



Sustainability and Building Materials within BNB¹ – Evaluation, Tools and Database

Abstract: *Due to the growing activities in the field of sustainable construction the consideration of possible environmental and health relevant impacts of building materials gains in importance. Within the German assessment system for sustainable construction for federal buildings (BNB), building materials are not evaluated as such but in the context of their application within the building regarding all relevant requirements, e. g. ecological, economical and technical.*

The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) offers different tools for the evaluation of these aspects. Within this paper the environmental impact of building materials on ground water, air pollution or soil is regarded, and also health relevant aspects. The website WECOBIS is intended for planners and architects and provides a tool for selecting suitable building materials regarding environmental and health relevant issues. WECOBIS is provided by BMUB in cooperation with the Bavarian Chamber of Architects (ByAK). It is maintained by the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR), a research Institution under the portfolio of BMUB.

Life cycle assessment and its tools within BNB are explained in another paper of this conference; see “Life Cycle Assessment within BNB - Online Tool eLCA and building materials database ÖKOBAU.DAT” [1].

Sustainability, Building Materials, Life Cycle Assessment, WECOBIS, Health, Environment

Introduction

Due to growing activities in the field of sustainable construction the consideration of possible environmental and health relevant impacts of building materials gains in importance. Even the European Construction Products Directive (CPD) addresses now sustainability aspects and resource efficiency. Due to these developments it is often asked for so-called ecological or sustainable building materials. The philosophy of BNB is not to evaluate building materials as such but in the context of their application within the building regarding all relevant aspects, i.e. ecological, economical and technical requirements. Hence, building materials are regarded within different sustainability criteria.

In a former paper of SB 13 the philosophy of evaluating building materials within BNB was explained [2]. In another paper of this conference life cycle assessment within BNB is explained [1]. Hence, within this paper the environmental impact of building materials or its contents on ground water, air pollution or soil is regarded, and also health relevant aspects.

BMUB offers different tools for the evaluation of these aspects. The website WECOBIS (www.wecobis.de) provides a meaningful help which provides free and comprehensive information on environmental and health-relevant aspects of building materials for different

¹ BNB – German assessment system for sustainable construction for federal buildings

life cycle phases.

Within myWECOBIS selected information of WECOBIS can be organised for individual projects and individual documents can be added. Also, help for (public) tendering which takes into account specific environmental aspects are given by WECOBIS.

Product specific information is organized in a specific tool, also used within BNB, which complies with WECOBIS.

WECOBIS – structure and content

WECOBIS is intended for planners and architects. With WECOBIS the German federal government offers comprehensive basis information on building materials, which is not product or producer specific. A team of experts from Universities, or other specialised scientific Institutions and also practical experience contributes and continuously revises the contents of WECOBIS. Furthermore, a scientific committee gives advice on strategic development of contents, cooperation, research projects, and the like.

WECOBIS provides, in a very structured way, helpful information for selecting suitable building materials and products regarding environmental and health relevant issues (Fig. 1). Typically, in the planning stage, the user can find out if there are possible health and environmental aspects for the considered material/product group which could be relevant within the different life cycle stages.

