

Vertical Gardening: A New Concept for Modern Era

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Introduction:

The lack of vegetation in urbanized areas, as result of human establishments, directly affects the quality of life, from physical and aesthetic point of view. The construction of vertical gardens is recommended both in interiors and especially in the exterior of buildings. By applying these technologies, any kind of area can be used at its maximum capacity, obtaining esthetic valences, benefic for environment and human health. Even if the price of constructing and maintaining the vertical gardens is higher than a classical landscape it's compensated by the environmental benefits, raising the vegetation surfaces, with impact for reducing the pollution effect. The new modern concepts for landscape development are keen on using any kind of concrete or glass, turning them in real vertical gardens, being possible to overcome the development of the urban areas making a smooth transition for a healthy green urban environment. Vertical Gardening is a special kind of urban gardening suitable to small spaces, particularly for decorating the walls and roofs in various styles. This is an alternative method for gardening by expanding the scope of growing plants in a vertical space. Intensive urbanization has left hardly any horizontal space for outdoor gardens. Green walls are not only spectacularly beautiful, but also helpful in enlivening the ambiance. Green walls can absorb heated gas in the air, lower both indoor and outdoor temperature, providing a healthier indoor air quality as well as a more beautiful space. In Switzerland, the idea of vertical nursery was first created. It was not regular in India, however now-a-days because of shortage of room it has been embraced in metro urban communities of the country. This is really a unique sort of nursery made with assistance of vertical structures and plants are developed in extraordinary way.

Classification of Vertical Gardens:

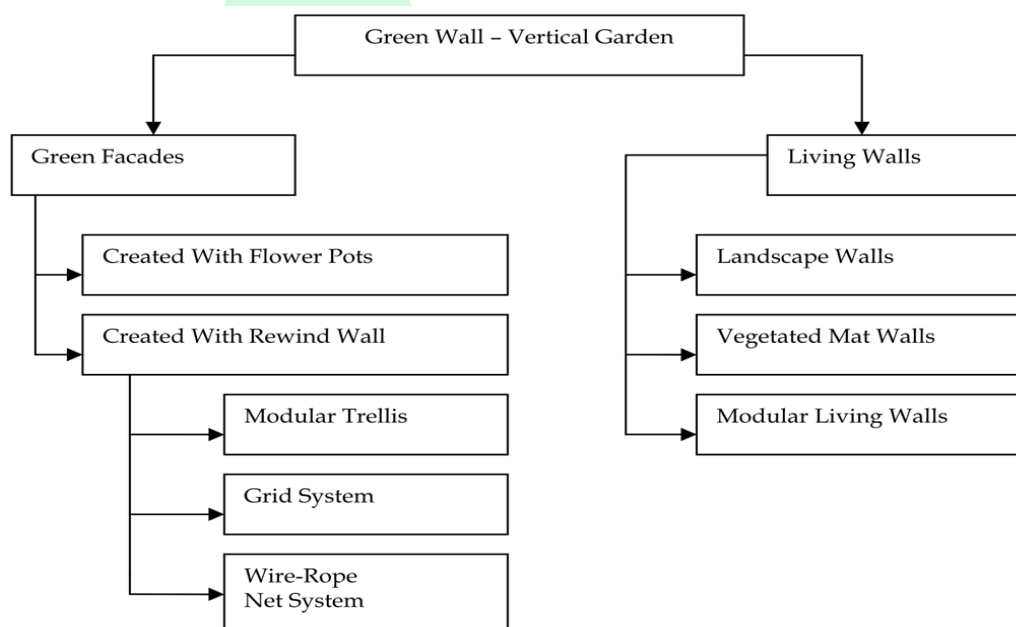
There are two main categories of green walls:

1. Container/trellis system

Generally known as Green façades, allude to vines and climbers that develop starting from the ground or from large containers at different areas around the structure upheld either by the divider itself or by a supporting trellis/mesh.

2. Modular panel system

Regularly known as living wall, the board framework made out of pre planted boards, vertical modules that hold developing media to help plants that are fixed vertically to a basic divider or edge.



Planning for the Vertical Garden:

Arranging incorporates appropriate area, nearby atmosphere, accessibility of plant material, set up of supporting structures including vital arrangements for coordinated trickle tube water system. A vertical garden can be fabricated for all intents and purposes in any area and key to progress is the choice of the correct species for the correct area.

Preparation of Vertical garden:

Step-1: Choose a wall

In the event that you have a wall that is appalling, that is the one you are going to need to do it a vertical garden. Fortunately practically any wall will do and except if we need to manufacture an enormous vertical garden or plant trees, no compelling reason to stress

over weight load as it relies on the plants we pick and furthermore the how much daylight the wall gets.

Step-2: Build a frame

Building a frame to hang on the wall means taking it down will be much easier and we can use ¾ -inch PVC pipe, elbows and four –way joints to build a frame.

Step-3: Attach plastic sheet

Attach plastic sheet to the frame. The plastic act as a backing for the fabric layer, plus keeps the water off the wall.

Step-4: Attach a fabric

This is the material in which plants will live and which will hold water for them. It needs at least 2 layers of fabric attached directly to the frame with galvanized screws and stainless -steel staples as we stretching canvas across a frame.

Step-5: Irrigation system

To keep the plants growing on vertical surface, it needs an irrigation system that can provide moisture throughout the fabric layer.

Step-6: Add fertilizer injector and attach irrigation system to water source

To fertilize wall, attach a fertilizer injector with a simple irrigation valve that sends liquid fertilizers into the irrigation system then hook up the irrigation system and connect an irrigation water filter, which is cheap and available at most hardware stores.

