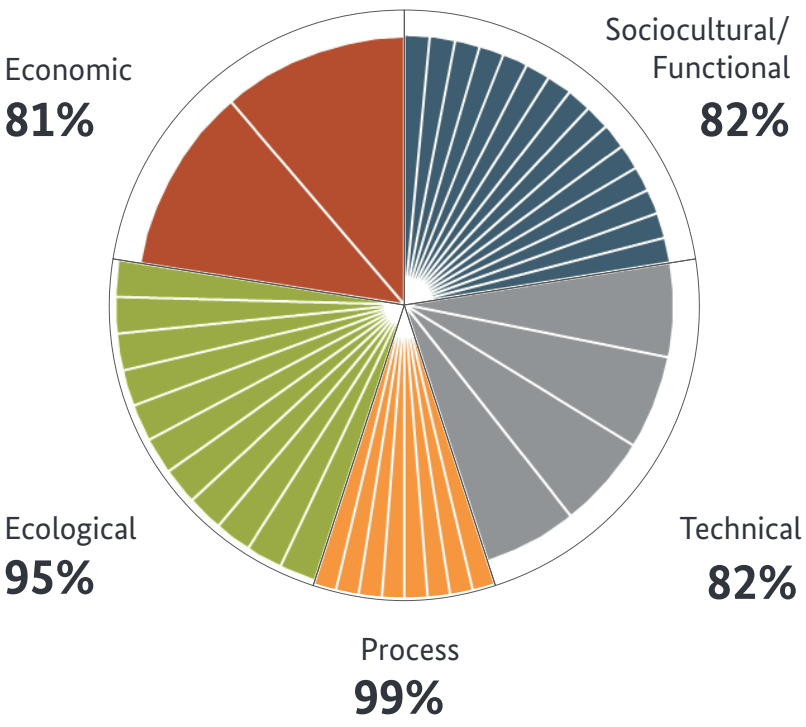
Ministry of Education and Research

New Construction | Berlin | Grade 1.3 | GOLD

Weighting of Assessment Quality **86.2 %**



Office Building (New Construction)	Gold according to BNB_BN 2011
Client	Institute for Federal Real Estate
Architect / Planner	Christian Pelzeter, Heinle, Wischer und Partner
Auditor	Thomas Thümmler, WSGreenTechnologies GmbH
Completion	August 2014
Gross Floor Area (GFA)	58,273 m²
Gross Construction Costs	€ 114.5 million
Construction Costs (KG 300, 400)	1,151 €/m²$_{GFA}$ (net)
Operation Costs	772 €/m²$_{GFA}$ (net)
Life Cycle Costs	1,922 €/m²$_{GFA}$ (net)
Primary Energy Demand (LCA)	total: 101 kWh/(m²$_{NFAa}$ a)
Global Warming Potential (LCA)	21.86 kg CO_2 eqv./(m²$_{NFAa}$ a)

Nachhaltiges Bauen

The new building of the Federal Ministry of Education and Research (BMBF) is the first civilian building project implemented by the Federal Government in the context of a Public Private Partnership (PPP), and is also the first project of this size and type awarded with a BNB Gold certificate.

Ecological and Energetic Quality

The reduction of the energy demand by 71.6 % according to EnEV 2009 shows the success of the energy concept as an optimally matched combination of building physics measures on the one hand and conventional and alternative technology systems on the other hand. Particular systems for example are an activated ceiling with integrated ventilation, the realized combined heat and power and cooling production with CHP and fuel cell as well as the façade-integrated photovoltaic.

Economic Quality

Despite high energy quality and high comfort, the project could be realized economically and on schedule.

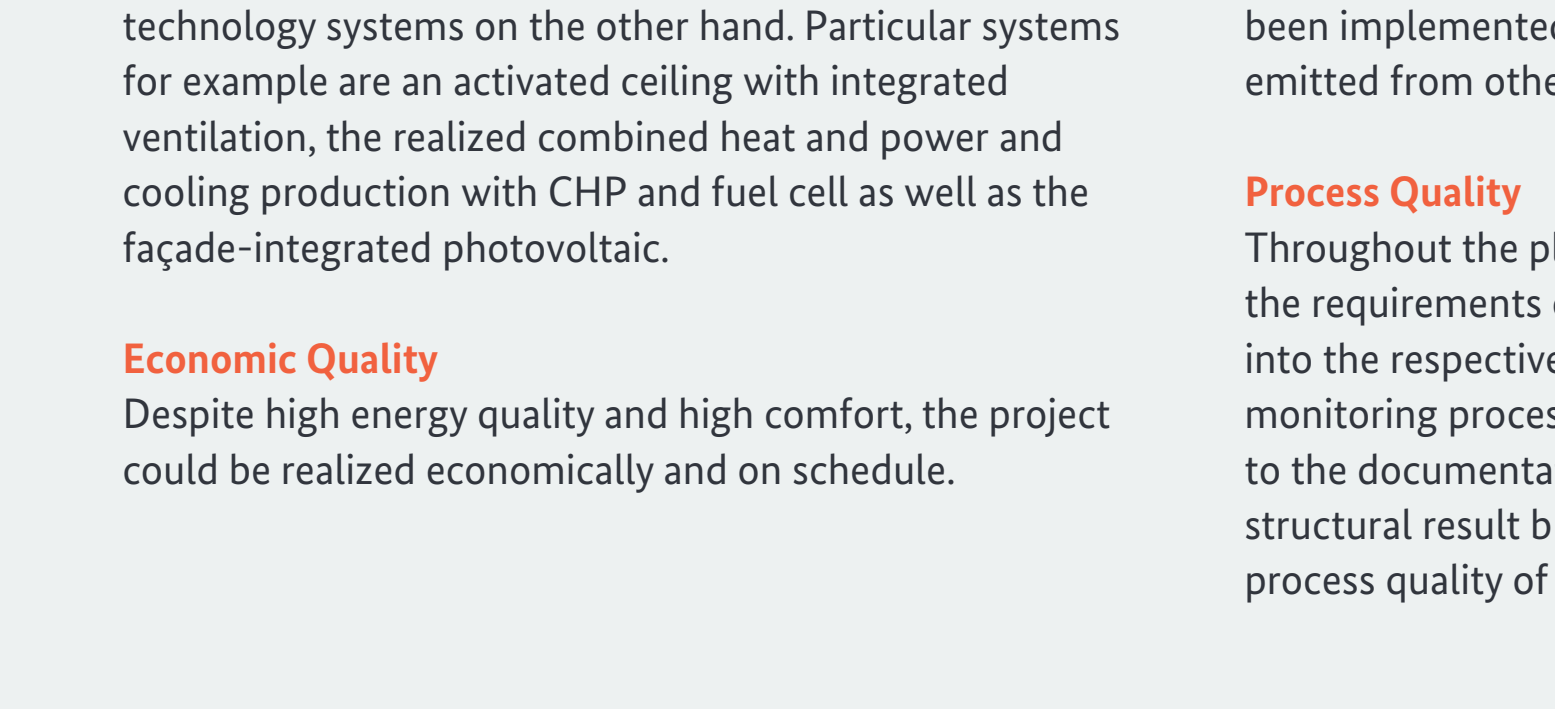
User-relevant Quality

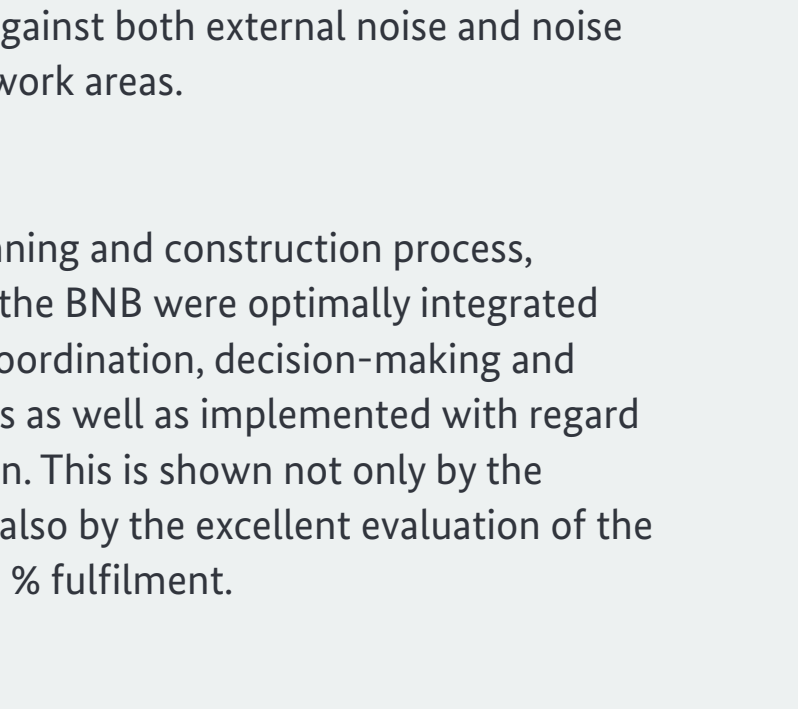
Due to the selection of low-emission construction products and the use of mechanical ventilation the BMBF fulfils the highest requirements for BNB in the area of pollution control and indoor air hygiene.

