

POSTGRADUATE COURSE IN “SUSTAINABLE CONSTRUCTION” AT GRAZ UNIVERSITY OF TECHNOLOGY



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Summary

Graz University of Technology, in co-operation with the Chamber of Commerce, the Chamber of Architects and Consulting Engineers, and the Provincial Government of Styria, intends to install a four-semester part-time postgraduate course in sustainable construction in the academic year 2007/08. The reason is increasing discussion about the implementation of principles of sustainable development in all areas, including the construction sector. Climate protection, sustainable resource management, life-cycle costs or durability are demands that the construction industry cannot ignore. University and technical college graduates working in the practical field have so far lacked the necessary expertise to implement this new concept in the sphere of their activities. New forms of knowledge transfer such as e-learning allow us to convey new knowledge at a high level of quality and concentration, largely independent of location and with few on-site phases. In line with its strategy of excellence, Graz University of Technology aims to tackle these new tasks, offering its advanced courses not only to students but also to those working in the construction sector within the framework of international networks.

Keywords: Sustainable construction, postgraduate course, sustainability, civil engineering, e-learning, construction sector

1 Introduction

1.1 Sustainable development

The term “sustainability” dominates current scientific and political discussion like hardly any other. Twenty years after publication of the “Brundtland Report” [1], practical implementation has only just begun in everyday business activities. Sustainability is not objectively quantifiable but rather a beacon concept, not an objective but rather a process

of constant development [2]. Sustainable construction means ensuring the long-term intended functions of a building with minimum negative environmental impacts and costs – throughout the whole life-cycle.

1.2 The significance of sustainable construction

As one of the biggest business sectors in Europe, the construction industry plays a key role in the discussion of sustainable development. This becomes clear when you look at a few figures:

The percentage contributed by the construction sector to Austria's gross domestic product was 8.4 % (€18.9bn) in 2003, with 6.1 % of employees (234,000 employees). The percentage contributed by the construction sector to the GDP of the EU-15 was 9.8 % (€904bn), with 7.1 % of employees (11.7m employees) [4]

Together, construction waste (with a total of 6.6 m t/a registered in disposal facilities) and excavation material (22 m t/a) amount to approx. 53 % of total waste in Austria [5]. On the input side, 108 m t/a of construction materials are used for existing buildings in Austria. [6]

The current climate protection discussion concerns the construction sector not only with regard to manufacturing construction products, but has also drawn general attention to the heating requirements of buildings. As important as reducing energy consumption is for achieving an energy-saving house standard (state of the art for new buildings) or even a passive house standard, we must not overlook the fact that short-term to medium-term success can only be achieved if existing buildings are efficiently refurbished. While buildings built before 1918 may display acceptable energy indicators even according to current demands, thermal refurbishment measures should focus above all on those buildings built between 1950 and 1980. This period may be seen as the all-time low of technological building culture in Austria – and in many other European countries.

1.3 Future framework conditions in Europe

Today there are myriad activities on the subject of sustainable construction in Europe. Future framework conditions within the European Union will be prescribed by the European Commission.

These include, for example:

- The Commission's "Directive on the Energy Performance of Buildings", energy certification of buildings,
- The Commission's "Thematic Strategy on the Urban Environment" (amended 2006),
- Standardisation activities at CEN: Framework Document "Sustainability of Construction Works" to be drawn up by 2008/2009.

The draft of CEN/TC 350 [7] provides the following structure, as indicated in Fig. 1, for assessment of integrated building performance. Holistic approaches that consider the three dimensions of sustainability and cover the whole life-cycle only make sense if costs and environmental impacts are also compared with the benefits. Therefore, today quantifying assessments are made in terms of a functional unit (m² of floor area for building assessments, m² of wall area for comparisons of building components). In order to assess "Integrated Building Performance" in the three dimensions environmental, social and economic performance, technical and functional performance was also included in the

comparison as the fourth dimension of sustainability, as it were. In the language of civil engineers, this could also be referred to as “structural sustainability”.

