



## The Role of Green Buildings in Reducing Air Pollution: Opportunities and Challenges

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Air pollution is a major global challenge because of its devastating effects on the environment, economy, and human health. Effective air pollution control necessitates the implementation of a comprehensive array of strategies and interventions. After policymakers evaluate the effectiveness of these measures, these policies can help choose a more efficient and effective approach<sup>1</sup>. According to World Health Organization (WHO) estimates, every minute, approximately 13 lives are lost globally as a result of air pollution exposure<sup>2</sup>. This phenomenon is generally divided into outdoor (ambient) and indoor air pollution<sup>3</sup>. Indoor air pollution means the presence of pollutants that are hazardous to human health in the air of confined spaces. Individuals spend most of their lives indoors; therefore, the impacts of exposure to internal pollutants should be inspected. Internal air pollution has two sources: outside air pollution emissions and inner activities<sup>4</sup>. Indoor pollutant levels depend on outdoor pollutant concentrations, outside aerology, inner ventilation, percolation rates, and personal actions in buildings<sup>5</sup>. Buildings

are the biggest contributor to carbon emissions. Buildings are also responsible for 40% of global energy consumption<sup>6</sup>. Over the past decade, five major studies have addressed the issue of reducing environmental pollution via the usage of green systems<sup>7</sup>. Green constructions is a concept proposed to decrease the environmental burden of constructions. Green constructions have financial cost larger than common constructions because of their low carbon release, energy storing, and maximum commercial profit throughout their life period<sup>8</sup>. Green buildings are often defined as permanent buildings<sup>9</sup>. Studies have shown that using lower carbon materials in green buildings can reduce greenhouse gas emissions over the life period of construction by up to 30%<sup>10</sup>. Using renewable energy technology, green buildings can generate their own heat and electricity, thereby increasing their energy security and independence<sup>11</sup>. Green roofs and walls are emerging in eco-friendly architecture because of their many benefits, such as reducing the urban heat island effect, increasing thermal insulation, and improving air quality. Low-VOC paints, recycled

materials, pastes, and sustainably sourced wood are examples of sustainable building materials that can decrease a building's environmental effect and

increase inner air attribute<sup>12</sup>. A conceptual schematic of green buildings is presented in Figure 1.



**Figure 1.** Conceptual schematic of a green building.

Between 2000 and 2016, energy costs worldwide were reduced by approximately \$7.5 billion with the help of green buildings, which also brought about \$5.8 billion in co-benefits in the fields of climate and health for the United States, Brazil, China, Germany, India, and Turkey<sup>13</sup>. Green construction can effectively decrease the exposure of occupants to harmful substances and toxic gases<sup>14</sup>. However, there are many dares to implementing green construction. Among the economic challenges is high investment costs. Furthermore, the use of green construction requires a collective effort from all participants and stakeholders to fully understand the laws and regulations related to green buildings.<sup>15, 16</sup> In addition, even though governments have relatively complete support policies, the industry and the public remain skeptical because they believe it has not delivered what it promised<sup>17</sup>. Overall, it can be concluded that although the application of green buildings have multiple dares, But the benefits of this approach include the high potential for reducing energy consumption and the greenhouse effect (as a global challenge).<sup>16</sup>

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