

## MooB – Multi-objective Life Cycle Optimisation of Sustainable and Innovative Construction Materials and Buildings

### Summary

This project for cooperation in Science between Portugal (IST - University of Lisbon) and Hungary (Budapest University of Technology and Economics) aims to apply advanced Multi-Objective Optimisation (MOO) tools to the Life Cycle Assessment (LCA) of innovative construction materials and buildings. The environmental, economic, and energy performance of materials and buildings will be evaluated separately, and their efficiency will be maximized with the application of MOO. Young researchers will participate in this project (doctoral students whose research is directly related to the project's aim) to enhance the research results through sharing and transferring knowledge. This work will be supervised by senior researchers in both research teams and consolidated through the exchange trips. The result will correspond to high-quality scientific production and, in the medium to long term, to the development of common larger-scale projects.

The main objective of the proposed Transnational Cooperation Project is to strengthen the work of the teams involved, generating new and improved knowledge about the Life Cycle Assessment of innovative construction materials and buildings. In addition to performance issues, the environmental, economic, and energy impacts will be evaluated separately. Their efficiency will be maximized by applying Multi-Objective Optimisation (MOO) tools.

Additional objectives of this project are: to investigate possibilities for closer future cooperation (networking), including with other international research teams; to coordinate activities that would lead to joint applications for international projects such as Horizon 2020 and Horizon Europe (2021-2027) in future calls for proposals. These objectives will be achieved by sharing knowledge and experience within the teams. Each team has significant contributions in the field. Since similar topics are being investigated simultaneously, collaboration offers

a chance to integrate their work into future common projects.

The topics currently being investigated by the teams are:

- Life Cycle environmental, economic, and energy Assessment of thermal retrofit interventions.
- Environmental Assessment of different scales of thermal retrofit interventions.
- Multi-objective optimization (including environmental, economic, and energy parameters) of solutions for the building envelope.
- The integration of environmental LCA in the Energy Certification of buildings.
- LCA of buildings at the urban scale.

Research is carried out through ongoing national and international projects and involves several PhD theses. Thus, it is intended with this collaboration to start a joint work that extends the scope of the analytical and experimental results in each case, improving the methodologies used and discussing the results achieved.

Through mutual visits of researchers, knowledge transfer would be possible. It would improve the work of both teams and enhance capacity building, especially of the young researchers. Regional experience concerning the LCA of construction materials, building thermal modelling, and multi-objective optimization tools could also be shared.

The proposed collaboration will also aim to increase high-quality scientific production in the context of joint international work through joint publications (Figure 1). This collaboration is expected to strengthen the relationship between research teams and develop ideas for future joint projects, possibly on a larger scale and with other funding sources.

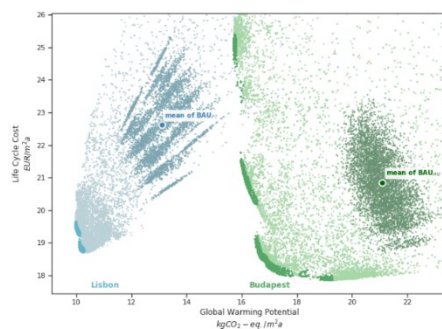


Figure 1. Results of the optimization and the Business as usual (BAU) cases in the Hungarian and Portuguese contexts (Pareto front and near-optimal solutions depicted by saturated colours).

### Project Reference

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### Leading Institution

IST-ID – Associação do Instituto Superior Técnico para a Investigação e Desenvolvimento (Portugal)

### Partners

BME – Budapest University of Technology and Economics (Hungary)

### CERIS Principal Investigator

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### CERIS Research Team

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### Funding

FCT – Fundação para a Ciência e a Tecnologia (Programme for Cooperation in Science between Portugal and Hungary)

### Period

2019-2022

### Total

9 326.00€

### CERIS

4 000.00€

### Project Website

<https://arquivo.pt/wayback/20230310104521/https://former.fct.pt/apoios/cooptrans/hungria/index.phtml>