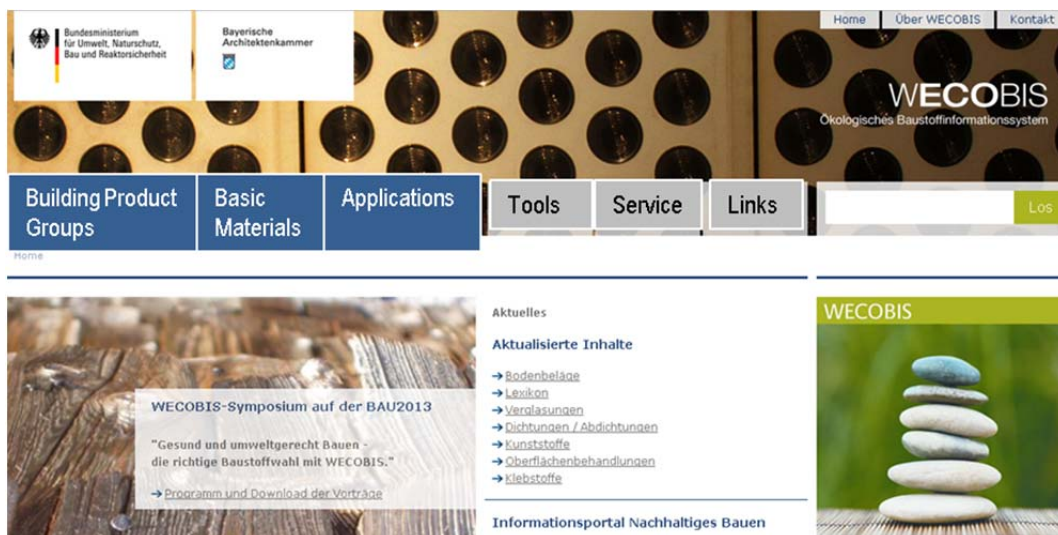


Figure 1: WECOBIS. German web based information system for health and environmental aspects of building products. www.wecobis.de

The following material groups are considered:

- **Building product groups**, i.e. wallcladding / flooring / insulation / seals / timber and derived timber products / adhesives / solid construction materials / mortar and screed / surface treatment materials / glazing;

- **Basic construction material**, i.e. binder / aggregates / plastic / metal.

These main material groups comprise further sub-groups, which finally lead to a “data sheet” of a more specific material group. For example, for the main group adhesives the following sub-groups are given: dispersions / epoxies / pastes / solvents / polyurethane. These data sheets are structured in two basic information blocks, i.e. technical information and life cycle, with subsequent detailed information on the following subjects:

- **Technical information**, i.e. general / tendering / marks and labels / technical specification / literature
- **Life cycle**, i.e. raw materials / production / construction / use / re-use

Users can choose amongst 190 different data sheets. As an example, Fig. 2 shows information within the block ‘life cycle’ for the life cycle stage ‘raw material’, for PVC-flooring.

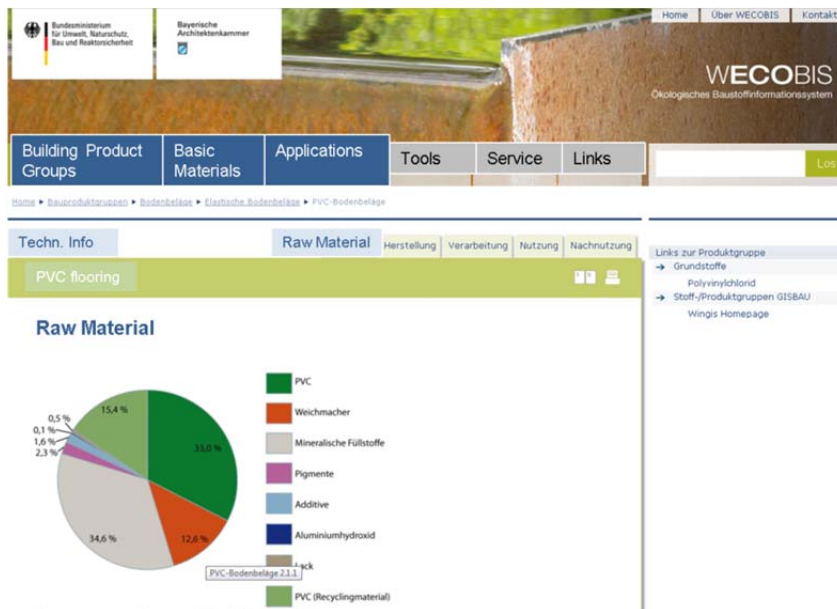


Figure 2: Screenshot – Life cycle / raw materials (PVC-flooring)

As userfriendliness is one of the important aspects of WECOBIS, a multiscreen view allows a direct comparison of two data sheets (Fig. 3). With this help, it is easy to find out if two different products groups imply the same health risks or not.

