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A comparative analysis of embodied carbon in high-rise buildings regarding different design parameters

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11 **ABSTRACT:** The building sector accounts for one third of the global greenhouse gas emissions,
12 of which a substantial amount is embodied carbon from construction material production. While
13 previous studies concentrated on analyzing the carbon emissions of low-rise buildings, they have
14 overlooked high-rise buildings, which also have large impacts on the carbon emissions of a city.
15 Moreover, high-rise buildings use different construction materials and structural forms, resulting
16 in large variability in their embodied carbon estimates. Therefore, this study aims to evaluate the
17 relationships between different design parameters and the embodied carbon in high-rise
18 buildings. The results serve as a basis for making more environmentally-sustainable decisions
19 when designing high-rise buildings in order to reduce the carbon emissions from the building
20 sector. Different high-rise buildings are designed by varying the construction materials (namely
21 reinforced concrete, structural steel and composite materials), recycled contents (steel scrap and
22 cement substitutes), structural forms (i.e., core-frame, core-outrigger, tube-in-tube and mega-
23 brace) and building heights. The embodied carbon values are evaluated and compared, by
24 considering the carbon emissions from material manufacture and transportation. Given the same

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