

# Sustainable Building Assessment System for Research- and Laboratory buildings - Austrian and Swiss Perspective on the BNB Applicability

Alexander PASSER<sup>a</sup>

<sup>a</sup> Graz University of Technology, Austria, alexander.passer@tugraz.at

---

## ABSTRACT

Green Public Procurement (GPP) calls for the use of the public authorities purchasing power to foster environmentally friendly goods and services. As the building sector is a top priority in terms of maximizing energy efficiency, accounting for up to 40% of global and European energy consumption, the goal of the International Energy Agency (IEA) is to achieve an 80% reduction in global emissions by 2050.

Within the paper the applicability of GPP for the buildings' design process is elaborated. The different stages in the procurement process for buildings are explained and the interdependencies of the complex process of design and construction of buildings and related sustainability performance are discussed.

On the base of two international case studies, the applicability of building sustainability assessment methods is briefly discussed. These methods ensure a holistic life cycle perspective within all phases of design and construction, which can easily be implemented in the procurement process. However only with the commitment from the purchaser as well as from involved design team the implementation of sustainable building projects is possible.

**Keywords:** *green public procurement, sustainability assessment, sustainable design process, BNB*

---

## 1. PUBLIC PROCUREMENT AND BUILDINGS

How can the COP 21 agreement against climate change be linked to public procurement?

Well, it has been proven that public authorities are one of the major purchasers of goods and services around the world. Green Public Procurement (GPP) calls for the use of the public authorities purchasing power to foster environmentally friendly goods, services and, in this case, construction works, to make an important contribution towards more sustainable consumption and production. Although GPP is only a voluntary instrument, the vision is to change the market forces due to a different demand-driven innovation policy - „Market Pull“.

In Europe, public authorities spend more than 16% of EU's GDP – nearly 1.8 Trillion Euros – on buying goods such as office equipment and building components, and purchase services such as buildings maintenance and transport services. In that sense, it is obvious that GPP has a key role in the efforts to implement Sustainable Development Goals (SDGs) and become a more resource-efficient, circular economy. The European Commission and a number of European countries have developed guidance documents and recommendations, in the form of national GPP criteria. For the applicability in the procurement process, GPP requires the inclusion of clear and verifiable criteria for products and services i.e. the inclusion of e.g. environmental ones. In the Austrian case, based on the new EC public procurement, repealing Directive EC and national regulations, new legally approved criteria were developed. They include the level of innovation, risk mitigation (both technically and economically) and new positive incentives (synergy effects, additional benefits, etc.).

Within all industry sectors, the building sector is a top priority in terms of maximizing energy efficiency because the most cost-effective energy savings can be found in the residential and commercial buildings. Due to the fact that the building sector accounts for up to 40% of global and European energy consumption, the goal of the International Energy Agency (IEA) is to achieve an 80% reduction in global emissions by 2050. In Europe, the EU Parliament approved a recasting of the Energy Performance of Buildings Directive in 2010 that requires member states to propose measures to increase the number of nearly zero-energy buildings and to encourage best practices for cost-effective transformations of existing buildings into nearly zero-energy buildings (Passer et al. 2016).

Evidence gathered from office buildings across Europe indicates that the most significant contributors to operational environmental impacts are due to lighting, heating, cooling and ventilation services. In Europe their

relative importance primarily varies according to the thermal performance of the building and its climatic location respectively. (EUROPEAN COMMISSION 2016)

Second most significant environmental impacts are related to the production of construction products. These - so called embodied impacts - arise in the life cycle of construction products due to their material extraction, processing and transportation, production, installation into the building or construction works, maintenance and end of life. In this respect, the recycling and re-use of construction materials and products, as well as whole building elements, can contribute to reducing environmental impacts and development of a circular economy. (EUROPEAN COMMISSION 2016)

For the overall life cycle sustainability performance, the buildings service life plays a major role, which can be influenced by other than technical factors too. For example, the building's technical and functional performance as a healthy and attractive working environment can contribute to a longer service life-span and minimise the need for renovations or the building's demolition. Evidence shows that in a healthy building with good indoor air quality and good socio-functional performance, e.g. as daylight comfort, the workforce is more productive and less illness-related absences occur. (EUROPEAN COMMISSION 2016)

In Europe an overall – holistic consensus has been reached (CEN 2012) that the buildings' performance assessment shall only be done on the buildings level, including all dimensions of sustainability, namely the environmental, the economic, the socio-cultural as well as the technical and the functional performance of a building, pictured in Figure 1.