Allgemeines Ausschreibung Zeichen & Deklarationen Bewertungssysteme Technisches Literatur Lebenszyklus >>	
Multiscreenshot	
Insulation material (EPS)	Insulation material (XPS)
Product group information	Produktgruppeninformation
<hr/>	
Definition Expandierter Polystyrolschaum EPS (auch: Polystyrol-Partikelschaum, expandierter)	Begriffsdefinition Extrudierter Polystyrolschaum XPS (auch: Extruderschaum) ist ein harter Dämmstoff mit
Application (additional information) - Der Einbau zwischen den Sparren kann sich als problematisch erweisen, da das Schwinden des Holzes nicht kompensiert werden kann. - nicht geeignet für Anwendungen mit Heißeitungen oder unter Gussasphalt (s. Beständigkeit) Verwendung in Bauteilen aus Holz nach DIN 68800-2 bei DZ (Zwischensparrendämmung, DIN 4108-10) oder bei WH (Dämmung von Holzrahmen- und Holztafelbauweise, DIN 4108-10) Bei Verwendung von Dämmstoffen aus EPS in DZ oder WH ist wie bei allen anderen	Anwendungsbereiche (Besonderheiten) - als einziger Dämmstoff zugelassen für Umkehrdachkonstruktionen - besonders geeignet für stark beanspruchte, erdberührte Bereiche (s. Beständigkeit) - Der Einbau zwischen den Sparren kann sich als problematisch erweisen, da das Schwinden des Holzes nicht kompensiert werden kann. Verwendung in Bauteilen aus Holz nach DIN 68800-2 bei DZ (Zwischensparrendämmung, DIN 4108-10) Bei Verwendung von Dämmstoffen aus XPS in DZ ist wie bei allen anderen Schaumkunststoffen eine Einstufung in Gefährdungsklasse II (GKN) nach DIN 68800-2 nicht
Ecological product choice Flammschutzmittel / Position des Umweltbundesamtes *HBCD ist ein additiv eingesetztes Flammschutzmittel mit sehr hoher Neigung zur Bioakkumulation, dessen langfristige Toxizität für den Menschen noch nicht völlig geklärt ist. Zudem ist es persistent und für aquatische Organismen toxisch. Die Vermeidung dieses Stoffes in der Umwelt muss daher von punktuellen Maßnahmen zu Emissionsreduzierung	Hinweise für die ökologische Produktauswahl Treibmittel Die Verwendung von HFKW (teillfluorierte Kohlenwasserstoffe) als Treibmittel in XPS-Hartschäumen für das Bauwesen ist nicht erforderlich. Mit CO ₂ als Treibmittel oder durch Kombination von CO ₂ mit 2-3% Ethanol kann die gesamte Produktpalette hergestellt werden. Die vier Hersteller in Deutschland produzieren alle bereits heute zumindest einen

Figure 3: WECOBIS multiscreen with comparison of two product group datasheets (insulation EPS and XPS)

WECOBIS will inform the user about which products are in the market and which relevant health and environmental aspects are relevant for different life cycle stages. The user will also find out, that here might be a wide range of products, some with more or less significant impacts. Further links show where more detailed and also product specific information can be found. Hence, WECOBIS is an important tool with basic information for decisions within the planning processes. Still, it does not replace the planners task to inform himself and finally decide about the products to be used for construction. It shows which information is relevant within a product group, at which life cycle phase, which aspects might be relevant and where detailed information is to be found.

myWECOBIS for planning processes

WECOBIS does not only offer comprehensive information in a structured and userfriendly way, it furthermore offers a planning tool for real planning and construction projects. In myWECOBIS (Fig. 4) the user can organize information found in WECOBIS in such a way, that for chosen materials and construction elements (which individually can be created) information can be collected in the given scheme of technical and life cycle information with its sub-groups. In a very helpful way, individual comments, fotos or other documents, e. g. product specific documents, can be uploaded and filed. Certain templates, appropriate for BNB evaluations, will be given. Anyhow, within the templates one can structure the projects in reference to a building project or construction elements. An output of myWECOBIS can be a zip.file and/or a report (pdf.file), useful for project meetings and other working progress (Fig. 4).

