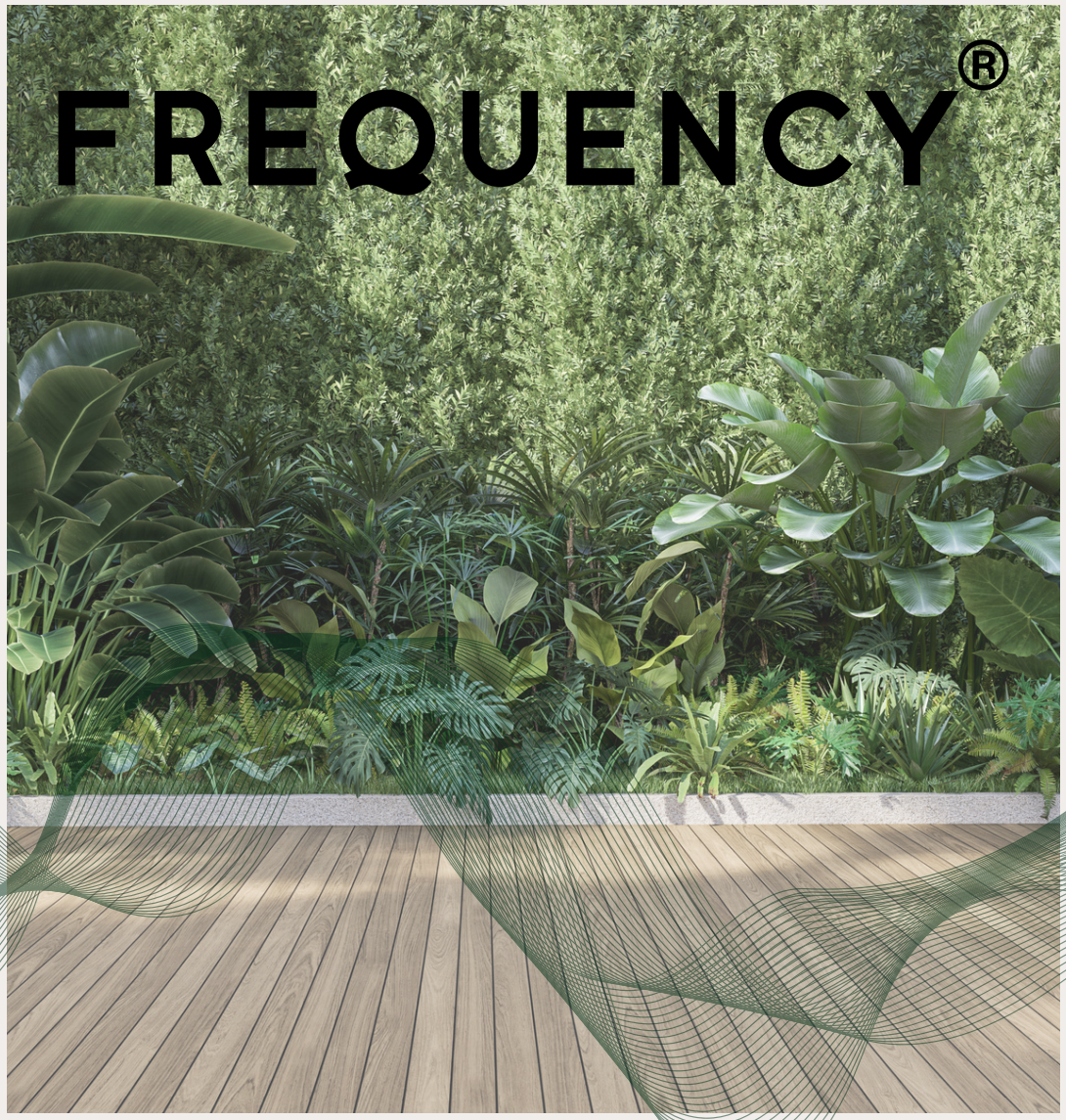


Deep Dive:
Green Walls

Academic Insights

Green walls, the high-tech solution to maximizing the benefits of indoor plants while minimizing maintenance requirements, are paving the way for more natural indoor spaces. Given lifestyle trends that drive people increasingly indoors (the average American spends 90% of their time indoors), green wall providers seek to close the gap between our inherent desire to spend time in nature and the realities of modern life.

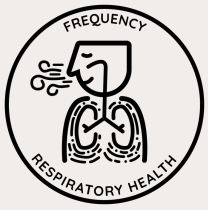
These providers often seek to restore more than just the aesthetic absence of nature. Using technology like intelligent biofilters, humidity-regulation, and AI-driven ventilation, green walls can maximize the biological impact of the plants they house from focus and cognition to lung and heart health.