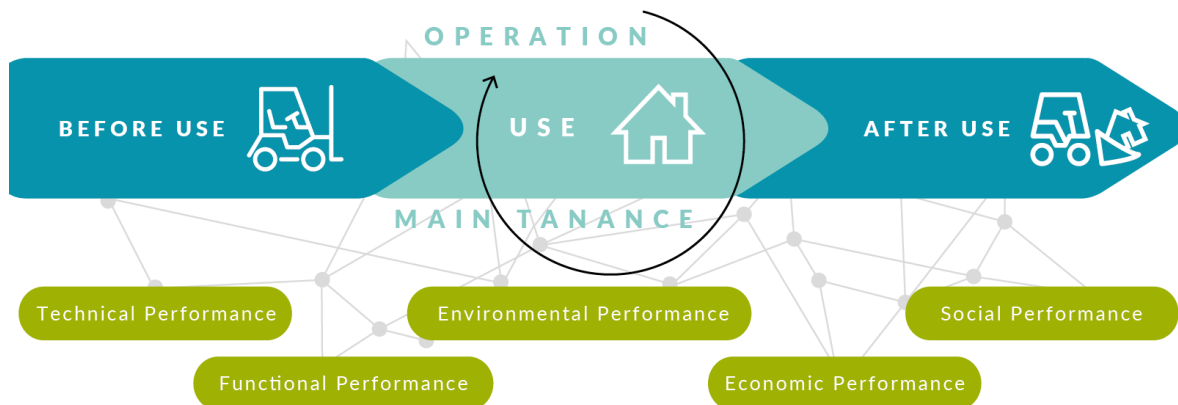


Figure 1: Life cycle of buildings (AGNHB TU Graz)

In the past years a various number of building certification systems like LEED, BREEAM, HQE, DGNB, BNB, SGNI, O'GNI and TQB were placed on the market to promote green and sustainable buildings. Recently, an increasing demand for such labels has been noticeable. In these building certification schemes aspects of sustainability (economic, social and environmental as well as functional and technical) are considered very differently. However, as all these building certification schemes are based on assessment criteria, they are applicable for GPP and related activities for public authorities. As the German Assessment System for Sustainable Building (Bewertungssystem Nachhaltiges Bauen: BNB) was developed by the German Federal Building Ministry to be used for public buildings, its applicability from an Austrian and Swiss perspective will be assessed on the case of the Sustainable Building Assessment System for Research- and Laboratory buildings.