The accessibility of public spaces and areas used as workplaces has been realized in a maximum. Art on building was realized according to the “Guideline Art on Building” including a corresponding competition with a total budget of 500,000 €. A total of 282 bicycle stands were established. Higher noise control requirements have been implemented against both external noise and noise emitted from other work areas.

Process Quality

Throughout the planning and construction process, the requirements of the BNB were optimally integrated into the respective coordination, decision-making and monitoring processes as well as implemented with regard to the documentation. This is shown not only by the structural result but also by the excellent evaluation of the process quality of 99 % fulfilment.





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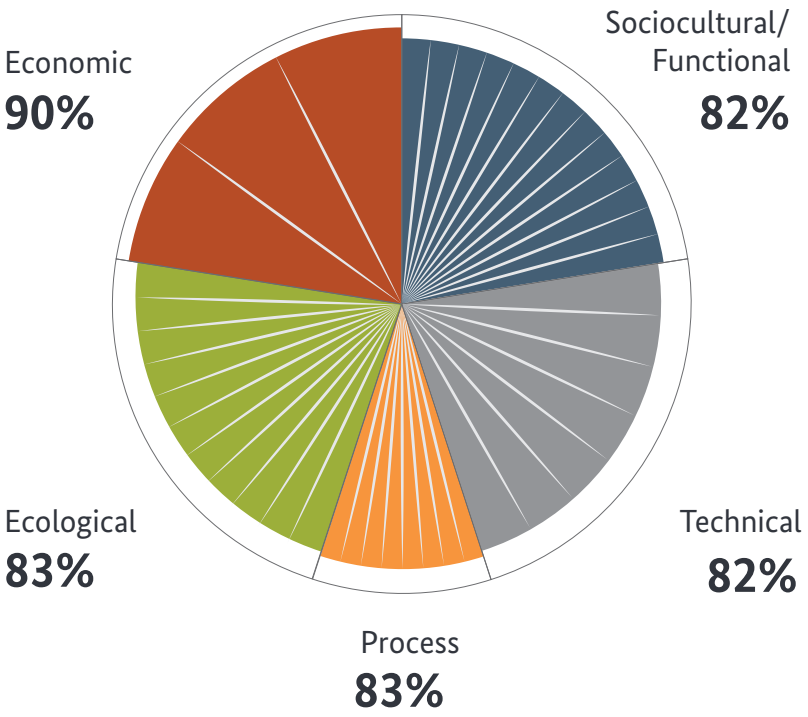
Federal Institute for Research on Building, Urban Affairs and Spatial Development within the Federal Office for Building and Regional Planning

Center for Neurodegenerative Disease

New Construction | Bonn | Grade 1.4 | GOLD

Weighting of Assessment Quality **84.1 %**



Laboratory (New Construction)	Gold according to BNB_LN 2014
Client	DZNE e. V., Bonn
Architect / Planner	wulf architekten gmbh, Stuttgart
Auditor	Johannes Hopf, DS-Plan GmbH, Stuttgart
Completion	April 2017
Gross Floor Area (GFA)	35,938 m²
Gross Construction Costs	€ 127 million
Construction Costs (KG 300, 400)	2,296 €/m^2_{GFA} (net)
Operation Costs	1,588 €/m^2_{GFA} (net)
Life Cycle Costs	4,579 €/m^2_{GFA} (net)
Primary Energy Demand (LCA)	total: 343 kWh/(m^2_{NFAa} a)
Global Warming Potential (LCA)	67.6 kg CO_2 eqv./(m^2_{NFAa} a)

Nachhaltiges Bauen

The building is located on the campus of the University Hospital Bonn, as part of the German Center for Neurodegenerative Diseases (DZNE).

The new building houses approximately 500 employees in 40 research groups, working in the fields of basic, clinical and population research and the central administration of DZNE's nine nationwide locations as well.

Three organically shaped buildings are connected by circulation areas, where spacious seating offers meeting points. They consist of a main building including the entire general facilities, entrance hall, cafeteria, lecture hall, library, clinical research, MRI and administration representing a central research building providing all laboratory facilities and offices, and the preclinical institute.

From the outside, the new building's facade captures the eye with its more than 2,400 solar shading slats in various shades of red and green and inspired by the changing colours of the neighbouring forest within the seasons.

User-relevant Qualities

The DZNE's spatial concept sets new standards in laboratory construction. By a depth of around 20 meters being planned and organized compactly. Workstations measure a depth of up to 17 meters from the facade, while the setting in the forest is still visible from the inside.

Heating / Cooling / Air Quality

By using geothermal energy for heating and cooling, the local regenerative potentials are fully utilized and the base load is covered all over the year. The ventilation systems are equipped with adiabatic exhaust humidification reducing cooling energy requirements, especially in the laboratories. A block-type thermal power station covers the base load for high-temperature heat and electricity. In summer, an absorption refrigerator provides cold water through a trigeneration system (CHCP).

Energetic and Economic Qualities

In order to optimize investment and operating costs, comprehensive mechanical ventilation of the offices was dispensed with. The rotatable vertical slats provide optimum shading from direct irradiation, still enabling visual connection to the outside. Simultaneously diffuse light ensures a high daylight quality in the rooms and allows high quality visual contact to the outside.

Environmental Risk Evaluation

Great emphasis was put on ecological aspects and simple constructions when selecting the building materials. A measurement of indoor air quality had proven the low level of air pollutants due to the use of low-emission materials, minimising the exposure to harmful substances during both processing and use phases.

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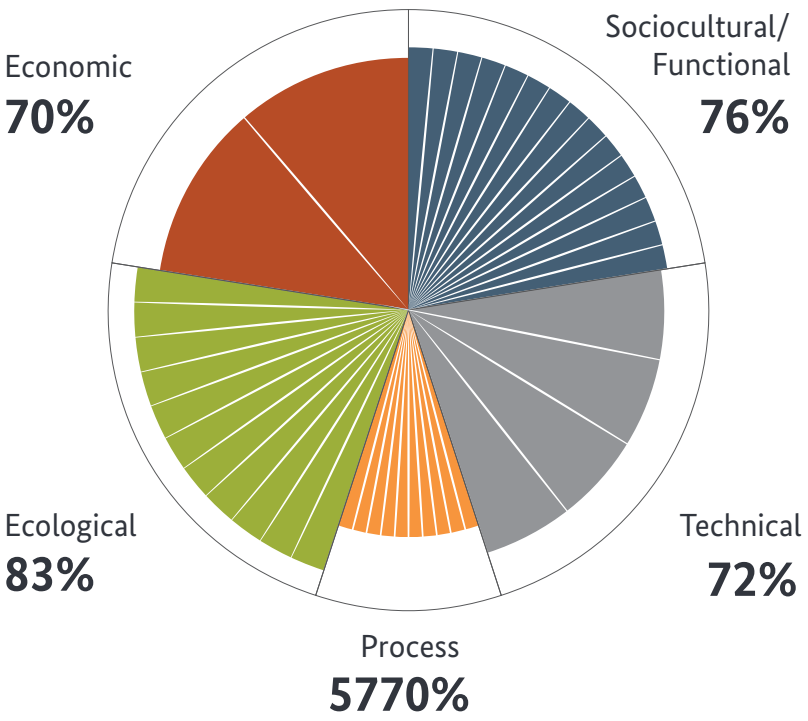
ZUKUNFT BAU FÖRDERN FORSCHEN ENTWICKELN

Federal Institute for Research on Building, Urban Affairs and Spatial Development within the Federal Office for Building and Regional Planning

Federal Constitutional Court

Complete Refurbishment | Karlsruhe | Grade 1.7 | SILVER

Weighting of Assessment Quality **73.3 %**



Office Building (Complete Refurbishment)	Silver according to BNB_BK 2013_3
Client	Federal Republik of Germany
Architect / Planner	Assem Architekten, Karlsruhe
Auditor	Dipl.-Ing. Jan Zak, ikl GmbH Karlsruhe
Completion	September 2014
Gross Floor Area (GFA)	16,726 m²
Gross Construction Costs	€ 57 million
Construction Costs (KG 300, 400)	2,297 €/m²$_{GFA}$ (net)
Operation Costs	1,342 €/m²$_{GFA}$ (net)
Life Cycle Costs	3,639 €/m²$_{GFA}$ (net)
Primary Energy Demand (LCA)	total: 166 kWh/(m²$_{NFAa}$ a)
Global Warming Potential (LCA)	34.1 kg CO_2 eqv./(m²$_{NFAa}$ a)

Nachhaltiges Bauen

The Federal Constitutional Court is located in the city centre of Karlsruhe, close to the public park of Schlossplatz and a Botanical Garden. It was planned and built in the years 1962- 1969 by the architect
Prof. Paul G. R. Baumgarten.

