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TITLE OF PROJECT: **REVIVE AND THRIVE: TRANSFORMING THE PAST INTO A SUSTAINABLE FUTURE DEVELOPMENT OF GREEN, SMART AND SUSTAINABLE BUILDINGS**

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ABSTRACT:
Retrofitting, a term commonly associated with enhancing the longevity of existing and deteriorating buildings, proves crucial as building energy consumption accounts for approximately 30% of total annual primary energy consumption in developed countries. Conversely, in developing nations like India, this figure escalates to 37-40%, revealing inefficiencies in the existing building stock. With the challenges posed by urbanization and population growth, the urgent need arises to upgrade structures, aligning them with evolving spatial needs while minimizing environmental impact. This paper delves into the sustainable renovation and transformation of deteriorating residential structures aged over 30 years and is being experimented in NIT Trichy, with a primary focus on improving energy efficiency.

In this study, a calibrated simulation approach utilizing Ansys is employed to achieve the objective of sustainable renovation. The methodology incorporates Building Energy Management Systems (BEMS) and artificial intelligence (AI) models, specifically Artificial Neural Networks (ANN). AI is harnessed for predicting occupancy patterns, conducting life cycle cost analysis with Revit, enhancing material selection processes, and optimizing lighting systems. This integrated approach ensures a comprehensive strategy for energy-efficient retrofitting.

Based on the current findings, the retrofitting aging buildings with sustainable measures can significantly reduce energy consumption by 25% and a 20% reduction in carbon emission is estimated. A payback period of approximately 5 years for the retrofitting investments based on life cycle cost analysis is expected. The results underscore the potential to transform deteriorating structures into energy-efficient assets, offering a promising solution to urbanization challenges. Recommendations stemming from these findings advocate for the widespread adoption of sustainable retrofitting practices and advanced BEMS technologies, aligning with long-term environmental and energy conservation goals.

KEYWORDS: Existing buildings; Retrofitting; Energy efficiency; Artificial Intelligence: Artificial Neural Networks: Sustainable buildings

CATEGORY: Infrastructure and Urban Science