## 2. APPLICABILITY IN THE DESIGN PROCESS

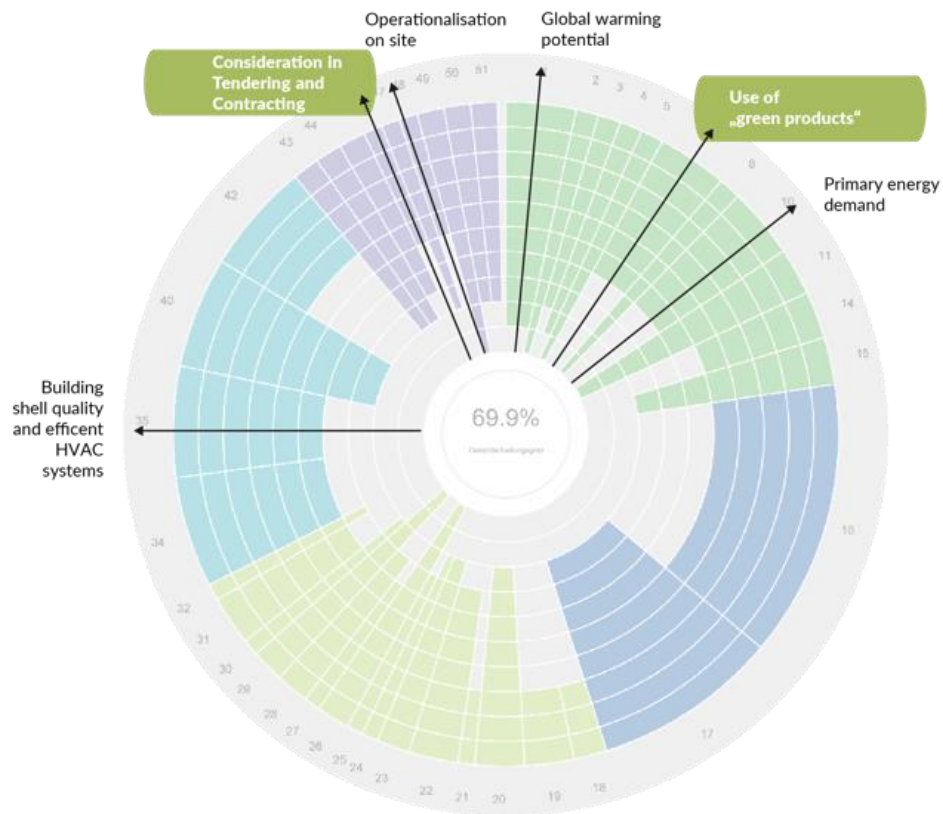


Figure 2: Consequences of GPP for the design and tendering process (AGNHB TU Graz)

Designing and procuring buildings with higher sustainability performance while reducing environmental impacts is a complex process. Figure 2 illustrates the different goals that need to be integrated in the design and procurement process, based on the aimed fulfilment level of different assessment criteria as well as according to the different life cycle phases.

As the implementation level of the goals into the procurement process can have a significant influence on the outcome, the distinct sequence of procurement activities with related contracts are of high relevance. This is because each type of contract brings with it distinct interactions between the procurer, the building design team, the contractors and the future occupants as well as facilities managers. Moreover, they each have advantages and disadvantages in seeking to procure a building with an improved sustainability performance.

According to the EC GPP process (EUROPEAN COMMISSION 2016), depending on the procurement route adopted, some of these contracts may be awarded to the same contractor but in most cases, they are let separately. Some contracts may be integrated in a design and build (DB) or a design, build and operate (DBO) arrangement, with the detailed design process, the main construction contract, the installation or provision of energy services and even facilities management all potentially co-ordinated by one contractor. It is therefore important to identify the main points in the sequence of procurement activities where GPP criteria should be integrated. To this end, these criteria are arranged to reflect the most common procurement activities and are accompanied by a guidance document, which provides general advice on how and when GPP criteria can be integrated into this process. It also suggests, based on experience from projects across the EU, how the procurement sequence could be managed in order to achieve the best results, issues to consider at key stages along the process and specific types of expertise that may help to obtain better outcomes.

### Sustainability criteria in the buildings life cycle

Within the different life cycle stages different sustainability assessment criteria need to be defined and checked for a building project. Figure 3 illustrates the possibilities of the definition of project target goals and the related building sustainability certification process. In most building certification schemes the project goals are assessed at the

beginning with the pre-certification process of the buildings design and are awarded with a final certificate after its completion ensuring that all goals and requirements are fulfilled.