The challenge was to preserve the distinctive, transparent architectural language as an expression of a representative and broad understanding of democratic jurisdiction. However, at the same time a contemporary, energy-efficient building that provides a comfortable indoor climate for the next life cycle should be realised.

Monument Protection

Due to the much respected decisions of the court and the interest of the media, the building became one of the most popular public buildings in Germany.

Because of its constructional and urbanistic qualities and its scientific and historical significance, the Federal Constitutional Court fulfils the criteria of a cultural monument of particular importance. The Botanical Garden adjacent to the Federal Constitutional Court is also listed as a cultural monument in the register of monuments of Baden-Württemberg.

Energetic Quality

According to experience, energy saving and monument protection are usually two inconsistent disciplines.
The use of renewable energies for cooling with well water as well as the generation of electricity with a photovoltaic system, combined with efficient LED lighting, have been a holistic approach to the energy refurbishment of the Federal Constitutional Court.

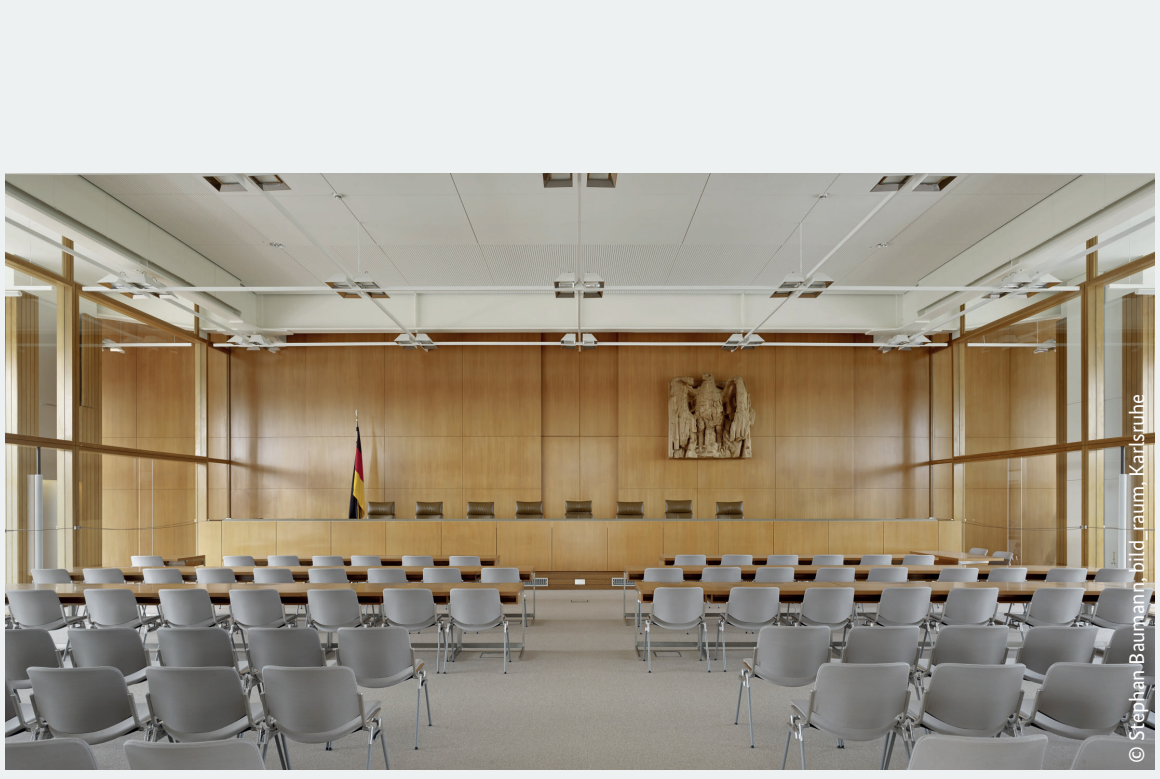
Since the complete refurbishment the buildings primary energy demand is 33 % below the requirement value of the EnEV 2009 for new buildings and with the consideration of the 140 % rule for existing buildings even 52 % below.

User-relevant Quality

Optimal comfort for the user has been achieved by:

- The installation of cooling ceilings or cool wave elements
- The use of non-toxic and low-odour building materials
- Carpet flooring and sound absorbing curtain covers
- Perforated solar shading slats
- The installation of control panels for solar and glare control, room temperature as well as daylight and artificial light in each office
- Covered and illuminated bicycle parking bay
- Art on building
- Redesign of the outdoor facilities


© Stephan Baumann, bild_raum, Karlsruhe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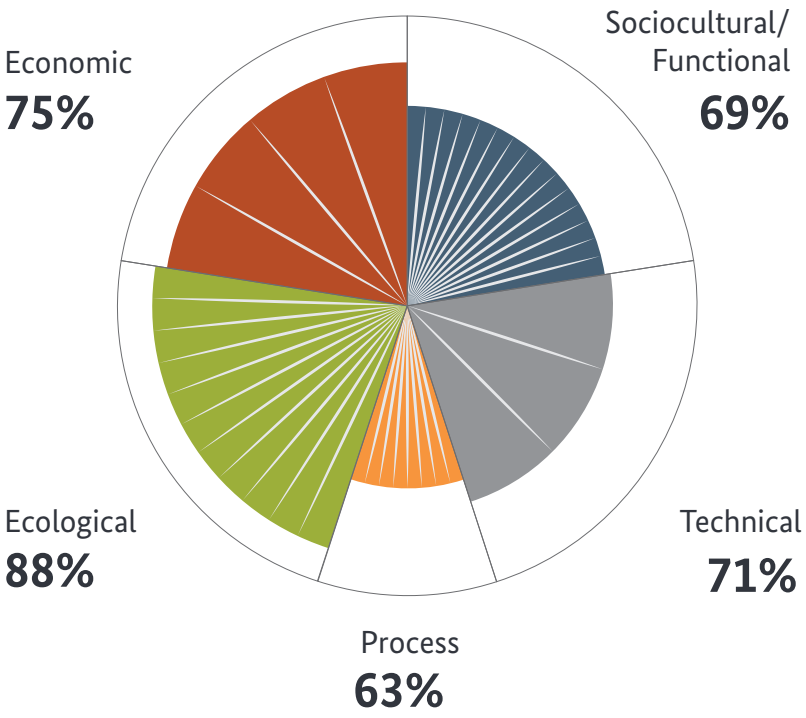
Day Care Centre

New Construction | Ulm | Grade 1.6 | SILVER

Weighting of Assessment Quality **76.4%**



Educational Building (New Construction)	Silver according to BNB_UN 2013
Client	Ministry of Defense
Architect / Planner	Günter Hermann Architekten Stuttgart
Auditor	Iris Schaaf, Staatliches Hochbauamt Ulm
Completion	September 2015
Gross Floor Area (GFA)	1,120 m²
Gross Construction Costs	€ 39 million
Construction Costs (KG 300, 400)	1,695 €/m²$_{GFA}$ (net)
Operation Costs	806 €/m²$_{GFA}$ (net)
Life Cycle Costs	2,886 €/m²$_{GFA}$ (net)
Primary Energy Demand (LCA)	total: 265 kWh/(m²$_{NFAa}$ a)
Global Warming Potential (LCA)	34.77 kg CO_2 eqv./(m²$_{NFAa}$ a)

Nachhaltiges Bauen

The new day care centre of the Federal Armed Forces Hospital in Ulm is located between the main hospital building and Albert-Einstein-Allee situated in the south-west of the property.

The project achieves the silver standard with the total degree of fulfilment of 76.4 % and the grade of 1.62.
It was rated as one of the first construction projects of the Federal Ministry of Defense (BMVg) applying the module BNB Education Buildings.

