

ATTITUDE TOWARDS LCA IN HUNGARY AND CZECHIA – RESULTS OF A SURVEY AMONG BUILDING DESIGN PROFESSIONALS

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ABSTRACT. Architects and designers have a critical role in promoting Life Cycle Assessment (LCA), a scientific methodology for evaluating the environmental impacts of buildings that can help decarbonise the built environment and minimise other negative effects.

This paper presents the results of an international survey conducted among design professionals as part of the IEA Annex 72 project about assessing life cycle related environmental impacts caused by buildings. Twenty-three countries were participating in the survey altogether, but in this paper, only the specific situation in two Central European countries, Hungary and Czechia, are presented. The questionnaire explored the designers' understanding of environmental problems and LCA methodology, the drivers and barriers of environmental assessment and the future perspectives.

The results show that many architects and designers are concerned about environmental problems and the built environment's contribution but have a limited understanding of the applicable scientific methods. A full LCA is seldomly applied as neither regulations nor clients demand it, and only the operational energy is mandatorily assessed. Further improvements in data quality and assessment tools and regulatory and other drivers are needed to increase the use of LCA in the construction sector.

KEYWORDS: Survey, life cycle assessment, building design, architecture.

1. INTRODUCTION

Decarbonisation of buildings plays a key role in reaching net zero emission levels by 2050, a global challenge to minimize the effects of climate change [1]. It is well known that buildings are responsible for about 35–40% of energy use and greenhouse gas emissions [2]. This can be divided into the operation of buildings (28%) and impacts of the construction industry (11%) [2], which shows the significance of material usage. Life Cycle Assessment (LCA) is a scientific methodology for the evaluation of the environmental impacts of products, which is increasingly applied to buildings, both in scientific research and in practice. However, the widespread application is still hindered by several factors, for example a consistent methodology and a lack of incentives.

IEA EBC Annex 72 is an international research project focusing on the assessment of life cycle related environmental impacts of buildings [3]. The project aims at establishing common methodology guidelines for the environmental assessment of buildings. In the framework of this project, a large survey was conducted across the world to explore the attitudes of designers towards the use of LCA, as well as the motivations and barriers. This paper presents the results of the survey focusing on two Eastern European countries: Hungary and Czechia.

2. METHODOLOGY

The paper presents the results of a large international survey with a focus on the findings for Hungary and Czechia, two countries in Eastern Europe with similar historical and economic background. In these countries, LCA is still mostly applied in academic research and there is an emerging number of projects pursuing green certification rating and conducting LCA in connection to this. There is no open national database available.

The original survey was compiled and carried out in the framework of the IEA EBC Annex 72, Subtask 1 that focuses on LCA methodology development and harmonization. The goal of the survey was to get an overview on the attitude, practices and perceived barriers of building designers in LCA and also on some related areas, for example Building Information Modelling (BIM) applications. The survey was prepared by a coordinating group in Annex 72 with the inputs of the whole Annex group as a web-based questionnaire and translated into many national languages. The survey was then distributed all over the world by the Annex 72 experts in their respective countries in 2019. The full survey with the list of questions and evaluation will be published in an Annex 72 publication (in progress). Findings of the general survey and the results for Germany and for Northern Europe can

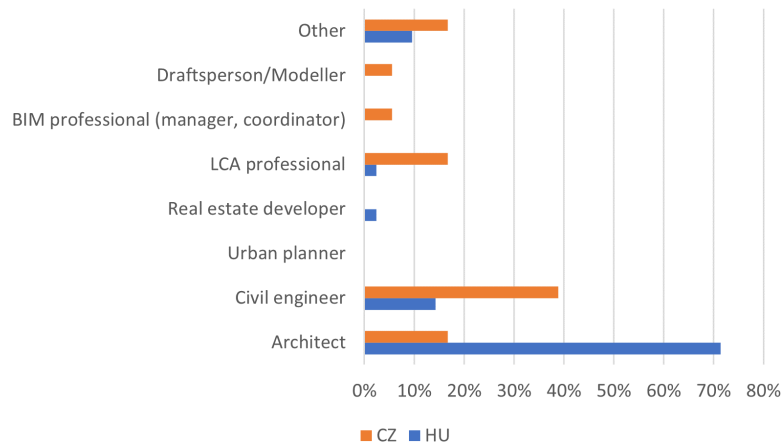


FIGURE 1. Occupation of respondents (based on 42 (HU) + 18 (CZ) = 60 responses).

be found in [4–6].