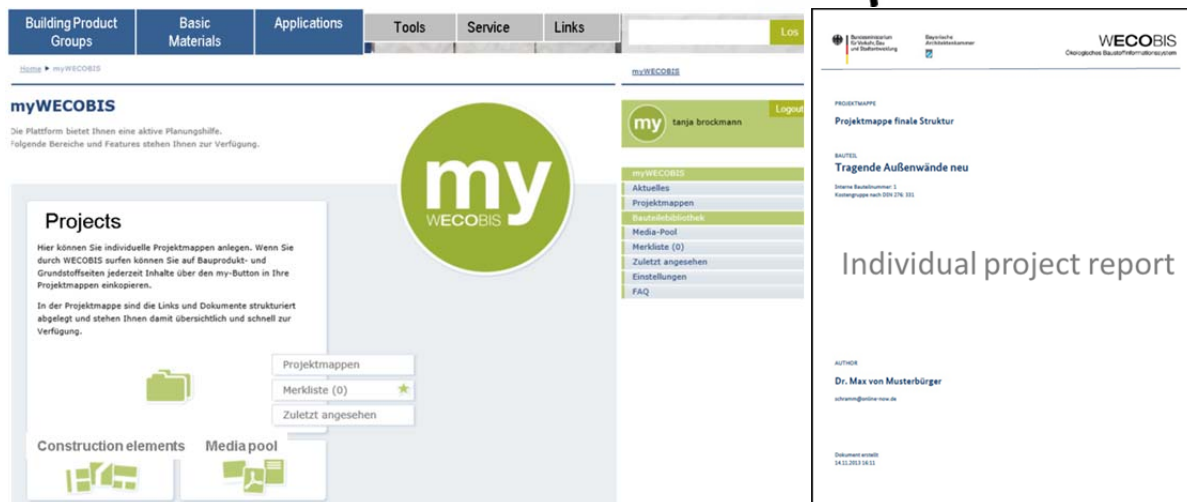


Figure 4: MyWECOBIS – homepage (left); report as output of myWECOBIS (right)

Help for planning and tendering

For the practical process of planning and building a construction the contents of public and private tendering can be decisive. The idea of sustainable building is established by now in general. Nevertheless, even though the application of BNB to federal buildings is compulsory (by several decrees issued by BMUB), it is still not brought into praxis in a satisfying way. Especially, in the context of sustainable buildings in (public) tendering the idea of using building materials which are suitable regarding health and environmental impacts (for example hazardous ingredients, possible emissions relevant for different life cycle stages) is not well integrated in the processes yet. Often, the planners or institutions responsible for tenderings stick to used procedures and have in mind well-known products only. Often, there is a lack of knowledge about building products, their impacts on health and environment and evaluation. Sometimes, it is not even known which aspects might be relevant and regarded within a tendering. Here, WECOBIS offers a good help with many tables for each product group which shows which product groups are suitable with respect to the different quality standards within BNB (especially sustainability criterion ‘Risks to the local environment’ 1.1.6). These tables show, which compound within different product groups might be relevant regarding different applications as well as life cycle stages. Furthermore, other tables show if there are alternative products within a product group. All these information is a good help, to inform and alert about possible impacts, but the planner will not find complete formulated tenderings and templates – it will still be the planner’s responsibility to evaluate and choose building products in the complex context of the building, regarding all relevant sustainability aspects, as ecological, economical and technical aspects.

All described features above are useful in general for everybody planning and choosing building materials for constructions. Furthermore, WECOBIS gives information especially relevant for BNB. Building materials are evaluated within several sustainability criteria. Important global environmental contributions which cause e.g. global warming, smog,

eutrophication, acid rain, are calculated by LCA using ÖKOBAU.DAT. Hence, WECOBIS offers links to relevant webpages for environmental products declarations or to ÖKOBAU.DAT.

Further sustainability criteria of BNB are related to ‘dismantling, separation, and utilisation’ (4.1.4) and ‘indoor air quality’ (3.1.3). In its data sheets WECOBIS gives as much information as possible directly related to these sustainability criteria as evaluated within BNB. Tables are provided showing which product groups may fulfill different quality levels of BNB.

The criterion ‘risks to the local environment’ (1.1.6) is of high importance for the suitable choice of building materials when a construction is certified according to BNB. But what does the reduction of ‘risks to the local environment’ mean for a BNB planning processes? On one hand side, a sustainable planning must give answers about the deposition of substances of very high concern, dangerous substances, volatile organic compounds from products, mobile heavy metals, biocides and refrigerant fluids with halogenated hydrocarbons. All these dangerous substances are addressed in European directives and regulations (e.g. REACH, CLP) or national documents, but a comprehensible assessment method is needed.