The single-story building with a floor area of approximately 23 m x 61 m is freely arranged on the site and fits suitably into the surrounding park of the hospital.

The building is designed on a regular grid in timber frame construction and thus offers maximum flexible indoor use. Group rooms are oriented east towards the outdoor play areas and the adjacent forest, the staff rooms and adjoining areas as well as sanitary and technical rooms are facing the hospital building aligned.

The clear arrangement of the functional areas in a dual zoning ensures good orientation and an undisturbed operation within the building.

The determining facade element is the floor-to-ceiling glazed post and crossbar construction. This provides an unobstructed view to the surrounding outdoor area for toddlers as well. The post and crossbar facade system as well as all other windows and doors meet the requirements of the German Energy Saving Ordinance EnEV2009.

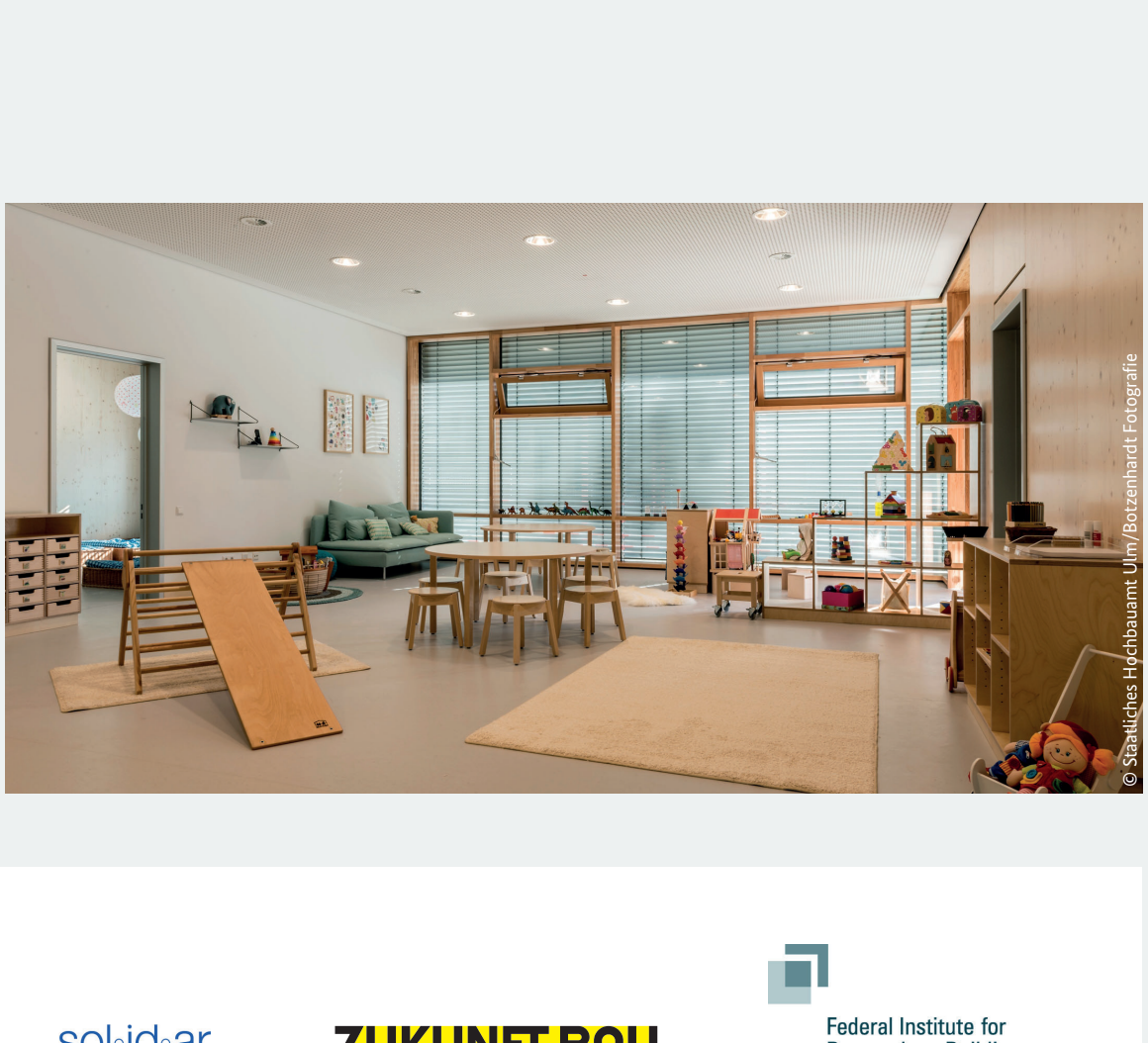
Concept Evaluation

The project has been realized as a highly efficient building based on the passive house standard with a high proportion of renewable raw materials. The result is a single-storey building in timber frame construction including an extensively greened flat roof. The facade is designed as a rough-cut timber formwork.

Environmental Risk Evaluation

An excellent indoor air quality can be attested to the project, which was previously unmatched in timber constructions. Even before occupancy, the workplaces and amenity places in the new daycare center showed air quality values, which are usually to be regarded as the best comfort values and VOC target values for interior spaces.


© GHA, Sandra Weisser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Involving the SDGs in Germany

Multi-Level Analysis and Monitoring

Supporting sustainability can look back on a longer history in Europe and particularly in Germany: The Sustainability Strategy of Germany, which was initiated in 2002 and last revised in 2016, is in line with the 2030 Agenda of the United Nations and its 17 Sustainable Development Goals (SDGs). Given this reference, urban and spatial analyses are carried out across the various levels of governance of the country in order to monitor its development in terms of sustainability at all levels – both nationally as well as regionally and locally. As input to the Quadrennial Report of the United Nations related to urban development, it is the National Progress Report on Implementing the New Urban Agenda of the United Nations that, based on the SDGs and some of their 169 sub-goals, will especially consider aspects of the built environment in urban neighbourhoods, cities of different sizes, regions and the entire nation.

SDG Indicator Set for Municipalities

Designing a specific toolbox for local authorities to measure their progress in sustainable development brought together as expert institutions in a joint initiative in Germany:

- Association of German Cities (DST)
- German Association of Towns and Municipalities (DStGB)
- German Association of Counties (DLT)
- German Institute of Urban Affairs (DIFU)
- Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR)
- Bertelsmann Stiftung
- Service Agency Communities in One World (SKEW)

These institutions developed the SDG Indicator Set for Municipalities as a set of specific indicators, which is compatible with the Sustainability Strategy of Germany and may be aggregated across levels.

Activities Serving the SDGs

The SDGs are involved into various activities in the context of cities, urban neighbourhoods and buildings as well as the individual behaviour of citizens. BBSR's Global Urban Transformation Project shows that all these activities are part of integrated and interdisciplinary local transformation paths in cities of different sizes, e.g. in

- Hamburg (1.800.000 people)
  Green, Fair and Growing City on the Waterfront
- Stuttgart (633.000 people)
  Strategic 2030 Agenda Implementation Orientation
- Leipzig (560.000 people)
  Integrated Urban Development Leipzig 2030 Concept
- Mannheim (308.000 people)
  Guiding Mannheim 2030 Principles
- Jena (110.000 people) Jena 2030 Mobility Concept
- Arnsberg (75.000 people)
  Sustainable Arnsberg 2030 Agenda
- Finsterwalde (18.000 people)
  Future City in a predominantly rural area

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Urban Redevelopment Programme