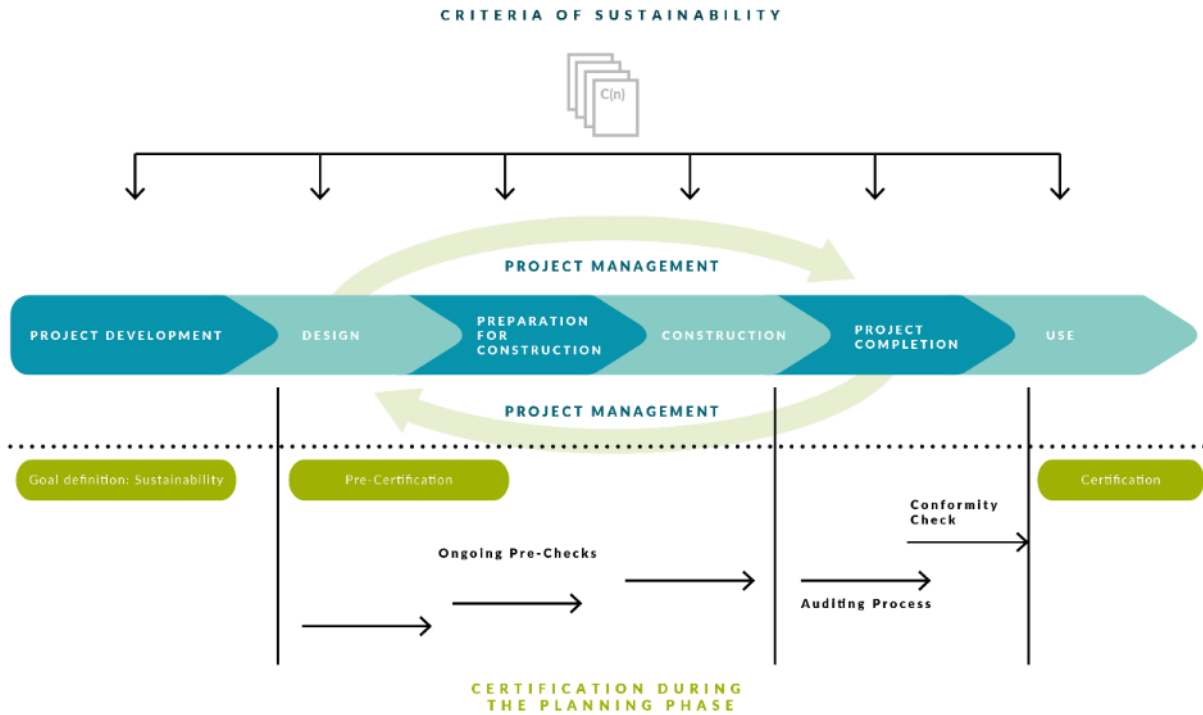


Figure 3: Sustainability criteria in the buildings life cycle (AGNHB TU Graz)

The complex process of design and construction of buildings and related sustainability performance is often checked by the use of a professional sustainability expert (e.g. Auditor, Accredited professional (AP), etc.). This expert checks the fulfillment of the goals defined from the GPP and then communicates with the design team as well with the procurer. Figure 4 illustrates the design process and the parallel process of sustainability performance integration.

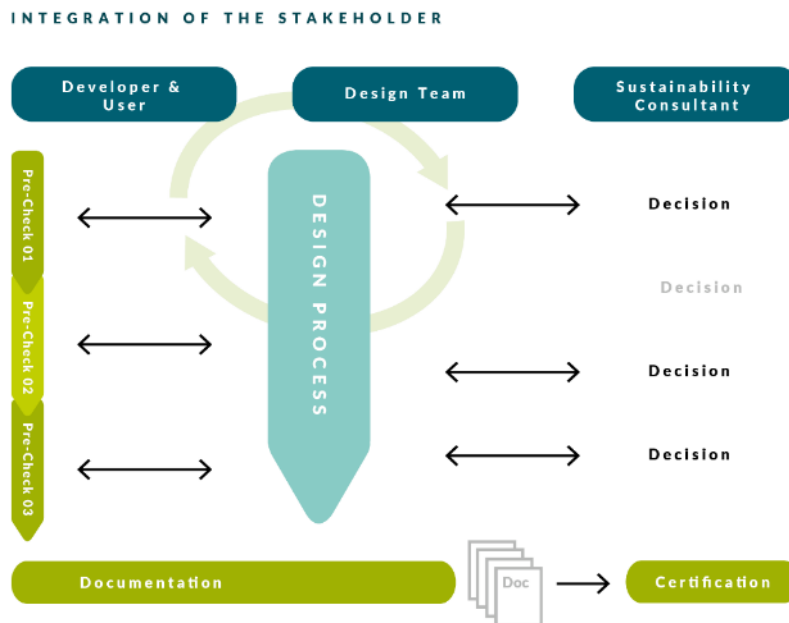


Figure 4: Integration of the stakeholder (AGNHB TU Graz)

### **3. OUTLOOK - SUSTAINABILITY ASSESSMENT OF BUILDINGS AS PART OF GREEN PUBLIC PROCUREMENT**

In a joint activity in the years 2011-2013 BNB, DGNB and ÖGNI developed an assessment method for laboratory buildings based on the BNB assessment method. For the case of two ongoing projects, the applicability and national adaptability of the BNB sustainable building assessment methods in Austria and Switzerland is explained.

