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# "Assessment tool for building materials - The role of the odor"

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**Abstract**

A parameter for "odor intensity" is integrated into an assessment tool for relative sustainability degree of building materials (PhD work of the author). The investigation tries to figure out if the rating is modified by the inclusion of this parameter and verifies if a building material which is considered sustainable could have a negative odor review. The case study compares three different interior plasters which will be analyzed and compared to a standard solution: cement (REF); gypsum (A), clay (B) and lime (C).



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## 1. Introduction

There's been developed several sustainability measurements and evaluation tools or systems, which perform analysis on a global, national and building scale. There are a few tool types: LCA-Life cycle analysis, environmental declarations, labels and certification systems; each one with its own specific objectives and scope. However, it is noted a reduced existence of a tool relative to building materials which can include broad criteria while being simple and clear for common users.

The whole building assessment is of course important but has different goals then the focused view on the material choice, because it has the contact to the user. The human comfort criteria is highly influenced by the material choice. This kind of tool could be used by the designer himself, turning it into a real support for the planning process.

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In this sense, we choose a tool developed by Bragança and Mateus [1] in 2009 that shows to be user-frindly and easy reading, which are also our main goals.

It was adapted in the PhD work of the author [2] into the scale of building materials with their specific requirements. The structure of this assessment tool compares several building materials and rates their relative sustainability level between each other. The analysis is supported by three main criteria: ecology, comfort, and economy. These criteria are built by specific parameters. Due to the normalization and aggregation of the raw data there will be a determination of a relative sustainability degree of the materials. The evaluation reveals no absolute classification or label, but a comparative analysis between the building materials themselves. The results show if a particular construction material is better in comparison to a reference material or not.

As the comfort criteria is very important for the evaluation of building materials we added for this paper a new parameter, the odour, that influences a lot the indoor air quality. Humans living in Central Europe spend most of their time in buildings, therefor indoor air quality is important for human health and comfort. In order to preserve the air quality of the room, contamination should be as low as possible, therefor materials and objects used should be of low emission, i.e. they should give off as few pollutants as possible [3].

The building materials have the greatest impact, since they are used in big extensions. Emissions can lead to unpleasant odors and thus lead to dissatisfaction and lower productivity of the users. Through increased ventilation, the indoor air quality could be led to an acceptable level, but this increases the energy consumption. This connection between ventilation rate and odor-related emissions, makes the selection of suitable building materials an important aspect of energy efficiency for buildings.

**Nomenclature**

| | |
|---|---|
| $R_{ij}$ | Real value |
| $\bar{R}_{ij}$ | Normalized value |
| $R_j^*$ | Optimum value |
| $R^*_j$ | Worst value |
| $IS_i$ | Generic ith index of aggregate sustainability |

## 2. The assessment tool for building materials

### *2.1. The structure*

Sustainability is an issue that should be evaluated in comparison to the common practice - the standard solution - of a country or a specific location, thus making it possible to verify, for each parameter, if the analyzed solution has a better performance than the reference option. The minimum threshold of sustainability must represent the most expressive solution on the market and should be regularly adjusted according to technological development. The most sustainable solution depends on the state of the art at the moment [4].

The analysis is supported by three main criteria: ecology, comfort, and economy. These criteria are built by specific parameters, emphasizing relevant aspects of the case study:

- Ecological criteria: OPD - ozone depletion potential (kg Ethen-eqv.); RMD - fossil raw materials depletion (MJ); GWP - global warming potential (kg CO2-eqv.); EP - eutrophication potential (kg Phosphate-eqv.); AP - acidification potential (kg SO2-eqv.); PIE - primary incorporated energy (MJ); IW - incorporated water (kg); SW - solid waste (kg); RP - recycling potential; TT - transportation type/distance to the project (MJ/tonKm);
- Human comfort criteria: AC – acoustics; TC - thermal conductivity (λ); SC – security; DU – durability (years); HED – hedonics; PI – perceived intensity;
- Economic criteria: CC – construction cost (€); DC – disposal cost (€).

The Data collection is the most important and delicate task in the evaluation process. The source from which the values are drawn must be scientific and independent, so that it does not influence the results of the analysis. It must be regularly updated and controlled by an external review to ensure its quality. Most of the data fonts are from public available databanks. The others are defined by different references or by scales witch were developed in the PhD work of the author [2].