In Hungary, the survey was distributed via social media and national organizations, such as the Hungarian Chamber of Architects and the Hungarian Green Building Council. Altogether 83 respondents (61 + 22) filled the questionnaire in Hungary and Czechia. The respondents had the option to fill in a full or a short version and it was also possible to skip any question or to quit the survey at any time. This resulted in a different number of answers for each question. This paper presents a selection of the data, focusing on the attitude of designers towards LCA, motivations for using it, perceived barriers and further development needs.

3. SURVEY RESULTS

3.1. BACKGROUND OF RESPONDENTS

Figure 1 shows the professional occupation of the respondents. In Hungary, the majority were architects and civil engineers (86 % in total) and 10 % other (environmental consultant, construction experts), while in Czechia also a high share of the responses came from civil engineers and architects (56 %), but also LCA and BIM professionals were represented.

The respondents are experienced people, with 26 % of more than 20 years and only 5 % of less than 2 years of professional experience (Figure 2). Regarding the size of the organisation, the majority (64 %) belong to small offices with 1–9 employees (Figure 3).

Figure 4 illustrates the familiarity with environmental LCA as declared by the respondents. Nearly half of the respondents have some basic knowledge and about a third a good knowledge, while a quarter of them is not familiar with the subject. According to our opinion, these results show that people open to environmental assessment were overrepresented in this survey, as it is probable that this survey was more attractive to people who are interested in environmental issues. Hence, the survey is not representative for Eastern European designers, and the results are valid only to this pool of respondents.

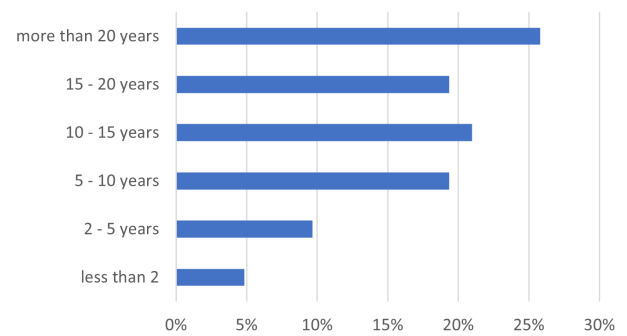


FIGURE 2. Work experience of respondents (based on 62 responses).

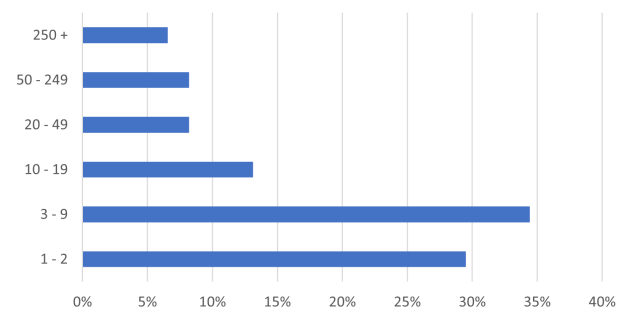


FIGURE 3. Number of employees in the organisation of the respondents (based on 61 responses).

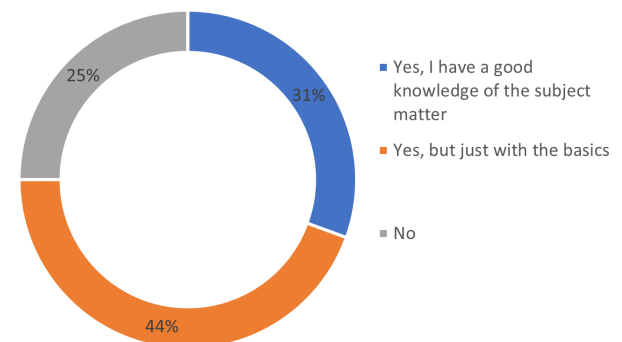


FIGURE 4. Responses to the question: Are you familiar with environmental LCA of construction products and buildings? (based on 72 responses).

