

# VERTICAL GARDENS AS AN ADAPTATION STRATEGY FOR URBAN AREAS: A REVIEW

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### Abstract

The constant intensification of urbanized areas resulting in microclimate deterioration, high expansion and air pollution and dust pollution levels, as well as noise provoking a response and a rise in urban greenery, is currently observed. In this context, the subject of green walls also known as vertical gardens subscribes to the notion of sustainable design and its growing popularity manifests the unbreakable bond between man and nature. One cannot overestimate the importance of green wall technology, which provides architects with new ecological elevation material, offering an unlimited number of textures and color effects, changing according to the time of the day and season, and sometimes unpredictable even for the designer himself. Vertical gardening in urbanization area provide ecosystem services in urban areas, including improved storm-water management, better regulation of building temperatures, reduced urban heat-island effects, and increased urban wildlife habitat. This article reviews the evidence for these benefits and examines the interior and exterior space that contributes to overall ecosystem services.

**Keywords:** vertical garden, green wall, façade, sustainable design, nature, human-being

### WHAT IS VERTICAL GARDEN

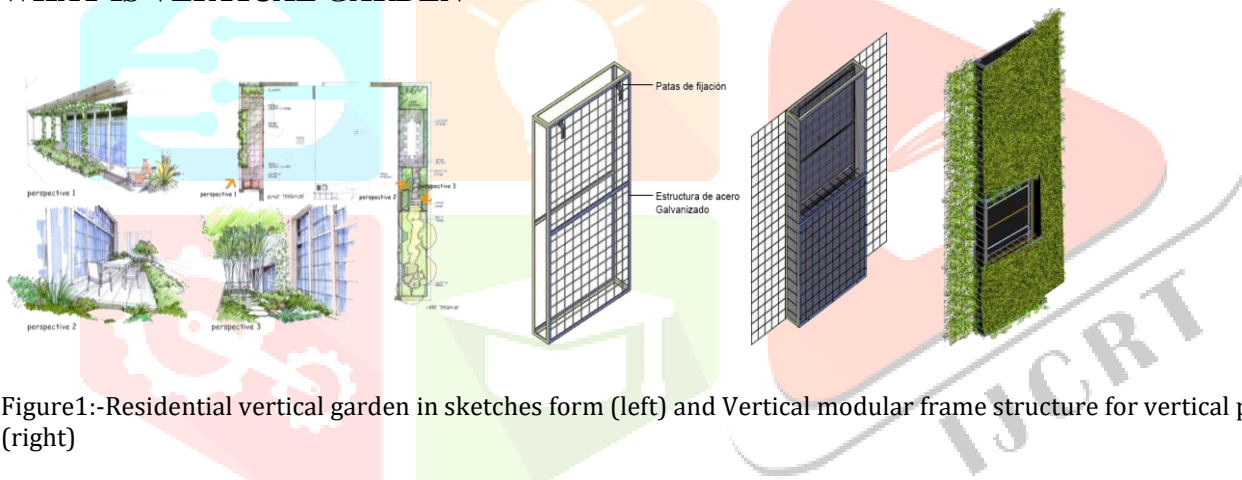


Figure1:-Residential vertical garden in sketches form (left) and Vertical modular frame structure for vertical plantation (right)

Now a days we all are talking about green and clean environment and this green is related to building facade, livingwall, and vertical freestanding structure. Here we understand about vertical green garden which is very widely spread all over the world turns to good symbol of sustainable life. Vertical Garden is also called green wall, living wall, green garden which is totally and partially filled with vegetation. Including vegetation also filled with some of the soil medium, which depend on the types of plant and shrubs that we use in any vertical frame. Most Green walls also features as integrated water system. It is useful to distinguish green walls from Green Facades. We improve green wall function by understanding the interactions between its ecosystem elements, especially the relationships among growing media, soil biota, and vegetation, and also use of freestanding frame and building facade. Further things into green wall maintaining should assess the efficacy of green garden compared to other maintenance with similar ends, and ultimately focus on estimates of aggregate benefits at landscape scales.

