Popular Science Summary

The ability to combine Building Information Modelling (BIM) with Building Energy Modelling (BEM) is extremely important, and it increases the efficiency of the actors in the Architecture, Energy and Construction Industry. Studies have shown that integrating BIM with BEM in the early design phase can significantly reduce the costs of design changes in the later phases and improve performance for the building. The most essential factors to consider when selecting a building energy performance simulation tool are the accuracy of the tool, the quality of the output, the ease of use and level of detail, sensitivity during energy analysis, speed of learning and use.

A comparison of three building energy performance simulation (BEPS) tools has been conducted: Revit, IDA ICE, and ClimateStudio. Energy simulations were carried out using the tools to estimate annual and monthly heating and cooling demand, on the buildings selected for the project. The energy simulations were majorly based on individual inputs using a systematic method and a combination of the inputs.

The results show that the combining BIM with BEM is achievable in Revit, however, the provision of more custom inputs in the energy settings such as flexible HVAC inputs, an operational schedule, a detailed schedule for internal loads would produce a more accurate outputs when compared with the state-of-the-art BEPS tools. It is also possible to use IDA ICE to combine BIM and BEM but errors on import of the BIM file and the complexity of its inputs make the process challenging. In terms of ease of use, speed of use, and quality of output, ClimateStudio was shown to be the best option, however, it has limited HVAC systems and does not facilitate the combination of BIM with BEM as the buildings had to be remodeled which was time consuming and not a good option in the cases of several revisions to the building design.