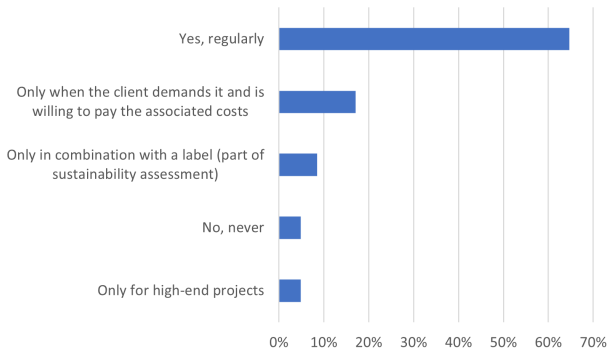


FIGURE 5. Responses to the question: Do you consider requirements and assessment results of environmental performance in your design decisions? (based on 82 responses).

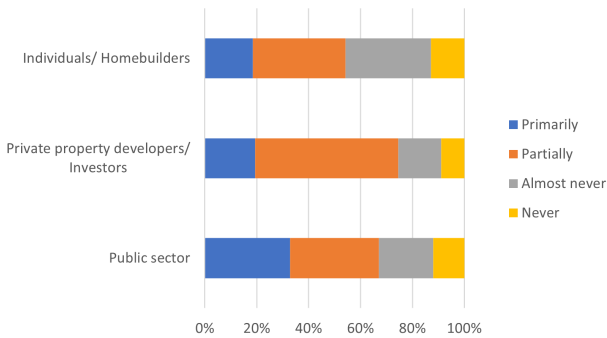


FIGURE 6. Type of clients that demand services with regard to environmental performance (based on 67 responses) .

3.2. MOTIVATIONS FOR USING ENVIRONMENTAL ASSESSMENT AND LCA

Environmental requirements and assessment results are regularly taken into account by the majority of the respondents, while in some cases only if the client demands it and pays for it (Figure 5). The ratio of projects is still low where a sustainability assessment scheme requires this. Please note that these questions refer to environmental assessment in general and not specifically to LCA.

Figure 6 illustrates the type of clients demanding services related to environmental performance. Private investors and the public sector seem to drive the demand by primarily or partially requiring environmental assessments (67–74%), while the demand from individual homebuilders is weaker (54%).

Figure 7 shows that motivations for using environmental assessment are different in Czechia and Hungary: in Hungary more than half of the responses consider this out of personal conviction or as a core business value while in Czechia these drivers are also important but the reasons are more diverse. An important factor is the client in both countries, while cost or competitive advantage were mentioned less often. In these countries, building regulations today only refer to energy efficiency. Environmental assessment is not required by the law and its introduction is not expected in the near future, which is mirrored

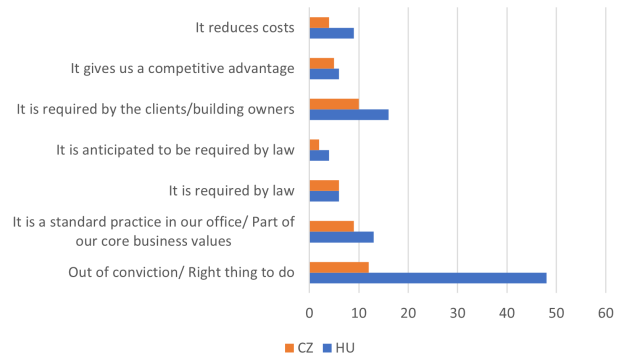


FIGURE 7. Motivation for considering environmental performance assessment results in the design decisions (based on 74 respondents, more than one answer could be selected).

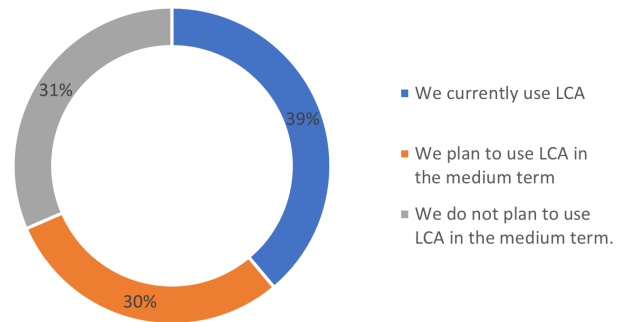


FIGURE 8. Responses to the question: How would you describe your organisation’s (future) use of LCA? (based on 54 responses).

in the low number of replies in these categories.