For this reason, the mission of the green wall and some of the leading companies behind them is layered. These companies aren't just trying to create attractive and beneficial products; they're creating the technological building blocks to bring nature, in its fullest form, indoors.

Findings and Impact by Badge

Cognitive

- The presence of indoor plants can significantly benefit academic achievement.
- Office workers scored higher on performance measures when working in “green” environments with low indoor pollutants and low carbon dioxide levels.
- Meta-analysis shows that people report greater concentration, productivity, and performance in indoor spaces with plants.

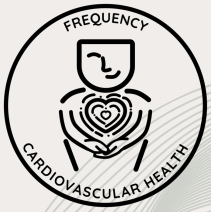


Respiratory

- NASA funded research successfully showing the impact of certain indoor plant arrangements on respiratory health by cleansing the air and regulating both oxygen & humidity.
- Combining a botanical biofilter with ventilation can reduce levels of CO2, TVOCs, HCHO, PM2.5, and PM10 by 76%, 87%, 75%, 52%, and 51%, respectively.

Emotional Sustainability

- Studies demonstrate that people perceive spaces to be more comfortable and associated with more positive emotions (friendliness, kindness, happiness, cheerfulness, calmness, peacefulness, pleasantness, relaxation, and warmth) and reduce negative feelings when plants are present in a room.
- The experience of plant-filtered air and the appearance of nature in an indoor space promotes emotional balance by decreasing stress by up to 60%.



Cardiovascular

- The presence of indoor plants is connected to significant improvement in diastolic blood pressure.
- The risk of hospitalization for CVD were 37% lower in those living in areas of highly variable greenness.

Resilience

- People recover from illness faster in the presence of plants.

Testimonies of Trusted Voices

Dr. Gary Soffer, Director of the Integrative Medicine Program and specialist in Pediatric Immunology, explained in an article the observed effects of indoor plants on patients.

“We have science looking at volatile chemicals that plants release that are actually beneficial to the immune system. We see our adrenaline and our cortisol go down, and we see our serotonin and dopamine go up to support us feeling good and healthy. [...] We see improved wellness, we see improved mental health”

Dr. Austin Perlmutter, board-certified internal medicine physician, author and educator, spoke on The Doctor's Farmacy podcast hosted by Dr. Mark Hyman, about stress on the brain and the power of nature in counteracting these effects.

"When you look at these animal models, you see that the neurons in the prefrontal cortex shrivel up when they're exposed to chronic stress. On the other hand, in the amygdala, they expand, you get more dendritic branches, it creates more connection. [...] Being exposed to chronic stress is rewiring brains to favor the types of activities that create chronic stress. [...] We said you can just put a plant in your home and be getting these benefits."

Mengmeng Gu, a horticulturist and researcher at Colorado State University, spoke briefly about the mood-improving effects of indoor plants to The Washington Post.

“Different properties of plants, such as how they look, smell and feel, impact us in so many ways, They can feel good to the touch, make a space more fragrant and please our eyes.[...] it is not only seeing a plant that improves our mood so quickly, but the smells can also make a huge difference."

Green Wall Buyers Guide

Size	Square Footage
Small	21-43
Medium	43-86
Large	86-129

Intelligence
Most companies offer self irrigation and optimized maintenance processes, complete with real-time, cloud-based monitoring systems. Some of them provide AI solutions to measure the health of plants, soil/sediment, and the surrounding environment. Depending on the provider, these data points are used to provide both general intelligence to the owner (like an air quality monitor) and optimized plant care.

Aesthetic
Aesthetics very by plant type, modularity, style of hardware, and the degree of customization involved.

Green walls can be arranged with different types of vegetation depending on location and desired aesthetic, with options depending mostly on the offerings of a particular provider and the limitations of the hardware involved. Modular walls tend to have plant offerings constrained to the limits of a single modular wall, while custom solutions can be more creative and expansive. Conversely, the control of a higher-tech modular wall often allows for more varieties of plants to thrive compared to lower-tech alternatives.

The aesthetics of the hardware behind green walls are quite broad, with different option profiles for modular and custom solutions. Modular solutions tend to be more high-tech and hardware dependent, lending themselves to an aesthetic that unifies and transitions between a sleek mechanical wall and timeless nature. On the other hand, custom solutions tend to be less technical and truer to the concept of a vertical garden, using a variety of media to serve as the “ground” for the wall. These media vary widely, from mat media – using cloth or fibers, sheet media – usually composed of polyurethane, or freestanding media using a diverse array of materials for indoor suitability.