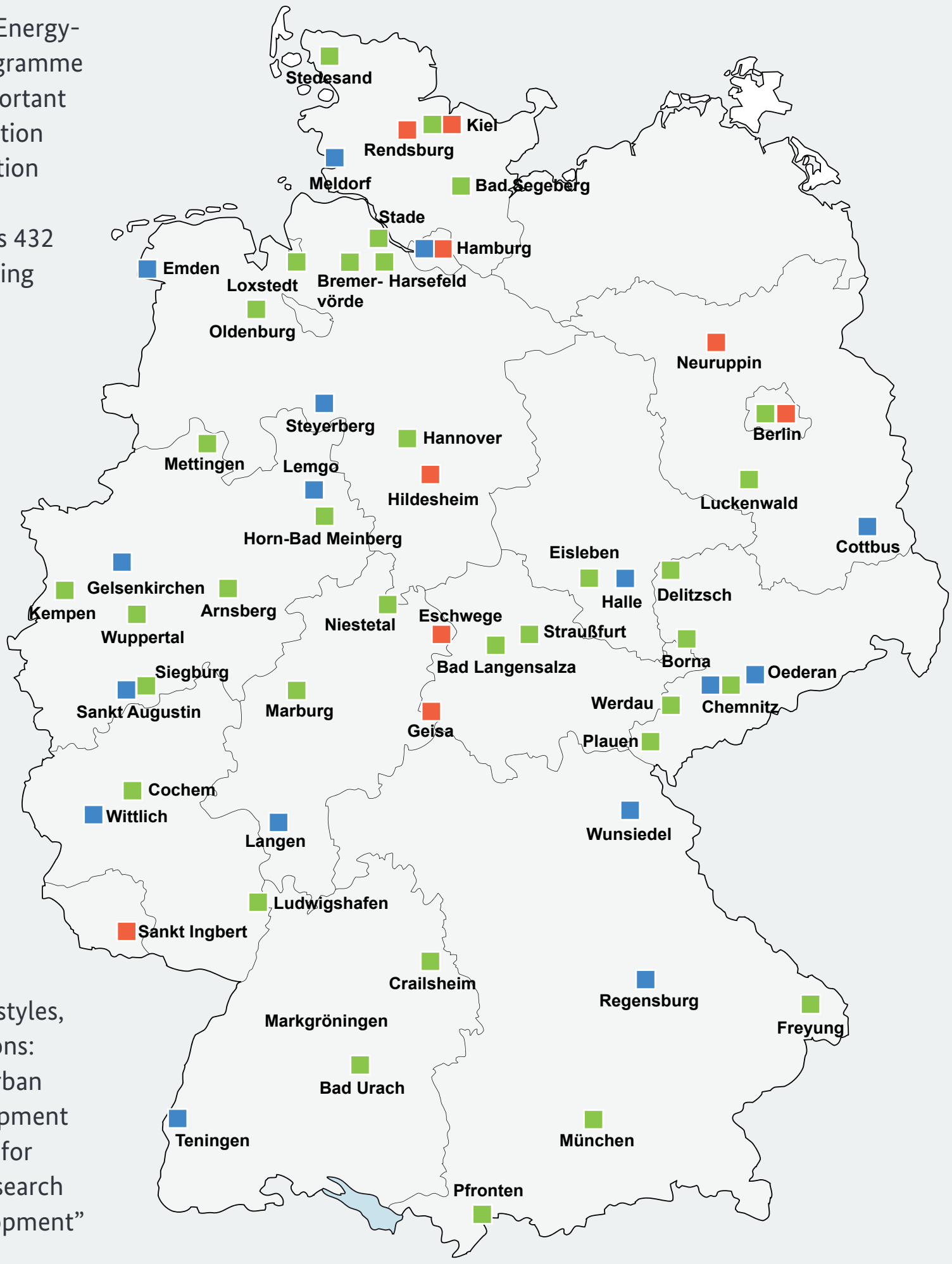
Programme-Related Research of KfW 432 Implementations

Since its establishment in 2011, the Energy-Efficient Urban Redevelopment Programme (EnSanQ KfW) has been making important contributions to the localized realization of goals towards energy-transformation in Germany. Experiences with the implementation of KfW Programmes 432 have been analysed through supporting research since mid-2013.

The research study will examine up to 70 reference projects. Some of the reference were pilot projects during the first phase of supporting research. The first municipalities nationwide were supported by scientists as they began the first phase of developing their integrated, energy-efficient neighbourhood concepts.

Begun in July 2018, the second phase focuses on the implementation and stabilization of energy-efficient renovation processes through the municipality itself.

Different city sizes, varying building styles, and diverse socio-economic conditions: the programme “Energy-Efficient Urban Redevelopment” enables the development locally adapted of flexible strategies for energy efficiency. The supporting research of “Energy-Efficient Urban Redevelopment” examines 63 projects.



The projects vary in terms of neighbourhood size, ownership structures, and types of housing markets. The projects are supported and analysed based on their varying goal sets, and may be categorized as follows:

- Reference projects: which illustrate differentiation in local conditions depending on the municipality as well as diverse possibilities for the application of the program.
- Representative projects: which provide examples for successful implementation of integrated development methods.
- Focus projects: which are of interest for “Energy-Efficient Urban Redevelopment” insofar as specic aspects, such as incorporation into the entire city development strategy, citizen participation, of building culture, may be thoroughly examined and provide practical knowledge.


Quartierssanierung Halle, Lutherviertel © BBSR


Quartierssanierung Langen, Südliche Ringstraße © BBSR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Efficiency House Plus

Support Programme for Housing and Educational Facilities

The German Federal Ministry of Building launched a first support programme in 2012 for a housing prototype that fulfils the Efficiency House Plus Standard.

The Efficiency House Plus Standard is true if a building provides

- Negative annual primary energy demand: $\sum Qp < 0$ kWh/m²a
- Negative annual final energy demand: $\sum Qe < 0$ kWh/m²a

The programme supported constructors looking to develop buildings that produce considerably more energy from renewable sources than they need, with the surplus available to use as electro-mobility. The pilot projects are assessed according to a scientific evaluation programme. The results should help to improve the energy management of modern buildings. Additionally, the components required for an energy efficient building shell and the use of renewable energies should be improved.

Detached and Semi-detached Houses

The Federal Ministry of Building supported 26 small residential buildings in the Efficiency House Plus Standard. The buildings provide a compact design and a very low heat and electricity consumption. The majority of energy needs are covered by environmental heat and photovoltaics. This generates more energy than is consumed.

Apartment Blocks

During the first phase of the support programme the implementation of the concept concentrated on detached houses. Over the years the possibility of transferring the design method to apartment blocks emerged. For this purpose, a number of large housing complexes was built in Berlin and Frankfurt as Efficiency House Plus.

Refurbishment of Residential Buildings

A great challenge in Germany is the refurbishment of the existing building stock, particularly in the sector of small private residences.

A semi-detached house located in Mühltal, which had originally been built during the 1970ies, was one of the first existing buildings to be transformed into an Efficiency House Plus in 2013. The evaluation proved the concept to be working.

As a next step, an architectural competition was held with the task of refurbishing two identical rows of houses towards a positive carbon footprint. The two winning concepts have been put into practice in Neu-Ulm between 2013 and 2016. A scientific evaluation on the technical solutions used in these buildings was carried out.

Educational Buildings

After successfully introducing the Efficiency House Plus approach for residential buildings, the next step was to apply it to non-residential structures. Therefore, in 2015 the German Federal Ministry of Building launched a support programme for the construction of Efficiency House Plus educational buildings.

Educational buildings are especially suited for the concept of using on-site generated renewable energy that is produced by solar cells, since these buildings consume most of their energy-demand during daytime. The support programme was open for all kinds of schools, for kindergartens, universities and other research institutions.

Scan me

For more information visit
https://www.forschungsinitiative.de/effizienzhaus-plus/

Office and Administration building: Zero-Energy-Building Berlin
Client: Federal Republic of Germany
Design: Werner Sobek Stuttgart

© Ulrich Schwarz

Residential Building:
Client: Bau-Fritz GmbH & Co. KG
Design: Georg Schauer, Bau-Fritz GmbH & Co. KG

© Bau-Fritz GmbH & Co. KG

Residential Building: Effizienzhaus Plus HO Immobilien & Baukonzepte
Client: Brigitte von Engelbrechten, Holger Osterloh
Design: Gruppe GME, HO Immobilien + Baukonzepte GmbH

© HO Immobilien + Baukonzepte GmbH

Educational Building: Louise-Otto-Peters-Schule Hockenheim, 2017
Client: Eigenbetrieb Bau und Vermögen Rhein-Neckar-Kreis, Neckargemünd
Design: Roth Architekten, Schwetzingen | Energy Design: Ing.-Büro Wilhaug GmbH

© Dorothea Burkhardt

Refurbishment of Residential Buildings: Pfuhler Straße 12 -14
Client: NUWOG Wohnungsgesellschaft der Stadt Neu-Ulm
Design: o5 architekten bda

