Popular Science Summary
Energy performance and Climate impact assessment of different prefabricated façade systems

The study assessed the energy performance and climate impact of three prefabricated façade panels, with the goal to provide more information that could be useful in the decision-making process. The three prefabricated façade panels, which were available on the market, were aluminium frame panel, concrete sandwich panel and wooden frame panel. The approach in this study consisted of five distinctive steps: the study began by establishing the physical and thermal requirements of the panel, as both properties would determine the amount of material in each pane. Then, the initial thermal transmittance of each panel would be calculated to create a relatively comparable energy performance between each panel. Then in the third step, the additional heat losses in the panel and where the panel connects to the main structure would be evaluated in the thermal bridge assessment. The result of this would be used to calculate the average thermal transmittance of the panel. The fourth step, happening simultaneously as the third, was to make a Life Cycle Assessment (LCA) of each panel and its supporting structure. While the fifth step included a comparative study of thermal bridge assessment and LCA with different main structural materials, joints and EPDs.

The results of the study suggested that the wooden frame panel system had the lowest average thermal transmittance, followed by a slightly higher value from the aluminium frame panel, and then a concrete sandwich with the highest value among the three. The lower thermal transmittance indicates better energy performance. Whereas in the LCA, the concrete panel and its supporting material were found to have the lowest greenhouse gas (GHG) emissions among the three, followed by the wooden frame panel with slightly higher emissions, and then the aluminium frame panel with the highest value. Though it was explainable that the wooden frame panel had higher GHG emissions because of its main structural materials, which were steel and concrete. The study illustrated an important point that the choice of material has an impact not only on the energy performance but also on the climate impact of the building. The comparative study eventually demonstrated that while the choice of façade material was important, the choice of structural material was also crucial to the energy use and GHG emissions of the building.