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Implementing vertical gardens in educational buildings to reduce energy consumption and achieve low carbon emissions

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Abstract. Nowadays, the change of climate has been a crucial problem for architects to address since buildings consume more than half of the energy that results in carbon dioxide emissions that contribute to climate change. Vertical gardens have been proven in studies to be capable of significantly offsetting carbon dioxide emissions from building. in addition to passively cooling and insulating the structure As a result, the energy required for building operation is lowered in what appears to be a butterfly effect. The bulk of non-residential buildings in Egypt have been built without regard for energy efficiency regulations in recent years. As a result, mismatched designs are frequently responsible for environmental problems. Energy usage is influenced by building design (form, orientation, and building materials), as well as operational and space utilization factors. Because non-residential buildings are among the most carbon-intensive structures, greening current structures to achieve zero-carbon status is far more efficient than greening new ones. This study investigates if adding vertical gardens in Cairo buildings might serve as a passive cooling load reduction approach. This is accomplished by calculating the building energy required for cooling load, carbon dioxide emissions from cooling load, cooling load reduction made by vertical gardens, and CO2 sequestered by vertical gardens, with the goal of providing a guide that quantifies the vertical gardens system's efficiency to minimize energy usage and carbon dioxide emissions. Through simulation, it was found that living walls with mentha and spicata could reduce as much as 6200 watts and offset 5204kg of carbon dioxide emission.

Keywords. Climate Change, Urban Heat Island, Vertical Green System, Energy Efficiency, Low Carbon, Carbon Sequestration, Educational Buildings.