Step-7: Choose the plants

The plants which grow upto 2-3 feet from the wall should be choosen. If building a detachable wall and planting it with evergreen, we could try storing it in a cool, dry place for the winter while the plants are dormant.

Step-8: Insert plants

To insert plants into the outer layer of fabric use a razor blade to make a horizontal cut in the material. Get as much soil off the plant's root ball as possible and insert it into a cut. Using staple guns, insert 3-5 stainless steel staples to attach the cloth to the plastic backing in a semicircle around the root ball, creating a secure envelope.

Benefits of vertical gardens:

There are various benefits of vertical gardens which include:

1. Public benefits

2. Private benefits

3. Design specific benefits

1. Public Benefits:

- **Aesthetic Improvements:** Green walls can reclaim barren space by providing aesthetic stimulation where it would not otherwise be found. They can also serve to create privacy and a sense of enclosure while limiting the negative psychological effects associated with property demarcation.
- **Reduction of the Urban Heat Island Effect:** The re-introduction of vegetation into urban environments promotes the occurrence of natural cooling processes, such as photosynthesis and evapo-transpiration. With strategic placement of green walls, plants can create enough turbulence to break vertical airflow, which slows and cools down the air.
- **Improved Exterior Air Quality:** Green walls mitigate air pollution levels by lowering extreme summer temperatures through photosynthesis, trapping particulate matter, and capturing gases.
- **Local Job Creation:** Green walls draw upon several disciplines for their design, installation and maintenance - such as landscape architects, architects, irrigation consultants, and more. Demand for a local supply of plant materials, blended growing media and fabrication of structural frames creates further business activity.

2. Private Benefits:

- **Improved Energy Efficiency:** Green walls can reduce the temperature fluctuations at a wall's surface from a range of 10-60°C (50-140°F) to one of 5-30°C (41-86°F), in turn limiting the movement of heat between building walls.
- **Building Structure Protection:** Temperature fluctuations over a building's lifetime can be damaging to organic construction materials in building facades. Green walls provide an additional layer of exterior insulation and thereby limit thermal fluctuations.
- **Improved Indoor Air Quality:** Most North Americans spend 80-90% of their time indoors and as a result are highly influenced by the effectiveness of interior air circulation systems. Air that has been circulated throughout a building with a



strategically placed green wall will be cleaner than that on an uncovered building. The presence of vegetation indoors will have the same effect.

- These processes remove airborne pollutants such as toluene, ethyl benzene, xylene, and other volatile organic compounds.
- **Noise Reduction:** The vegetated surface provided by strategic urban greenery such as green walls and roofs will block high frequency sounds, and when constructed with a substrate or growing medium support can also block low-frequency noises
- **Marketing Potential:** Green buildings products, and services now possess a competitive edge in the marketplace. Green walls are an easily identifiable symbol of the green building movement since they are visible and directly impact the amount of green space in urban centers.

3. Design Specific Benefits

- **Increased Biodiversity:** Green walls can help mitigate loss of biodiversity due to the effects of urbanization; help sustain a variety of plants, pollinators and invertebrates.
- **Improved Health and Well-Being:** Buildings that feature and promote access to vegetation have been documented as having a greater positive human health impact than those without.
- **Urban Agriculture:** Green walls offer the opportunity for urban agriculture, such as vertical gardens of small fruits, vegetables, and herbs.

Other Benefits of Green Wall Includes

- ✓ Reducing internal room temperature by 5 to 10 degrees in summer.
- ✓ More plants with in limited space.
- ✓ Helps in saving water.
- ✓ Helps in hiding less attractive portions of landscape.
- ✓ Provides excellent air circulation for the plants.
- ✓ Can provide privacy and a disguise from unattractive views.

Plants Suitable for Vertical Garden:

Plant selection should be based on location and climatic conditions. Plants should have compact growth habit which is likely to provide thick and dense cover. Plants with short growth habit should have shallow fibrous root system, long life cycle. Plants should be

capable to cope with full sun or full shade according to the location. Most commonly used plants in vertical garden are

- **Green Façades:** *Hedera helix*, *Parthenocissus* spp., *Hydrangea petiolaris*, *Lonicera* spp., *Clematis* spp., *Aristolochia* spp., *Jasminum officinale*, *Passiflora caerulea*, etc.
- **Living Wall:** *Dracaena*, *Phalaenopsis* spp., *Asparagus sprengeri*, *Kalanchoe*, *Cordylins* spp., *Chlorophytum* spp., *Haworthia* spp., *Tradescantia* spp., *Fittonia* spp., *Nephrolepis*, *Clematis*, *Gardenia* spp., *Asplenium nidus*, *Maranta* spp., *Cotoneaster*, *Euonymus fortunei*, *Hedera*, *Hydrangea*, *Lonicera*, *Parthenocissus*, *Polygonum*, *Pyracantha*, *Selaginella*, *Wisteria*, *Rose*, *Petunia*, *Nasturtium* and even some vegetables like tomato, chilli, cucumber, peas and lettuce etc.
- **Exterior Wall:** *Lavendula*, *Thymus*, *Salvia* for full sunlight and *Begonia*, *Arum*, *Davallia*, *Asplenium*, and *Fuchsia* for shady locations.
- **Interior Wall:** *Philodendron*, *Epipremnum*, *Aeschynanthus*, *Columnnea*, *Saintpaulia*, *Begonia* and different ferns like *Nephrolepis*, *Pteris* and many species of *Peperomia*.