#### **MED CAMPUS Graz (Austria)**

The building complex as a modern university building, research and teaching facilities centers will have space for around 1700 employees and 4300 students and 68.000m<sup>2</sup> gross floor area.

From the project's inception, its development was aligned towards a sustainable and healthy campus in the broadest sense, and this has resulted in a GPP process by the inclusion of sustainability performance targets already in the public competition requirements. Before the process inception a target catalogue on the basis of the ÖGNI assessment criteria was developed, which is the Austrian adaptation of the BNB/DGNB method. In an interdisciplinary, iterative design process, the buildings performance was constantly optimized and checked from a sustainability perspective, which led to a precertification at the end of the buildings design. The achievable goals formed the basis for the requirements and the tender specification respectively. For the construction phase, regular updates of the precertification were used as a monitoring tool. For the final certification, on-site measures were performed to finally evaluate the building's real life performance.

#### **GLC ETH Zürich (Switzerland)**

As a second case study, the GLC project from ETH Zurich, demonstrates the integration on GPP processes in Switzerland. Due to the general sustainability requirements of ETHZ all building projects must reach a high fulfillment degree (>65%) of the SGNi assessment scheme, which is the Swiss adaptation of the BNB/DGNB method.

All projects from the architectural competition were assessed with the focus of the criteria that can be assessed in early design stages. In the following, a coordinated initial assessment between ETH and awarded design team has taken place, which then acts as an objective agreement with specific planning requirements to be included in the contracts. The next step was the commissioning of the design team. With the preliminary project, the assessment procedures were established, and ETH is only controlling the target agreement. The precertification was conducted with the preliminary project, where ETH provided the auditor function. The design team and their sustainability experts provided the project details for the assessment. After the building completion, the GPP process ends with the final certification and hand over to the users.

### **OUTLOOK GREEN PUBLIC PROCUREMENT**

Due to the reached common understanding for the importance and urgency of sustainability targets to be implemented in the construction sector, green public procurement could foster the efforts of public authorities towards environmentally, economically and socio-culturally high (better) performing built environment. GPP can have many direct and indirect environmental and economic life cycle benefits. Apart from the immediate environmental gains, e.g. through the purchase of a more sustainable product, it can be a crucial market driver to foster a critical mass of sustainable products.

The use of building sustainability assessment systems, such as the BNB method, ensures a holistic life cycle perspective within all phases of design and construction towards diminishing long term implications. The variety of the developed methods and tools allows the procurers to make transparent, scientifically based decisions. However, all tools, data and methods need to be publically available in advance in order to avoid any discrimination.

Findings from both case studies show that that only with the commitment from the purchaser as well as from involved design team the implementation of sustainable building projects are possible.

However more research on the systemic interdependencies of design decisions and related multi criteria decision making process remains an open task. In order to facilitate the applicability in the design process, it is also

necessary to simplify and automate the assessment methods and align it with conventional steps in planning and procurement processes, i.e. through the implementation in Building Information Modeling (BIM).

The awareness of the achieved (higher) sustainability performance and related efforts is an ongoing learning process on its own that has just begun.

## ACKNOWLEDGMENTS

The Author would like to thank Andreas Rietz (BBSR) and Thomas Lützkendorf (KIT) for the possibility to contribute to the BMUB workshop on Sustainability assessment of buildings as part of green public procurement based on the German BNB-System. The case studies described in this paper were carried out in the project MED CAMPUS Graz by Medical University of Graz and Bundesimmobiliengesellschaft m.b.H. with the general planer Riegler - Riewe Architects ZT GmbH (architects, commissioned by BIG) and Team TU Graz. The second case study was provided by Christian Stoy (PBK AG) as consultant and Daniel Nötzli (ETH Zürich) for the building project (GLC). We would like to thank all for their support and their inputs.

## REFERENCES

- [1] CEN, 2012. ÖNORM EN 15978:2012-10-01- Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method
- [2] EUROPEAN COMMISSION, 2016. EU GPP Criteria for Office Building Design, Construction and Management
- [3] Passer, A. et al., 2016. The impact of future scenarios on building refurbishment strategies towards plus energy buildings. *Energy and Buildings*, 124, pp.153–163