# Vertical Gardens - The Living Green Walls

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Vertical Gardening is a special kind of urban gardening suitable for small spaces, particularly for decorating walls and roofs in various styles. This is an alternative method for gardening by expanding the scope of growing plants in a vertical space. Vertical gardens have been around since 1938 when Stanley Hart White, a professor at the University of Illinois, developed the idea and created a patent for it. Forty years later, a French botanist named Patrick Blanc gave life to the idea of the modern green wall, specifically with a hydroponics irrigation system. Today, you can see green walls anywhere, from offices and cafes to shopping centers and hospitals.



Plants Suitable for Vertical Garden

Plant selection should be based on local climatic conditions. Plants should have compact growth habit which is likely to provide thick and dense cover. Plants with short growth habits should have shallow fibrous root systems and long-life cycles. Plants should be capable of coping with full sun or full shade according to the location.

The most commonly used plants in vertical gardens are Green Facades: *Hedera helix, Parthenocissus spp, Hydrangea petiolaris, Polygonum bauldschianicum, and Lonicera spp. Clematis spp. Aristolochia spp. Jasminum officinale, Passiflora caerulea, etc.* 

Living Wall: Dracaena, Phalaenopsis spp, Asparagus sprengeri, Kalanchoe, Cordyline spp. Chlorophytum spp., Haworthia spp., Tradescantia sp, Fittonia spp, Nephrolepsis, Clematis, Gardenia spp., Asplenium nidus, Maranta spp., Cotoneaster, Euonymus fortune, Hedera, Hydrangea, Lonicera, Parthenocissus, Polygonum, Pyracantha, Selaginella, Wisteria, Rose, Petunia, Nasturtiums, Daisies, Bromeliadsand even some vegetables like tomato, chillies, cucumber, peas lettuce, etc.

**Exterior Wall**: Lavendula, Thymus, Rosmarinus, or Salvia for full sunlight while Begonia, Arum, Davallia, Asplenium, and Fuchsia for shady locations.

**Interior Wall**: Philodendron, Epipremnum, Aeschynanthus, Columnea, Saintpaulia, Begonia, or different ferns like Nephrolepis, Pterisandmany species of Peperomia. (Ritu Jain., 2023)



Cocopeat, Perlite, Sphagnum moss, vermiculite, vermicompost, shredded bark, and leaf molds are the common growing media combinations used.

# Features of a vertical garden:

In vertical gardening, use structures or columnar trees to create garden rooms or define hidden spaces ready for discovery. Trellises, attached to the ground or to large containers, allow you to grow vines, flowers, and even vegetables in vertical garden pots using much less space than traditional gardening requires.

# Benefits of vertical gardening:

# 1. Improve your physical and mental health

Plants counteract respiratory diseases and improve cardiovascular problems by producing oxygen and purifying the air which reduces issues like breathing problems and blood pressure.

# 2. Improved space

A vertical garden is definitely a unique way to have your own urban garden or to arrange plants, and



it also acts as a decorative element that brings a touch of nature to your spaces.

#### 3. Improvement of air quality

The plants in a vertical garden filter particles from the air and convert carbon dioxide into oxygen. One square meter of plant space will generate the equivalent of a year's supply of oxygen for a human and trap 130g of dust.

#### 4. Insulate your building

Vertical gardens also act as thermal insulators, this green solution lowers the temperature inside a building by up to five degrees, which means that less air conditioning is required, therefore saving energy.

#### 5. Reduce noise pollution

Plants in vertical gardens are capable of absorbing up to 50% of the noise generated in a large city.

#### 6. Increasing amount of green space in the cities

The speed of construction is increasing due to the urban population. Urban green spaces that offer recreational facilities for the people in urban areas are decreasing day by day.

# 7. Adding aesthetic and economic value to the structures

In our daily lives, we spend most of our time in areas built with gray walls is quite far from the aesthetic concept. People's living spaces are increasingly graying, with a reduction of available green areas in the cities. Vertical garden systems are involved in the aesthetic value of the landscape to which they apply.

