

## The Future of Urban Green Architecture

In recent decades, rapid urbanisation has accelerated at an unprecedented pace: according to the United Nations, nearly 68% of the world's population is expected to live in cities by 2050, compared with just 55% in 2018. As populations grow and land becomes increasingly scarce, architects and urban planners are searching for new ways to incorporate nature into dense metropolitan environments. One emerging solution is urban green architecture, a design movement that integrates vegetation directly into buildings through vertical gardens, rooftop forests, and eco-friendly construction materials.

The concept first gained widespread attention in the early 21st century, particularly after environmental scientists reported that urban temperatures had risen by 1.5°C on average in major cities since the 1990s. Green architecture was proposed not merely as an aesthetic enhancement but as a practical response to these environmental challenges. Vertical gardens, for example, have been shown to reduce heat absorption on building surfaces by up to 30%, lowering energy consumption for cooling. Similarly, rooftop forests can act as natural carbon sinks, absorbing an estimated 5–10 kilograms of CO<sub>2</sub> per square metre annually, while also improving stormwater absorption by up to 60%, thereby decreasing flood risks in heavily paved cities.

Despite its potential, the widespread adoption of green architecture faces significant obstacles. One major challenge is cost. Installing and maintaining living walls or rooftop ecosystems can be 20–40% more expensive than traditional building methods. Plants require regular irrigation, specialised soil mixtures, and climate-sensitive maintenance systems. In regions with extreme temperatures or limited rainfall, sustaining such vegetation can become technically complex and economically burdensome. As a result, many developers remain hesitant to invest in these systems without government subsidies or long-term financial incentives.

Another concern is the uncertain long-term effectiveness of certain green technologies. Although numerous pilot projects—more than 150 in Europe alone—have demonstrated promising environmental benefits, researchers argue that more data is needed to assess durability and performance over decades. Some critics also contend that the emphasis on eye-catching green façades may distract from more impactful environmental reforms, such as reducing car dependency or improving energy efficiency in public transport systems, which could lower emissions by up to 40%.

Nevertheless, the momentum behind urban green architecture continues to grow. Cities such as Singapore, Milan, and Toronto have already implemented large-scale green building regulations, requiring new developments to include at least 10–20% vegetation coverage. Supporters believe that as technology improves and maintenance systems become more efficient, costs will gradually decrease. If these predictions hold true, green architecture may soon shift from an experimental concept to a fundamental element of sustainable urban planning.