© Eibe Sönnecken

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Efficiency House Plus

Network and Built Projects

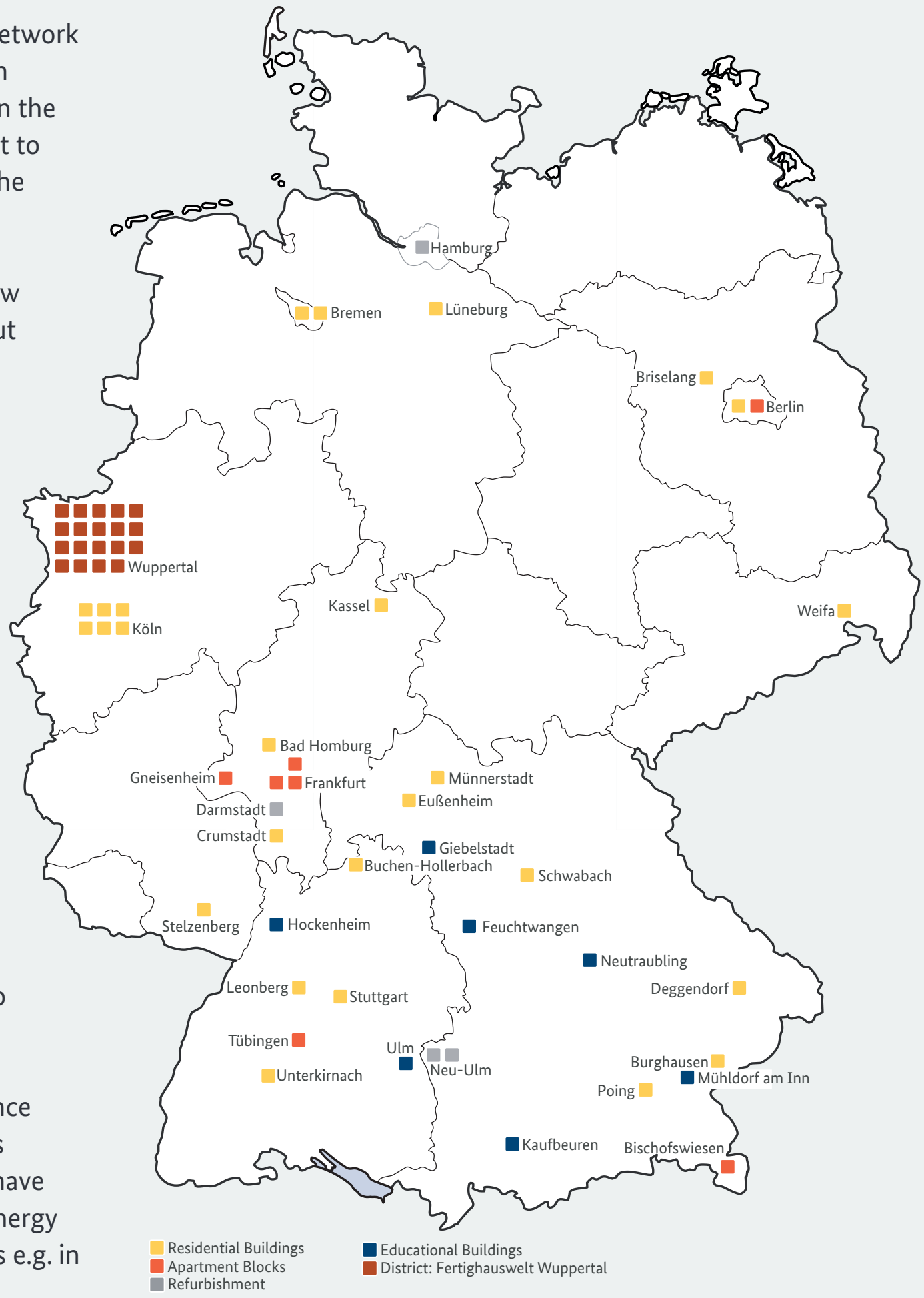
The map gives an overview of the buildings in the network Efficiency House Plus. All buildings have either been extensively evaluated already or will be monitored in the near future. The researchers also evaluate the extent to which the Efficiency House Plus Standard relieves the environment of greenhouse gas emissions.

The 34 realized Efficiency House Plus residential new buildings have an average electricity surplus of about 20 kWh/m²a. Compared with legally compliant buildings, the environmental impact is reduced by a total of 50 kg CO_2eq/m²a.

The refurbishment projects in Neu-Ulm from the 1930s caused an environmental impact of approximately 113 kg CO_2eq/m²a before refurbishment. The refurbished buildings now have an average electricity surplus of about 13 kWh/m²a. The reduction potential compared to the old buildings in the original state is therefore around 120 kg CO_2eq/m²a.

Overall, the projects of the network can thus save approximately 1,000 t CO_2eq annually in Germany. The Efficiency House Plus standard can thus make a significant contribution to climate protection.

Therefore, it is a particular success that the experience gained from the Effizienzhaus Plus network inspires several other builders. Numerous prefab providers have included the Efficiency House Plus as the highest energy standard into their portfolio. You can see the houses e.g. in the district „Fertighauswelt Wuppertal“.

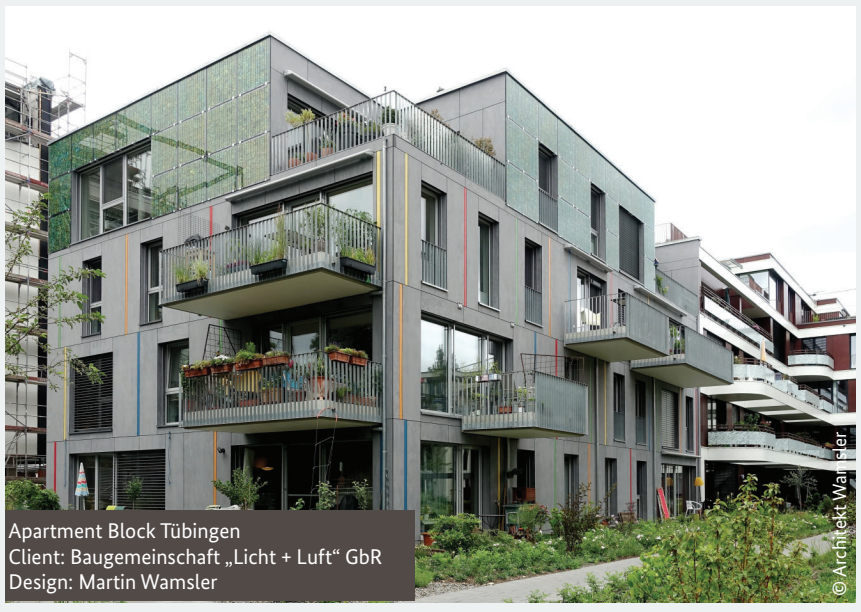


Apartment Block: Aktiv-Stadthaus Frankfurt am Main
Client: ABG Frankfurt Holding Wohnungsbau- und Beteiligungsgesellschaft mbH
Design: HHS Planer + Architekten AG, Kassel | Energy Design: EGS-Plan

© Constantin Meyer Photographie

Residential Building Leonberg
Client: Univ. Prof. Dr.-Ing. M. Norbert Fisch
Design: Berschneider & Berschneider Architekten Pilsach

© Univ. Prof. Dr. M. Norbert Fisch



Apartment Block Tübingen
Client: Baugemeinschaft „Licht + Luft“ GbR
Design: Martin Wamsler

© Architekt Wamsler

Residential Building Köln
Client: WeberHaus GmbH & Co. KG
Design: WeberHaus GmbH & Co. KG, Hamid von Berg

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Residential Building Münnerstadt
Design: Andreas Miller

© Andreas Miller

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Vario Apartments

Affordable Housing as a Challenge in Urban Spaces

In recent years, the influx into cities has increased significantly, having an impact on real estate and rental prices. In order to continue offering affordable housing for lower and middle incomes, sustainable re-densification in urban areas has to be carried out within a short period of time.

The funding programmeme „Model Projects for the Sustainable and Affordable Construction of Vario Apartments“ is a support and search for high-quality solutions concerning these challenges.

18 pilot projects, examine different strategies and their concepts are currently being tested, showing how affordable housing can be provided in a short time, further being of high quality.