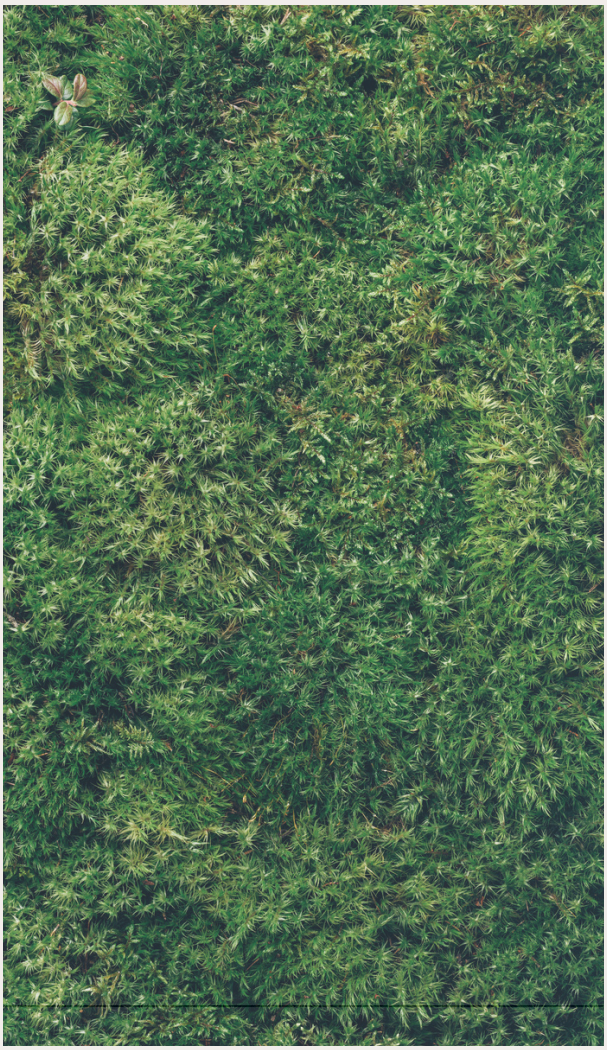
Pricing
Custom green wall pricing ranges from $5,000 to $15,000 or more depending on the desired square footage, automation, and customized care. Modular green walls, on the other hand, are easier to install and more reasonably priced, starting at $2,990 ($1794 with our link). Maintenance costs for modular solutions are quite predictable (~$20/module/month) while custom solutions vary widely in their demands for caretaking and plant replacement.

Installation
Freestanding or modular green walls are easy to assemble and move. Most modular green wall setup processes take 1 to 2 hours, hung like a whiteboard or on free-standing platforms (often on wheels). Some companies also offer installation alongside delivery. Customized green wall installations vary much more broadly and you can reliably expect that installation will be included in the process.

Upkeep
Maintaining the health of green walls is easier than your usual indoor plant. Most options offer self-irrigation, with the only manual work necessary being infrequent refilling of the water tank, usually every 2 to 3 weeks. This not only minimizes watering needs, but can also support monitoring of plant growth so overgrowth is not a concern. Some companies also offer line-in plumbing solutions, negating the need for hands-on intervention entirely. Often, mediums other than soil are used so they don't attract bugs or leave a mess.

Notable Vendors and Products

Product	Size	Installation	Growth Medium	Optimized Environmental Impact	Price
Biome TAIGA	24 X 25 X 4.5	Hangs on the wall like art. Has to be connected to power. Multiple TAIGAs can be connected together, only need to plug in once.	Activated Carbon	Active biofiltration for 200x air purification efficiency, plant probiotics	Starting at $2,990
Naava One	23 x 82 x 11	Free-standing, can be placed against a wall. Needs an electric outlet.	Inorganic Growth Medium	Continuous chemical removal, optimized humidity control	Contact Naava for pricing
Zauben Model Z	92 x 72 x 6	Free-standing, can be placed against a wall. Needs an electric outlet.	Mineral Wool	Air purification	Starting at $7,500
Compact Green LivingWall	102.3 x 31 x 11	Mounted on wheels. Needs an outlet and WiFi connection.	100% recycled felt substrate	-	Contact Compact Green for pricing
Vertical Fields Green Walls	Made to order	Vertical Fields offers installation services.	Soil	Biofilter sensors	Contact Vertical Fields for pricing
Ambius Living Walls	Made to order	Ambius offers installation services. Depending on the specific requirements of the green wall, the process may differ.	Different media, depending on order	Air purification technology, odor management	Contact Ambius for pricing.
LiveWall Indoor Living Wall Systems	Made to order	LiveWall offers installation services. There's also an installation guide available on their website.	Soil	-	Contact LiveWall for pricing
Recover Green Roofs	Made to order	Recover Green Roofs offers installation as well as design.	Soil	-	Contact Recover Green Roofs for pricing
CityGreen Living Walls	Made to order	CityGreen offers installation as well as design.	Textile	-	Contact CityGreen for pricing



Please reach out to research@afrequencyproject.com with any questions, suggestions, concerns or inquiries. Thank you for being a part of our community and your commitment to creating spaces that feel good.

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