As a consequence of the different discussions, the BBSR has designed a prototype of software - the BNB_1_1_6-Tool - for an estimation of defined quality levels for risks to the local environment (Fig. 5).

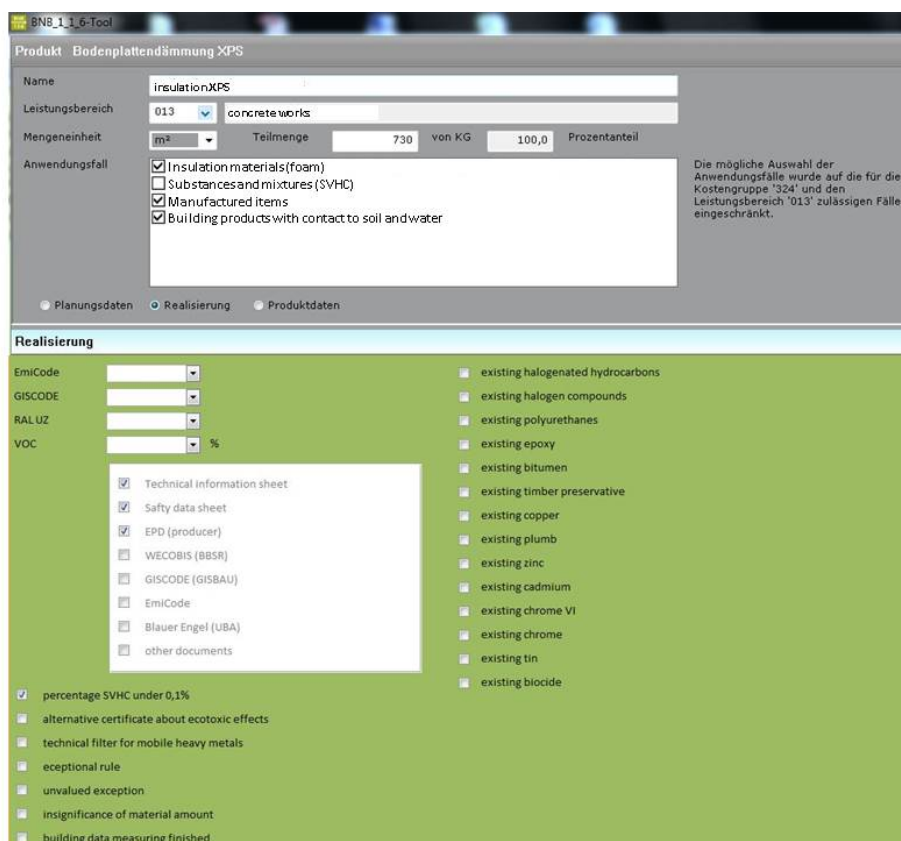


Figure 5: Software tool for estimations required for BNB criterion 1.1.6 Risk for the local environment



Summary

Within BNB the choice of building materials has a significant influence on the evaluation of the building regarding sustainability. Building products are not assessed as individual products, but looked at within the context of the entire building. The properties of building products play a role in all areas of sustainability: Ecological Quality (life cycle assessment, environment, and health), Economic Quality (life cycle costs), Socio-Cultural Quality (e.g., indoor air quality), Technical Quality and Process Quality. The German federal government requires sustainable constructions and hence, offers a comprehensive certification scheme with many useful evaluation tools. All these are free of charge and offered to the public, and hence may be used for any projects. Life cycle assessment and its tools are described in [1]. Regarding local environmental and health relevant impacts the website WECOBIS offers a very well structured and comprehensive basis of information on building materials. It allows organising and structuring information for individual projects in myWECOBIS and furthermore gives userfriendly help for tendering and planning processes. The information is directly linked to BNB criteria, but is also relevant for any interested user.

In summary, it can be seen that the German government acts as antetype to plan and construct its buildings in a mostly sustainable way.

[1] Brockmann, T.; Kusche, O.; Rössig, S. (2014). *Life Cycle Assessment within BNB - Online Tool eLCA and building materials database ÖKOBAU.DAT*. SB 14, Barcelona.

[2] Brockmann, T. (2013). *Ecological Aspects of Building Materials within BNB (Assessment System for Sustainable Buildings for Federal Buildings)*, SB 13 Munich.