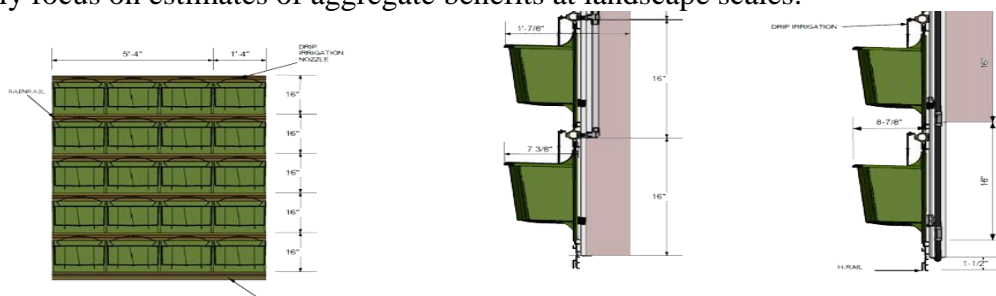


Figure2:-Fixing of Loose Media Buckets on Vertical Structure.

Vertical grading are the use of vertical stand space to grow flower, vegetable, fruits, herbs etc. vertical garden cover less space, easy to harvest, easy to install, Easy to maintain, however the vertical gardens have some limitations which it has to follow. Vertical gardens need proper wall space in sunny path. The support structure should have enough stability, rigid and strong. The structure should be at such height so that it could be maintained by the other party. The supporting structure design according to the need of green vegetation Proper soil nutrition is needed for growing garden.



Figure3:- Building cover with vertical landscaping from top to bottom.



Figure4:- Building elevation facade cover with vertical landscaping and gardening.

Green wall and green façade will installed because some of the major things they are as follows-they provide captivating aesthetic look to any of the building wall, they can apply except north façade, according to the need, they can engender cooler and small area range microclimate which is spread attached to the building facade surrounding to the building. They can also provide shade to the building. Such way many other useful benefits are attach or make a path of good example of vertical gardens, which help deciduous species throughout the year.

Green wall or vertical garden is the term used to refer to all forms of vegetated wall surfaces that includes a growing medium, such as soil. Most Green walls also work as integrated water system for vegetation. Vertical Garden gives fresh air and creating good Environment. They are easy to install, it includes less space in horizontal area and large space in veridical area. Live plants decrease stress levels, create peaceful ambiance. Reduces CO2 levels and increases oxygen and improved air quality. Conserves water and watering takes less effort covers up views of plain or ugly walls.

Vertical Gardens lends them to use of green material. They are planted to standing frame or hanging pots. They may be planted in such an unusual pots as recycled plastics and etc. But it can take a lots of time and hard work. After that this vertical garden looks perfect and beautiful. The vertical Garden are just one aspect of urban reconciliation ecology.

Vertical garden is not only for building aesthetic, but also provides a sustainable, energy saving, comfortable and healthy environment for building occupant. It is rooted into the ground, on the wall or in modular panels attached to the façades. It is also called a system to attach plants to civil engineering structures and walls of buildings or vertical greened façades are walls that are either partially or completely covered with vegetation, and they have exuberant green looks.

## BENEFITS OF VERTICAL GARDENING

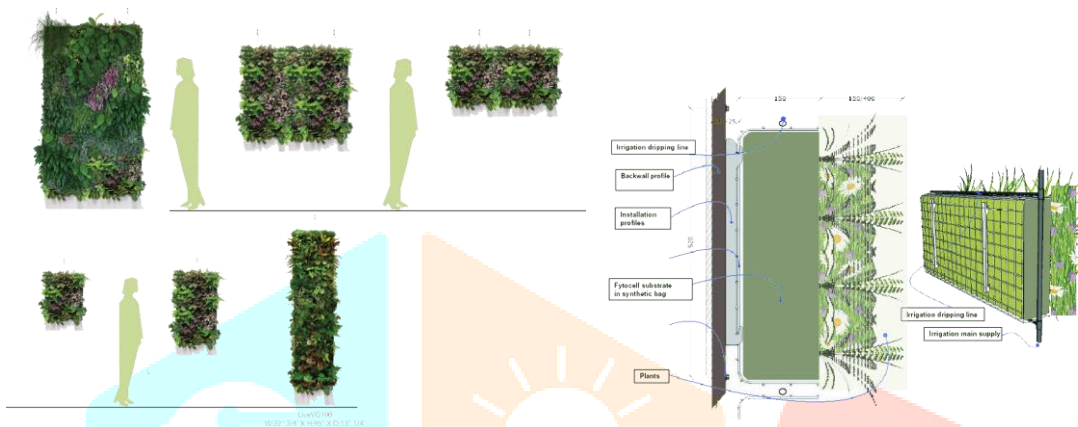


Figure5:- Vertical gardening through in different level with standardized of human figure. (left) and Section of standing wall facade filled with vegetation with details (right).

