The Impact of Noise in the Environment on the Acoustic Assessment of Green Houses

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In various green building assessment systems involving sustainable building projects, certain specific acoustic aspects are important. In Europe the most common system addressing the problem is the British system Building Research Establishment’s Environmental Assessment Method (BREEAM), American system Leadership in Energy and Environmental Design (LEED), or German system Deutsche Gesellschaft für Nachhaltiges Bauen (DGNB). The green building certificate comprises the assessment of noise impact generated by technical equipment of buildings on their external surroundings. The measures undertaken to counteract noise-generated pollution involve green certification, but it is also a global challenge to find appropriate technological solutions contributing to the protection of areas inhabited by people. We determined the impact of the surroundings of the assessed building in specific background noise conditions. We described the problem of appropriate selection of measurement points and the impact of noise generated by building installations on the acoustic assessment of green buildings in BREEAM system. A theoretical model of the simulated house was developed close to a road, with changes to traffic parameters including heavy vehicles and the summary acoustic power of the equipment mounted on the roof of the investigated house. We analysed the impact involving the location of the investigated building on the possibility to obtain ‘credits’ in view of environmental acoustics. Instead of a single case study, we used simulation to illustrate different situations such as the changing acoustic background represented by the existing traffic system or changing noise of the sources represented by noise generating units.

1. INTRODUCTION

In many countries the ecological assessment systems of buildings have become an indispensable element to be taken into account during the construction of office complexes. Such an approach has been enforced by the reduction of energy consumption in the building construction sector which accounts for 40% of global energy use. Such assessments are closely related with sustainable building construction. Nowadays, it is commonly accepted that sustainable building construction is based on three aspects: environmental, social and economic. Many publications describe most popular assessment systems of green buildings. The present publication focuses on acoustic parameters in view of the Building Research Establishment’s Environmental Assessment Method (BREEAM) and the Leadership in Energy and Environmental Design (LEED) assessments.

The BREEAM method was developed in 2011 and is the most widely acknowledged scheme, applied to investigate over 2000 buildings in Great Britain. The key criteria and features of BREEAM Offices are structured hierarchically into Issues, Categories, and Criteria levels. At the top level, there are ten distinct issues (the maximum number of obtainable credits is shown in parentheses): Management (22), Health & Well-being (14), Energy (30), Transport (9), Water (9), Materials (12), Waste (7), Land Use & Ecology (12), Pollution (13), and Innovation (10). Acoustic issues are investigated in Health & Well-being (room acoustics and insulation acoustics) and in Pollution (environmental acoustics). In the BREEAM assessment, a scoring system of particular credits is applied. The awarded credits are summed in a way that ensures an overall scoring for each category is obtained. Then the overall result as well as a percentage of the maximum achievable score for all categories are obtained. The latter is used to determine the overall grade of the assessment, which may be: Pass (≥30%), Good (≥45%), Very Good (≥55%), Excellent (≥70%) or Outstanding (≥85%). To obtain BREEAM certification, in addition to achieving a total percentage score that equals or exceeds the minimum percentage score of an awardable grade, a minimum number of credits (defined for each category of assessment pertaining to each rating level) and the number of credits obtained in individual categories must not be lower than the minimum number of credits specified for a given category.

The second important assessment system is the American LEED. The LEED system, designed in 2009, is divided into two levels, categories and points, which is similar to Issues and Categories in other schemes. The system consists of seven categories: Sustainable Sites (26), Water Efficiency (10), Energy and Atmosphere (35), Materials and Resources (14), Indoor Environmental Quality (15), Innovation in Design (6), and Regional Priority (4). The maximum possible total score is 110 points. The awarded points for individual aspects of assessment are summed and compared against a rating scale to yield an overall grade, which may be LEED certified with (40–49 points), LEED silver with (50–59 points), LEED gold with (60–79 points) or LEED platinum with (>80 points). As a condition for earning a standard LEED certification, the applicant project must satisfy all prerequisites and score the minimum number of points, i.e., 40–49.

As indicated in many research studies, when carrying out the assessment of green buildings, we should take into account local context, which depends on the geographical location of a country and its economic situation. The local context allows each country to define the parameters of such an assessment in a different way. We can refer here to Seinre et al.’s analysis of BREEAM and LEED requirements in terms of the binding building construction regulations in Estonia. The