The main issues on a glance:

- Reducing Construction Time
- Affordable Construction
- Adjustable Construction
- Quality of Use
- Sustainable Construction

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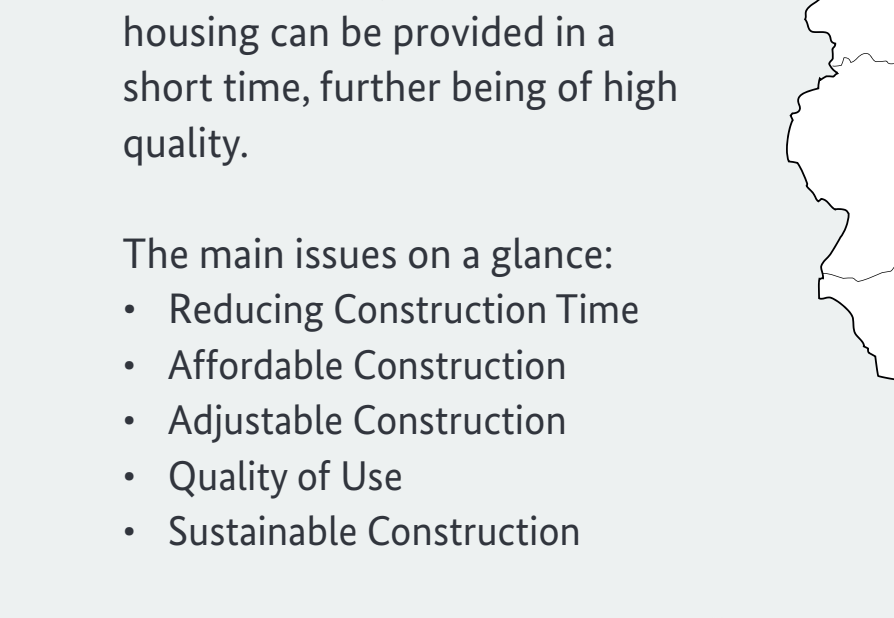
htw Hochschule für Technik und Wirtschaft Berlin University of Applied Sciences

TH OWL Technische Hochschule Ostwestfalen-Lippe University of Applied Sciences and Arts



Pilot Project Berlin-Grunewald
Client: Studierendenwerk Berlin
Design: Lehrecke Witschurke Architekten BDA

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Pilot Project Frankfurt-Oder
Client: VariWo GmbH & Co. KG
Design: Schuster Architekten FFO

© Hochschule für Technik und Wirtschaft Berlin

Pilot Project Brühl 65, Chemnitz
Client: Grundstücks- und Gebäudewirtschaftsgesellschaft
Design: raumfeld architekten

© Technische Hochschule Ostwestfalen-Lippe

Pilot Project Bochum
Client: Akademisches Förderungswerk AKAFÖ
Design: ACMS Architekten GmbH

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Pilot Project Bochum
Client: Akademisches Förderungswerk AKAFÖ
Design: ACMS Architekten GmbH

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Vario Apartments

Goals and Strategies

Reducing Construction Time

With the use of prefabricated elements, components such as entire facades, sanitary cells or space modules, the construction process can be accelerated. This is an advantage, especially in inner-city locations. Restrictions on residents are kept low, and logistics are potentially simplified.

Affordable Construction

In order to reduce construction costs, the projects pursue various strategies, including simplified construction, standardized components, serial floor plan designs and reduced fit-out standards.

Adjustable Construction

The model projects have different approaches towards adaptability. All of them are considered for elderly friendly living. Sufficient widths, movement areas and mostly barrier-free bathrooms allow the use even with handicaps. Targeted breakthroughs enable a precisely defined re-use at low costs. Skeleton constructions with large spans allow a very high flexibility of floor plans, though associated with higher manufacturing costs.

Quality of Use

An essential requirement in the funding program is the creation of community spaces. These give room for informal meetings and enable activities which are not possible within the individual living units.

Sustainable Construction

All model projects have been subjected to a sustainability certification. Their ecological, economic, socio-cultural, technical and process qualities were considered.
The buildings' entire life cycle is considered through Life Cycle Assessment (LCA) and Life Cycle Costing (LCC).

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After more than 20 years of vacancy, 247 dwellings have been created for students in the former dental clinic in Erfurt. The production costs amounted to 1,775 €/m² living area and were thus significantly lower than the costs for a comparable new building.


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In Chemnitz, due to pre-planned possible breakthroughs and non-load-bearing lightweight walls, a variety of floor plans is guaranteed in case of subsequent use at minimal cost.


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In Berlin-Marzahn, more than 5m² of common area is available per resident. The common spaces are connected by an air space between two floors and have a high spatial quality. The furnishing allows a wide range of possible uses and the appropriation by the tenants.


© Technische Hochschule Ostwestfalen-Lippe

For the Hamburg-Steilshoop model building project, entire room cells were prefabricated. 48 room units with a gross capacity of 8,400 m³ were assembled within 10 working days. The material for interior fittings was delivered directly to the construction site, included in the respective space modules.


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In Meschede, the former job center (left figure) was refurbished sustainably to a large extent after more than 16 years of vacancy. Here, the continued use of the embodied energy contained in the shell structure, the consistent supply of renewable energies and smart building technology is essential to the concept.

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Collegium Academicum Heidelberg

Flexible Timber Structure for Student Housing

Since 2016 a group of students and ‘DGJ Architektur’ have been planing a self-managed student housing project ‘Collegium Academicum’ in Heidelberg. The project is not only a model project of ‘Variowohnungen’ but also project of the International Building Exhibition IBA Heidelberg.

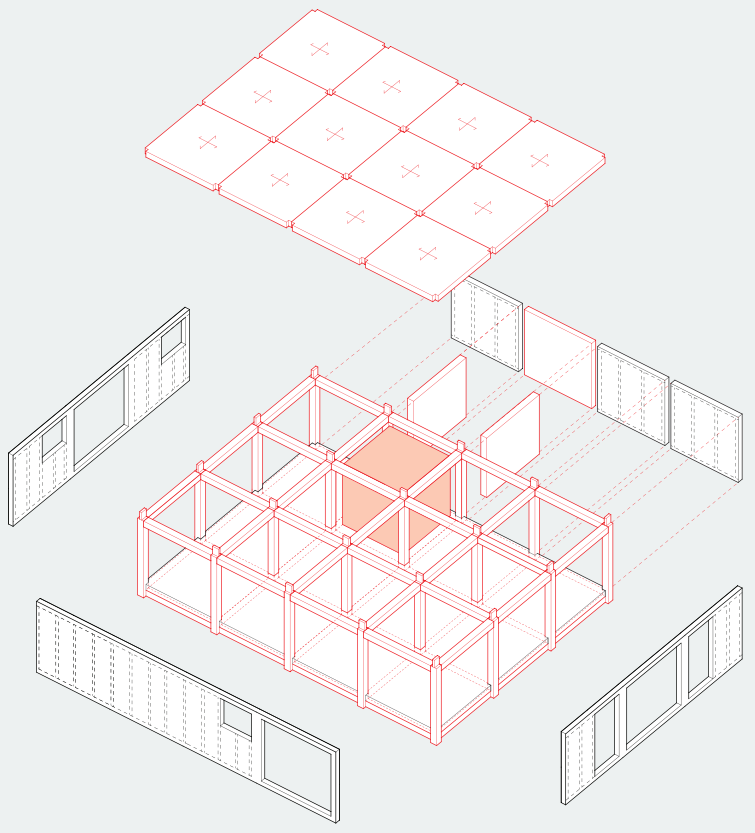
Innovative Timber Construction

The constructional design approach for the building is to utilize the ecological benefits of wood, being a locally available and renewable resource, as much as possible. To achieve this a newly developed timber construction system is applied as the main load bearing structure. Its skeleton frame design allows high levels of spacial flexibility as well as the use of modular elements easy to disassemble and recycle.

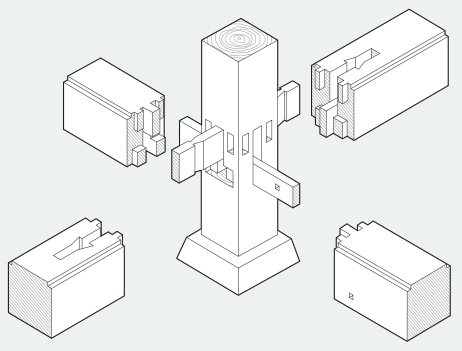
The system is adapting traditional carpentry techniques to modern fabrication and assembly processes. Wherever possible structural joints are constructed entirely out of wood avoiding additional steel elements.

Sufficiency and Flexible Spacial Arrangements

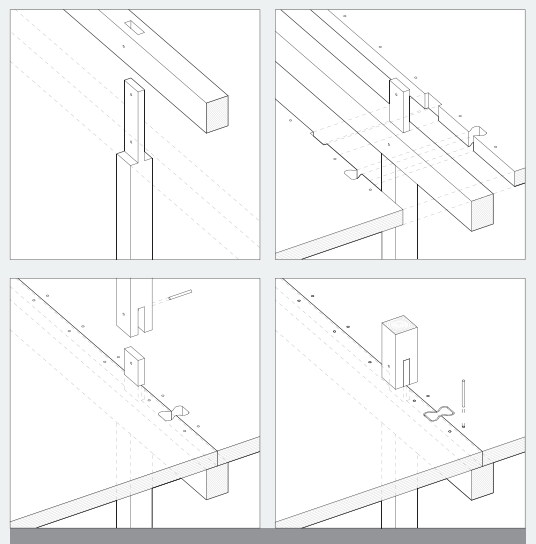
The project tackles both the reduction of material and spacial resources and tries to explore the spacial needs of individual residents, a group of flatmates, and the entire community. Following the concept of sufficiency the adaptability of apartments offers the option to reduce individual rooms for the benfit of larger shared spaces. Due to flexible partition walls, which can be repositioned by the residents themselves, a variety of configurations can be created. Depending on changing needs the apartments can be adapted and allow to accommodate different users throughout the buildings lifetime.



