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Incorporating Circular Economy into Passive Design Strategies in Tropical Nigeria

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Abstract : The natural environment is in need for an urgent rescue due to dilapidation and recession of resources. Passive design strategies have proven to be one of the effective ways to reduce CO₂ emissions and to improve building performance. On the other hand, there is a huge drop in material availability due to poor recycling culture. Consequently, building waste pose environmental hazard due to unrecycled building materials from construction and deconstruction. Buildings are seen to be material banks for a circular economy, therefore incorporating circular economy into passive housing will not only safe guide the climate but also improve resource efficiency. The study focuses on incorporating a circular economy in passive design strategies for an affordable energy and resource efficient residential building in Nigeria. Carbon dioxide (CO₂) concentration is still on the increase as buildings are responsible for a significant amount of this emission globally. Therefore, prompt measures need to be taken to combat the effect of global warming and associated threats. Nigeria is rapidly growing in human population, resources on the other hand have receded greatly, and there is an abrupt need for recycling even in the built environment. It is necessary that Nigeria responds to these challenges effectively and efficiently considering building resource and energy. Passive design strategies were assessed using simulations to obtain qualitative and quantitative data which were inferred to case studies as it relates to the Nigeria climate. Building materials were analysed using the ReSOLVE model in order to explore possible recycling phase. This provided relevant information and strategies to illustrate the possibility of circular economy in passive buildings. The study offers an alternative approach, as it is the general principle for the reworking of an economy on ecological lines in passive housing and by closing material loops in circular economy.

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