The general advantages of vertical gardens are:

- ✓ Growing plants up, not out, in beds with a small footprint
- ✓ Less soil preparation and digging from day 1
- ✓ More plant variety and much less space
- Many opportunities to create bottom-up and top-down plantings
- ✓ Less weeding

- ✓ Space saving containers
- ✓ Improved air circulation
- ✓ Easier harvest
- ✓ Large yields in compact space
- ✓ Increased aesthetic appearance

# Maintenance frequency and difficulty

Vertical gardens require regular maintenance. Maintenance frequency depends on the type of vertical garden, climatic conditions, and plant varieties. So maintenance is generally related to plant diversity and irrigation systems. But if there is a damaged carrier panel or isolation material they must be changed. As with all landscaping work the plants which convenient to environmental conditions must be used. However, if there is still damaged or dead plant they must be altered. Also, maintenance work is required for the irrigation systems not to be affected by frost during the winter months. It also should be realized that the addition of plant food materials and regular pruning work for the desired effect.

Expensive elements of the work that will be applied on a vertical surface are more than on a horizontal surface.

Expensive elements in the vertical garden are as follows:

- 1. Carrier profile
- 2. Isolation material
- 3. Drainage system
- 4. Plant growth media
- 5. Plant species
- 6. Routine maintenance costs

From an article given by Davis et al. (2017), Up to 44% of EU residents are exposed to noise levels that are detrimental to health. In this context, vertical gardens could play an important role in architectural acoustics, where the main absorber material is the substrate soil. Plants have a beneficial effect for higher frequencies when planted in a large density.

The objective was to ascertain and explain the random incidence sound absorption coefficient of



vertical garden modules. 50 modules making up a total floor area of 10.125 m<sup>2</sup> were used for the measurements. Six different configurations were measured: connected versus dispersed and directly on the floor versus with an air cavity of 5 and 10 cm.



Furthermore, each configuration was tested with modules solely filled with substrate and with substrate-filled modules with densely planted ferns. The weighted random incidence sound absorption coefficient of the modules densely planted with ferns equals 1.00. This applied to all different configurations tested. The sound absorption coefficient in the lower frequencies (100–315 Hz), mid frequencies (400–1250 Hz), and high frequencies (1600–5000 Hz) was 0.59–0.80, 1.00 and 1.00 respectively. This makes this type of building technology highly suitable for applications where sound needs to be attenuated, paving the way for applying vertical garden systems as a design tool for improving the acoustics of indoor spaces or urban squares.

Major areas where we can see vertical gardens are:

- 1. Airports
- 2. Railway stations
- 3. Hospitals
- 4. Educational institutions
- 5. Offices

Hyderabad has the maximum number of vertical gardens in India. The initiative was taken up in an attempt to control pollution and add aesthetic value to the city. Hyderabad took care of the green wall by pre-installing а drip irrigation system. Beautify flyovers in the city with paintings and vertical gardens on pillars. Vertical gardens can be seen at flyovers located at various places in Hyderabad. More such gardens are likely to come up at other flyovers including the biodiversity flyover, Chandrayangutta flyover, and Kothaguda flyover.

Recently, Hyderabad won 'World Green City Award 2022' at the International Association of Horticulture Producers (AIPH) World Green City Awards 2022 held in Jeju, South Korea. The city won the award defeating popular cities likely Paris, Mexico City, Montreal, Fortaleza, and Bogota.

The innovative concept of vertical gardens was launched on either side of the main entrance of Tirumala temple on 2<sup>nd</sup> June 2016. The 30 lakh rupee project was initiated by the Hyderabad-based Harsha bio farm, free of cost to TTD for a period of one year. Later on, the firm trained the garden staff of TTD on planting techniques and maintenance. Meanwhile, over-foliated plants have been planted in 2500 pots with automatic drip watering facility. Whenever the plant needs water, the drip automatically wets the plants.



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