As seen from Figure 8, 39% of the respondents already use LCA in their practice, 30% plan to use it in the medium term, while 31% do not plan its application. There was a large difference between the two countries, as 76% of the Czech respondents already use the method, while only 22% of the Hungarians. Please note that this question applies specifically to the method of LCA, so the scope was narrower than in the previous questions which referred to any type of environmental performance assessment.

3.3. BARRIERS AND FURTHER DEVELOPMENT

The perceived barriers of environmental performance assessments are illustrated in Figure 9. The largest obstacle is the lack of incentives from both clients and regulations. The respondents think that the lack of information/data and time also hinders the spread of these assessments. Additionally, the lack of in-house or external expertise and training are important factors. These results are similar to the findings in the Nordic countries where the lack of drivers and information were named the two main barriers [6].

One possibility to increase the uptake of environmental assessments is to introduce legal requirements related to environmental performance assessment. Most of the respondents of the questionnaire think that life cycle related carbon footprint and de-

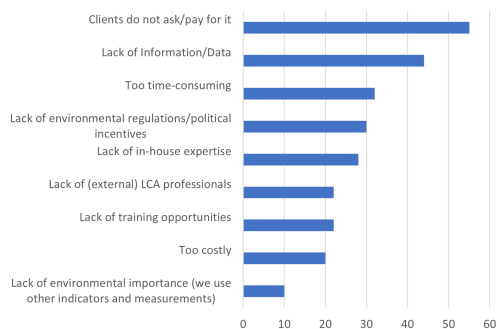


FIGURE 9. Perceived barriers of environmental performance assessments (based on 72 respondents, more than one answer could be selected).

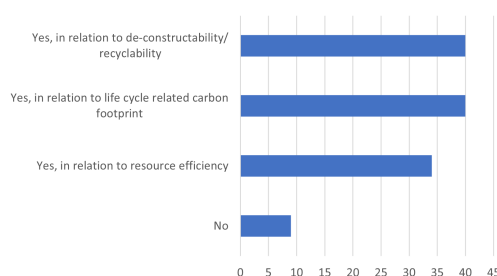


FIGURE 10. Responses to the question: From your point of view, should life cycle-related requirements in the area of environmental performance be defined/introduced into building codes and laws in future, if not already the case? (based on 61 respondents, more than one answer could be selected).

constructability/recyclability requirements should be defined in building codes and laws and many also support resource efficiency-related requirements (Figure 10). A high number of respondents voted for the introduction of all three of these requirement types, while only 15% think that there is no need for regulations in this field. Other incentives would also be possible to reward the use of environmental assessments and increase client demand.

Harmonization of environmental assessment methods and LCA would be important for a more widespread use of these methods. Also, communication of results should suit the audience. According to Figure 11, clients need user-friendly and straightforward communication forms, such as a label, a few important indicators or one single indicator. On the other hand, many designers prefer a comprehensive list of indicators. A label is also accepted by many of them but showing only one single indicator is not sufficient for most of them. Designers have an important role to interpret detailed information into more simplified formats.

Digitalization is a big challenge in the building industry that will transform both the design and construction of buildings. Building Information Modelling (BIM) is increasingly used for different applications. The results of the survey show that deriving the bill of quantities is already used or planned by many designers (Figure 12). Only a small fraction use BIM

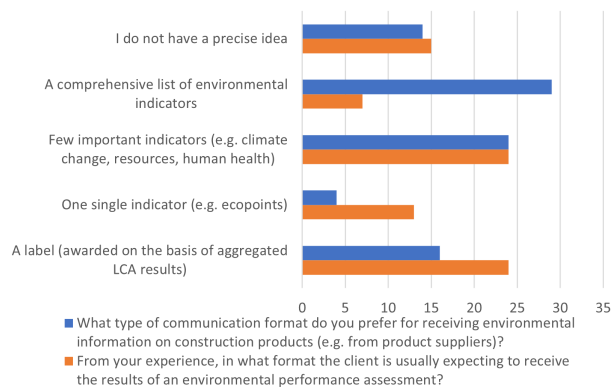


FIGURE 11. Preferred communication format of designers (blue – based on 62 respondents, more than one answer could be selected) and clients (red – based on 61 respondents, more than one answer could be selected).

