

CRITERIA FOR EVALUATION OF WASTE GLASS/CLAY BLOCKS PRODUCTION MODEL

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Abstract

One of the ways to solve the problem of waste mixed packaging glass recycling is to use glass packaging as a secondary raw material to obtain a new product - a block of clay with a certain mass fraction of crushed glass. The paper describes the criteria that are very useful for the analysis of the impact on the environment and the analysis of the economic factor when applying the model of the use of waste glass packaging, as a secondary resource in the production of clay blocks.

Introduction

Environmental natural resources are transported and used as raw materials in production plants, turning them into construction products, which further generates pollution and requires significant energy consumption with appropriate greenhouse gas emissions. The choice of construction products with less impact on the environment is one of the ways to reduce the negative impact of construction on the environment. Therefore, the environmental impact assessment must be balanced with the economic assessment. To satisfy their customers, manufacturers and designers must develop and select construction products with a reasonable balance between the results of environmental performance (Environmental Performance Score) and the result of economic performance (Economic Performance Score), which is not an easy task. To this end, the US National Institute of Standards and Technology (NIST) has developed BEES (Building for Environmental and Economic Sustainability - BEES) software that can be used as a tool to assess sustainability in the domain of environmental protection and economic sustainability in the use of certain construction materials [1].

The paper will present the criteria that were taken into account when assessing the impact of clay blocks production with a certain mass fraction of recycled waste glass on the environment.

Experimental

The BEES methodology quantifies the environmental impacts of construction products using a multidisciplinary approach known as Life cycle assessment (LCA). This means that it takes into account the multiple environmental and economic impacts during the life of a particular construction product. Consideration of multiple impacts and life cycle stages is necessary because product selection decisions based on individual impacts or phases may exclude some impacts that may cause equal or greater damage. In other words, a multidimensional life cycle approach is needed for a comprehensive, balanced analysis [2].

The LCA is a systematic approach to environmental impact assessment standardized by the International Standards Organization (ISO) [3]. In particular, BEES determines the overall impact of construction products on the environment using the life cycle assessment approach

specified in the ISO 14040 series standards [4]. All phases in the life of a certain product are analyzed: procurement of raw materials, production, transport, use, recycling and waste management. To determine economic performance, the Life Cycle Cost Method is used, which includes the costs of initial investment, replacement, production processes, maintenance and repair and disposal [2].

The general objectives of waste management, and thus waste glass packaging, relate to the protection of human health and environmental quality, resource conservation and sustainability [5], [6].

Results and discussion

Taking into account the approach of BEES methodology applied in the model of production of ceramic tiles with glass recycling [1] and general objectives of waste management, the paper defines the criteria for evaluation of the glass / clay blocks production model (Figure 1).

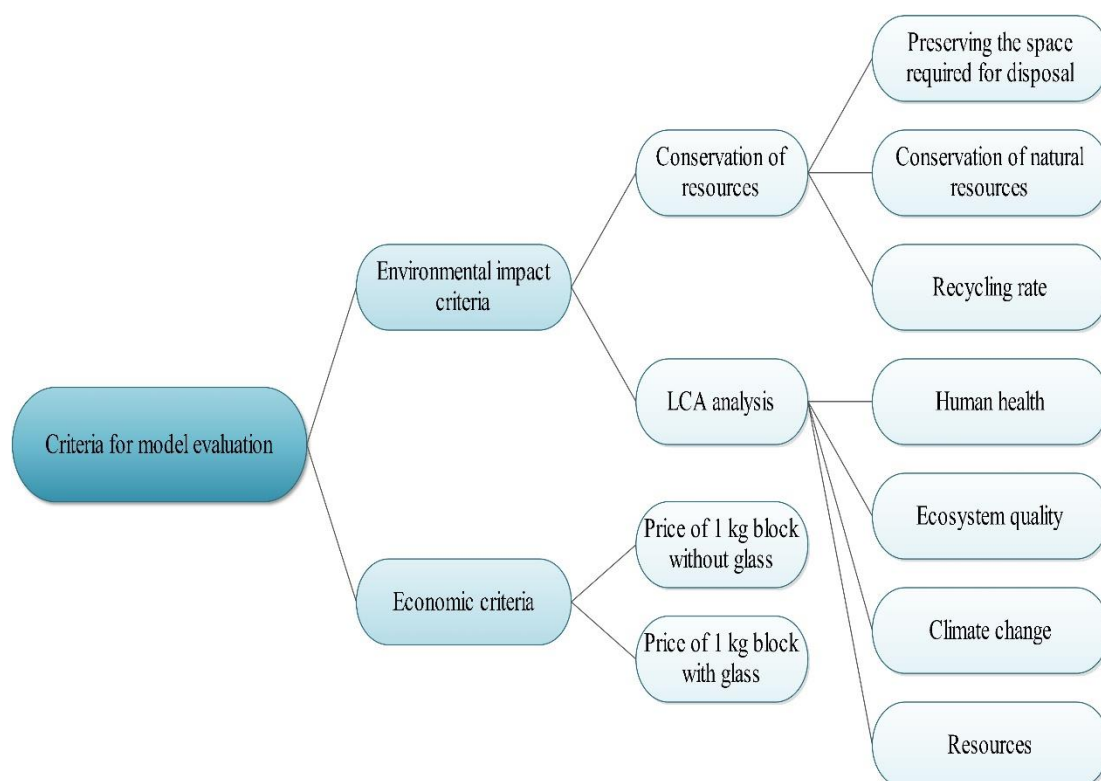


Figure 1. Criteria for evaluation of the glass / clay blocks production model

Within the evaluation of the model, two groups of criteria were considered: Environmental Impact Criteria and Economic Criteria. The basic criteria are: Preservation of resources with an emphasis on the preservation of space required for disposal, preservation of natural resources, in this example clay, and the recycling rate which refers to increasing the percentage of waste glass packaging recycling. The economic factor must also be taken into account, i.e. the calculation of the production price of commercial blocks and blocks with a mass share of recycled glass in its composition.

Conclusion

Hodge et al. (2010) in the research emphasized the importance of investing efforts in order to increase the use of waste materials, as ancillary resources of primary resources in industry,

considered it an important step towards sustainable industrial development [7]. In the mentioned research, a new approach of recycling application within the boundaries of industry is presented, with a focus on the whole industry, in order to identify locations where there is a benefit both from the economic aspect and from the aspect of environmental protection.

References

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