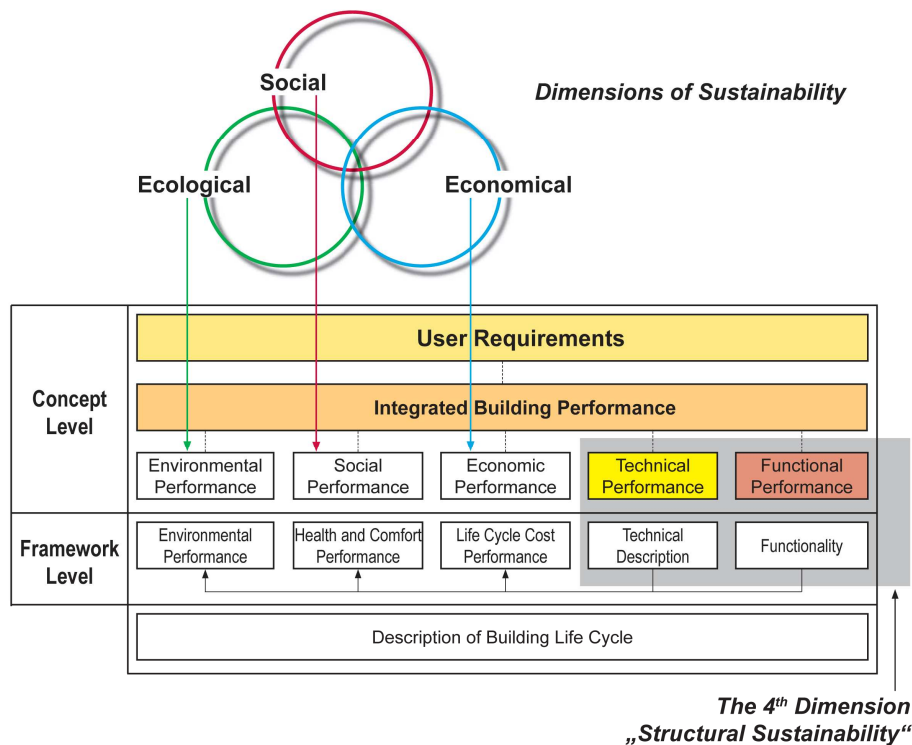


Fig. 1 The structure of the CEN/TC 350 Framework Document [8]

2 Training requirements

2.1 Traditional engineer training curricula in Austria

Civil engineers have always been trained to be all-rounders in Austria. Their training therefore comprises the field of constructional engineering and the construction industry, project management, transport development, hydraulic engineering or soil mechanics, to name just the main subject areas. Environmental aspects received too little attention, usually featuring as an appendage of hydraulic engineering.

2.2 Requirements of sustainability

Above and beyond ensuring functionality, sustainable construction demands that the consequences of building activities be taken into account from an ecological, economical and socio-cultural viewpoint, throughout the whole life-cycle. Whereas previously engineers focused on environmental impacts on construction work, today we must equally consider the impact of the building on the environment. This holistic approach in design and construction currently constitutes the greatest challenge for civil engineers and has yet to become entrenched in the awareness of civil engineers already working in the profession. For experienced practitioners in particular, this means saying goodbye to

various habits and bringing numerous decisions forward to an earlier stage of planning – or even to the project development stage.

3 The postgraduate “Sustainable Construction” course at Graz University of Technology

The aim is to convey this new understanding for civil engineers and the instruments required for implementation in building practice in a four-semester professional-development “sustainable construction” course. The aim is to convey the principles of holistic life-cycle assessments and direct implementation of this knowledge in day-to-day practice.

3.1 Target group and partners

The course is intended for executives from the entire construction sector, including architects and consulting engineers, executives from the construction industry and building products industry, building developers and public administration.

The course will be designed and handled in a close co-operation of the Faculty for Civil Engineering and the following institutions such as the Chamber of Commerce, Chamber of Architects and Consulting Engineers, and the Provincial Government of Styria.

3.2 Training objectives

The aim of the course is to convey to participants general and application-specific knowledge regarding the implementation of principles of sustainable development from an ecological, economic and socio-cultural viewpoint in project development, planning and construction, as well as in operation and disposal of buildings.

3.3 Curriculum

The course will focus on the following topics:

- Introduction to sustainability (historical development, current framework conditions in Europe, sustainable construction)
- Legal framework conditions (harmonised building code, public procurement law, technical specifications, EU Directive on the Energy Performance of Buildings, and energy certification of buildings)
- Financing (subsidies in Austria and the EU, principles of project financing, economic efficiency calculations)
- Waste and recycling management (dismantling instead of demolition, recycling of building materials)
- Sustainability in new buildings (project development, sequence of planning, choice of location, project management, choice of building materials, environmental impacts and their assessment)
- Sustainability in building refurbishment (existing Austrian buildings, new building or refurbishment, sustainable monument preservation, remaining useful economic life span – remaining life span, assessment of condition and bases for decision-making, thermal

- building refurbishment, environment impacts of refurbishment measures and their assessment)
- Special features of infrastructure construction (road building, bridge building, underground building)

- Master thesis

3.4 Organisation and structure

It is planned to hold the course in two stages. During the initial stage, the language of tuition will be limited to German, which will entail a restriction to the German-speaking region. In the second stage, it is planned to include English as a language of tuition so as to be able to offer the course to non-German speaking neighbouring countries, too. The aim is to focus on regional peculiarities in co-operation with local partners.

On-site tuition will be held above all in the form of discussions with experts in the field of sustainable construction. On-site attendance will be reduced to a minimum. Instead, it is planned to convey the main principles of the course by means of a well-structured, user-friendly e-learning platform. This will enable teaching and learning that is to a great extent independent of location. The only condition is a good Internet connection. The aim is not only for the teachers to transfer knowledge, but also for the course participants to exchange knowledge on this platform.

Upon successful completion of the course, participants will be awarded the title of “Master of Engineering” (MEng).

4 Prospects

Sustainable construction, i.e. holistic consideration of the environment, economy and society throughout the life-cycle of buildings, is a paradigm shift for the construction sector and a vast challenge. It is necessary to take into account that we need to re-discover old-accustomed things that go without saying, while acknowledging that the complex interrelations of the mutual dependencies of environment and economy do not constitute a self-enclosed field of knowledge, as no state of the art exists as yet in many spheres. Current pressing problems (e.g. climate change), however, brook no delay and require fast action in many areas. It is therefore the responsibility of universities of technology not only to think ahead but also to ensure that their courses account for future challenges. As the Greek statesman Pericles (493-429 BC) realized: “It is less important to foresee the future than to be prepared for it”.

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