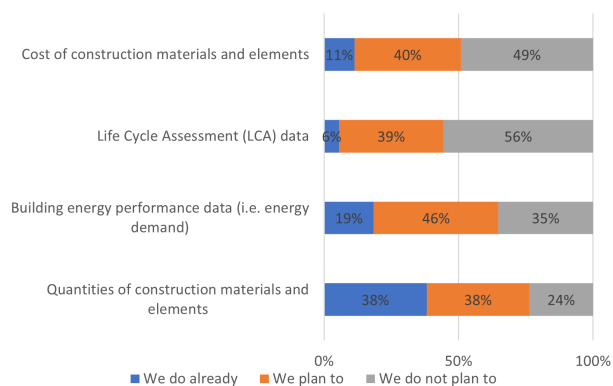


FIGURE 12. Responses to the question: Do you use BIM model's capability to integrate information on the following aspects? (based on 55 responses).

for LCA and for cost calculations today, but about 40% plan to integrate these in their workflow in the future.

4. CONCLUSIONS

This paper presented the results of an international survey on the environmental performance assessment of buildings, carried out in the framework of the IEA EBC Annex 72 project with a focus on Hungary and Czechia. Although the 83 respondents who accessed the survey were not representative for building professionals in these two countries, some general conclusions could be drawn regarding the current use and future potential of environmental assessment methods and LCA, as well as about the barriers hindering the widespread application.

Most of the respondents already had some knowledge in environmental performance methods and LCA and many of them regularly apply these methods in their projects, or plan to do it in the future. Most important driver today is the personal conviction of designers about the importance of environmental issues, while the client demand is still low and there is a lack of legal incentives. These factors represent the

largest barriers. The majority of respondents think that requirements on life cycle related carbon footprint and end-of-life should be introduced in building codes.

Widespread use of environmental assessment could be triggered by further harmonization of methods and BIM integration of LCA. This would facilitate the use of these methods in early design stages.

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REFERENCES

- [1] UN Environment, International Energy Agency. *Towards a zero-emission, efficient, and resilient buildings and construction sector. Global Status Report 2017*. 2017. ISBN 978-92-807-3686-1. https://www.worldgbc.org/sites/default/files/UNEP%20188_GABC_en%20%28web%29.pdf
- [2] IPCC. *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2021. 2391 p. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_FullReport.pdf
- [3] R. Frischknecht, H. Birgisdóttir, C.-U. Chae, et al. IEA EBC Annex 72 - Assessing life cycle related environmental impacts caused by buildings – targets and tasks. *IOP Conference Series: Earth and Environmental Science* **323**(1):012042, 2019. <https://doi.org/10.1088/1755-1315/323/1/012042>
- [4] M. Balouktsi, T. Lützkendorf, M. Röck, et al. Survey results on acceptance and use of Life Cycle Assessment among designers in world regions: IEA EBC Annex 72. *IOP Conference Series: Earth and Environmental Science* **588**(3):032023, 2020. <https://doi.org/10.1088/1755-1315/588/3/032023>
- [5] T. Lützkendorf, M. Balouktsi. The level of knowledge, use and acceptance of LCA among designers in Germany: A contribution to IEA EBC Annex 72. *IOP Conference Series: Earth and Environmental Science* **588**(4):042046, 2020. <https://doi.org/10.1088/1755-1315/588/4/042046>
- [6] F. N. Rasmussen, T. Malmqvist, H. Birgisdóttir. Drivers, barriers and development needs for LCA in the Nordic building sector – a survey among professionals. *IOP Conference Series: Earth and Environmental Science* **588**(3):032022, 2020. <https://doi.org/10.1088/1755-1315/588/3/032022>