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# EVALUATING FUTURE EMBODIED AND OPERATIONAL CARBON EMISSIONS OF THE NEW BUILDING STOCK IN SPAIN

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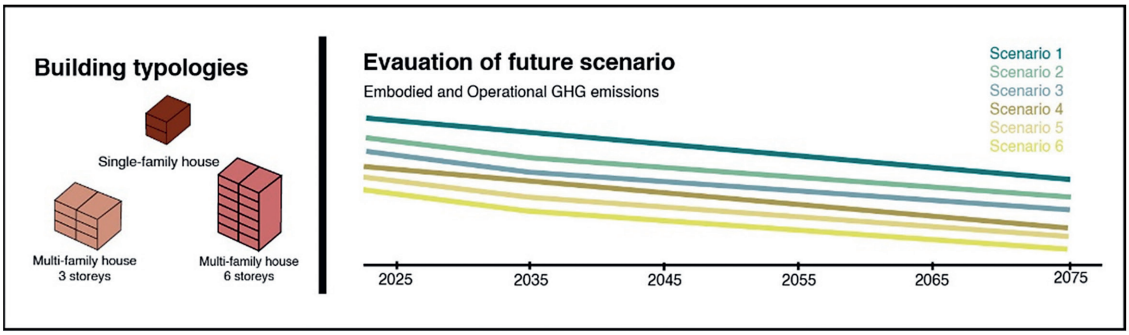
***Abstact*** – Given the urgent need to reduce $CO_2$ emissions from buildings and to anticipate future growth trends and their associated carbon footprint, this study explores potential future scenarios for new residential construction in Spain, with a specific focus on embodied and operational carbon emissions across the building life cycle. The research assesses how different development pathways could support the decarbonization of the building sector while accounting for environmental impacts and long-term sustainability goals. To achieve this, six different future scenarios have been developed using mathematical forecasting models, including linear regression, as well as official data on growing trends. These scenarios are subsequently assessed through a prospective Life Cycle Assessment (LCA), including modules A1–A5, B2, B4, B6, and C1–C4, to quantify their potential contribution to carbon-emission reduction. A Building Information Modelling (BIM)-based workflow is applied to estimate the environmental impact of new residential buildings, integrating official data on existing building typologies, geometric characteristics, and conventional materials and construction systems used in Span. The results identify scenarios that most effectively reduce both embodied and operational carbon emissions, underscoring the critical role of the development pathways and future trends in determining decarbonisation effectiveness. The study provides insights to support policymakers, planners, and industry stakeholders in defining evidence-based strategies for the decarbonization of residential construction in Spain.

***Keywords – Building Information Modelling; construction materials; decarbonisation; future scenarios; prospective Life Cycle Assessment; residential buildings; Spain***




DECIDE framework for evaluating 6 future scenarios for residential buildings in Spain

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