Schematic structure of the building system

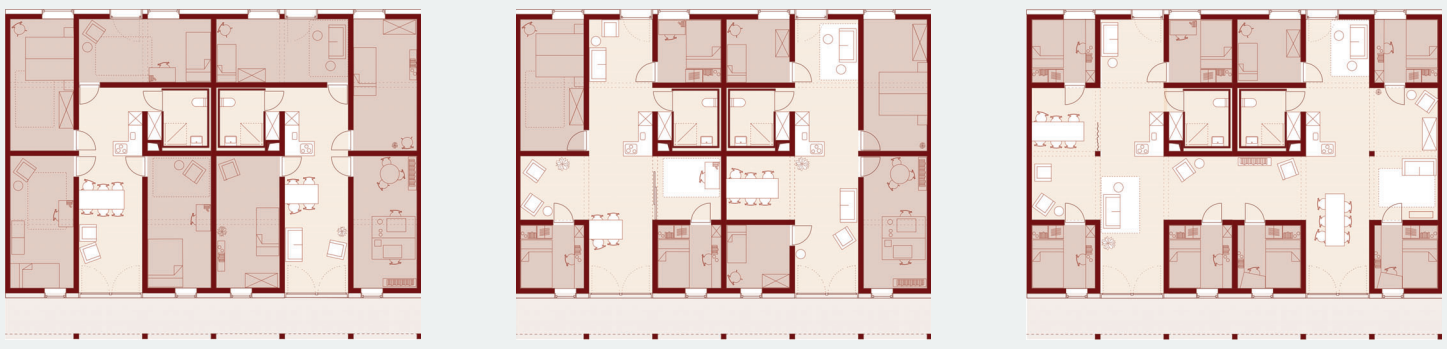


Traditional japanese joinery detail

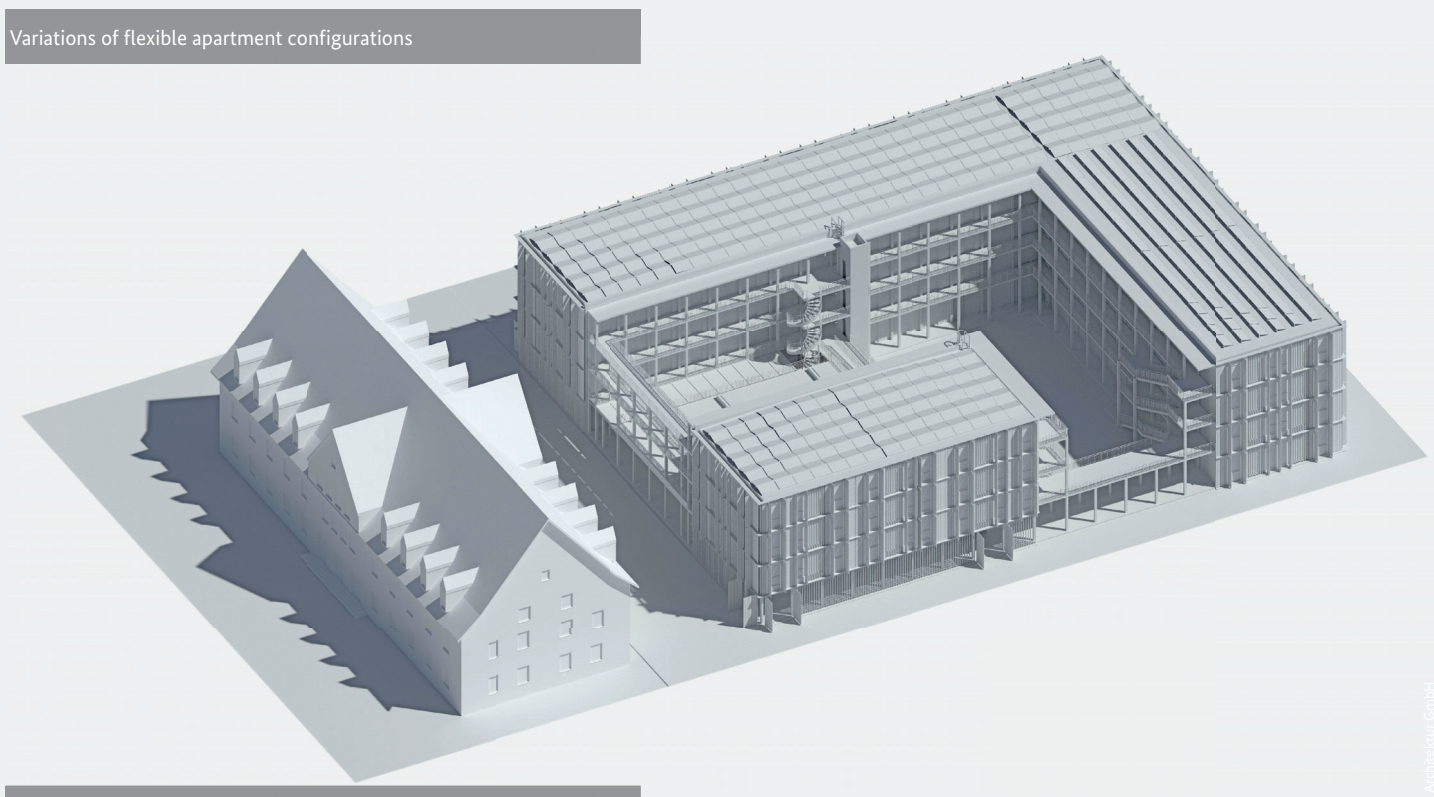


Joinery principal of the construction system

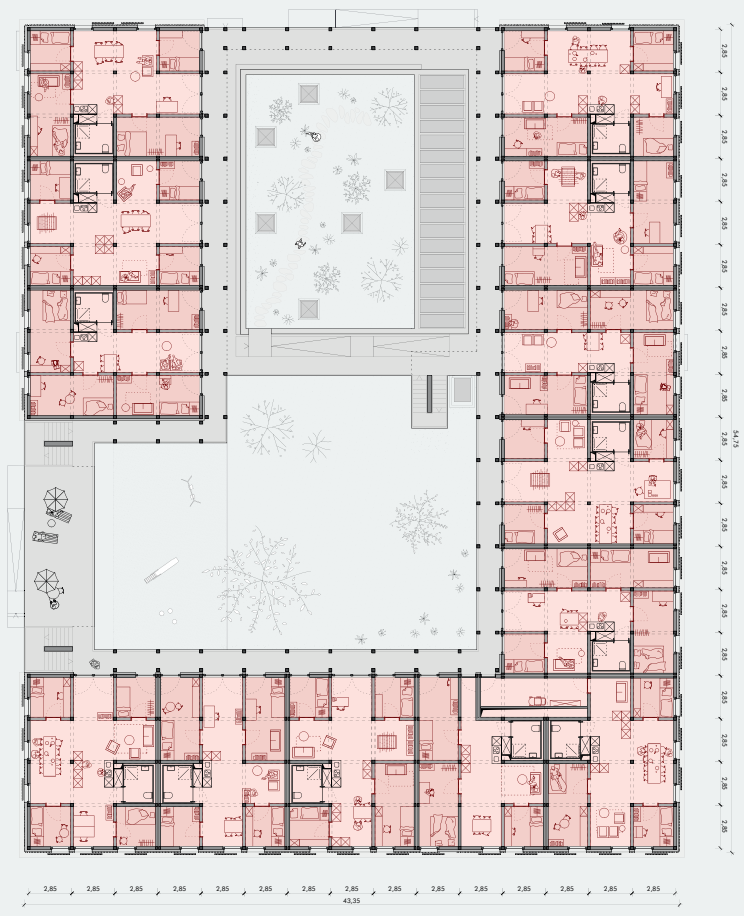
Scan the code to access the report of the BBSR research project ‘Press-fit timber buildings: developing a skeleton construction system’



Variations of flexible apartment configurations



Visualisation of the building volume



Floorplan; scale 1:200

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