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LightBudget: Carbon budget and daylight in the design of climatic building envelopes

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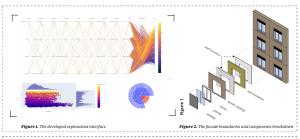






The Light Budget project aims to explore design strategies and construction techniques that deliver the best balance between daylight autonomy and whole life carbon emissions and stay aligned with the netzero pathway. To that end, we proposed a multi-disciplinary method and an online graphical interface prototype to generate, explore and analyse an extensive database of +290,000 design alternatives for the typical single- and multi-family houses in Switzerland. Furthermore, the carbon budgets for façade components, in line with Swiss climate strategy, are set using our database. These budgets provide a detailed benchmark for decisionmaking long before initiating the design phase. We further highlighted the rank of the construction methods based on their daylight benefits and carbon emissions and accordingly, as of 2040, it is increasingly challenging to create well-daylit spaces that also meet carbon budgets. The project outputs were shared with top Swiss design and engineering firms and HEIA-FR civil and mechanical engineering students. Additionally, our findings were published in a prestigious international conference and a leading scientific

journal, confirming their validity.



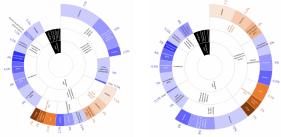


Figure 3. The carbon budget at components scale for single-family houses (right) and multi-family houses (left) based on analysis of *290,000 design alternatives for each archetype