## AESTHETICS OPEN SPACE AND URBAN FOOD PRODUCTION.

The living style of urban cities dependent on the availability of green open space, green façade, which can increment and provide opportunity, recreation or cognition point. Continuously magnification of urban area the contribution of green, façade, vertical green area to overall green space should not be underestimated. In inner area of cities most of filled by buildings and buildings infrastructure that has opportunities for green landscape façade, which is profoundly inhibited green wall and vertical wall can be utilized for multilevel greenery design that connect with ground level green space.

## CLEANING THE AIR

Green roofs, walls and facades can contribute to the abstraction of gaseous pollutants from the air, although their efficacy varies with plant species and area of cover. Plants with a high foliage density or with textured leaf surfaces that trap diminutive particles additionally avail in abstracting particulate pollution, through dry deposition on the foliage or through rain-wash. On a more sizably voluminous scale, green roofs, walls and facades can avail to reduce overall environmental heat gain (re-radiation of heat from building materials with high thermal mass), in turn ameliorating air quality as less photochemical pollutants are engendered at lower air temperatures.

Pollutants; inclusion of vegetation, such as a green wall, can avail to ameliorate the air quality of the indoor environment.

- Reduce urban heat island effect
- Promotes natural cooling and ventilation process
- Effective temperature in urban areas
- Improved exterior efficiency
- Improve indoor air quality
- Noise reduction
- Beauty abounds and adds visual drama
- Live plants decrease stress levels, create peaceful ambiance
- It reduces CO<sub>2</sub> levels and also increases the level of oxygen and improved air quality

## SELECTION OF PLANTS

It is important to select any plant in very right way. Study first each and every detail before to grow plant. Selection of plant is depends upon the certain criteria, which we have to fulfill according to the different types of structure in vertical stands. It also depends that where to plant, At what distances plant, what kind of structure is adopt to plant, etc. now here comes the part of vegetation, some of the plant need to climb on vertical facade, some of the plant need to grow in soil medium on top layer of earth surface, some of plant are behave to creeper part, some of plant need to grow on pot, bottle, tube, any hanging pot, most of the climbing plant attach themselves to a surface or structure. These all above type of plant have different strategies to grow and cover the vertical gardens. Some of the common plant are, India Basil, Aloe vera, sage, spider plant, Fern, Pothos, jade plant, Fenugreek, Heartleaf, croton etc.

**Self-Climbing:-** some of the climber is a form of self-supporting vegetation layer on the solid wall or surface.

**Twinning and tendrils:-** These are attachment by twing stems or by modified leaf, stem organs. These climbers require to specialized support system and can product both upward and cascading stems. Twining climber need a support system such as cables or trellis or net to support growth the plant. These support may be attach to the building or any mounted. Here in this case plant selection need to consider the available space for plant growth as the distance between the wall and the support structure.

Other group of climbing plant has a special characteristic scambing habit, which is called scandent shrubs, also plant These shrubs have no any attachment and need mean to be tied and managed on to the surface which itself support. They are strong, healthy and woody in their growth habitat, which makes difficulties to be sustained on a structure without pruning and maintained, (for example Bougainvillea). Self climbing plant create totally green façade which is effective and long terms cover through the season, but many are not be comfort for same building where the surface fabric is in poor repair. However this is rarely seen become of the foliage cover. For example heder helix should avoided and need to be regular pruning, and also necessary to maintain sustainable plant growth, form, size.

**IRRIGATION AND PLANT NUTRITION:-**

## CONCLUSION

Vertical garden is all about indoor and outdoor upwards and up stands design, which is, grow in vertical straight surfaces. It can applicable on wall of any kind of building.

Vertical garden help to cool the environment .It give fresh air and aesthetic look also insulate the building too and reduce the cost of air conditioning. Growing plant in the Building can help to filter air particle and help to control air quality as well as some level of humidity. It also helps to save water by reducing the need for irrigation and watering.

Here we understand about vertical green garden which is very widely spread all over the world which is very good symbol of sustainable life. Today, with the rapid growth of industrial cities, where fifty percent of the world`s population dwell, plants can provide better air quality, in the meantime sustaining the wellbeing of the environments, human health and the psychological aspect.

## ACKNOWLEDGEMENT

I would like to thanks some of the author which I mention on the reference section for their useful and valuable ideas and discussion on the Environmental topic of vertical garden, green façade, and green wall garden on building concept, benefit to the society where including the vertical garden method and technology.

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