Geotextile mats

Geotextile mats are the simplest and most basic living wall system. Typically they consist of a double layer of felt with planting pockets which is nailed to a wooden or plastic board. The pockets may contain a growing medium (semi-hydroponic system) or no growing medium (hydroponic system). The advantages of geotextile mat living walls include their ease of construction, and their comparatively low price. On the other hand, there are a number of disadvantages:

- they need irrigation once an hour during the day, less regularly during the night
- it is diffuclt to give the right dose of nutrients in hydroponic systems
- replacing dead plants is difficult because the roots grow into the fibres of the felt; the individual parts need to be cut out and the empty spaces filled by attaching two new layers of geotextile and planting new plants in between them
- large plants can get heavy and cause the felt to tear
- occasionally fungus and lichens form on the felt with are unattractive and can be odorous

Figure 12: Double felt living wall system
Source: **www.humko.si**

a) Patrick Blanc Mur Végétal system (FR)

This hydroponic system consists of a metal frame supporting a PVC plate, to which are stapled two layers of polyamide felt. These layers mimic cliff-growing mosses and support the roots of the plants. A network of pipes controlled by valves provides a nutrient solution containing the dissolved minerals needed for plant growth. The felt is soaked by capillary action with this nutrient solution, which flows down the wall by gravity. The roots of the plants take up the nutrients they need, and excess water is collected at the bottom of the wall by a gutter, before being re-injected into the network of pipes: the system thus works in a closed circuit. Plants are chosen for their ability to grow in this type of environment and depending on available light [3].

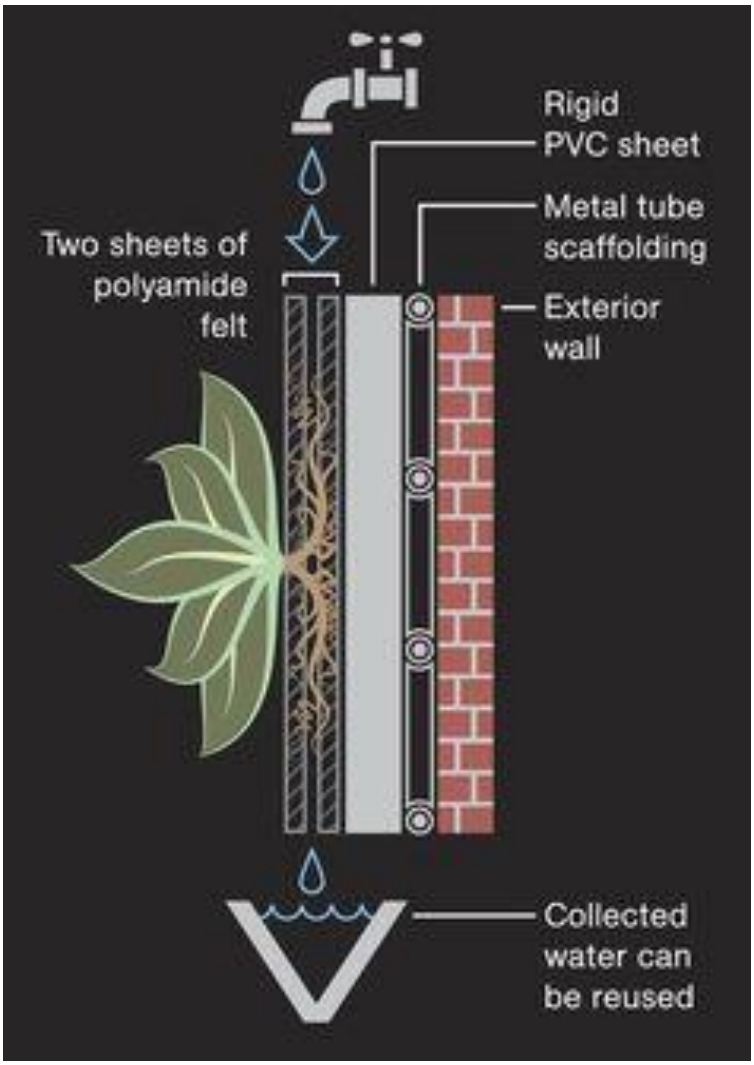

Figure 13: Cross section of the system used by Patrick Blanc
Source: **http://www.verticalgardenpatrickblanc.com/**

Figure 14: Patrick Blanc wall at Commercial Center Victoire, Sainte Geneviève des Bois (FR)
Source: **http://www.verticalgardenpatrickblanc.com/**

b) Terapia Urbana Fytotextile system (ES)

This semi-hydroponic modular panel system is made from a patented geotextile fabric composed of three layers of synthetic and organic material including PVC, Fytotextile and Polyamide. The geotextile panels are fastened with Velcro to facade mounted galvanized steel racks. Each square metre holds up to 49 plants in individual pockets, planted in a growing medium. Panels can be fitted to flat or curved surfaces and are planted on site. Every part of the module is made with recycled materials and is itself recyclable. Each panel incorporates a dripline to irrigate the plants through the fabric. There are two types of irrigation scheme. The closed circuit scheme suits large and very large surfaces (>90 m^2). Excess water is collected in reservoirs, treated, and then used to irrigate the wall again. For small and medium walls (up to 85-90 m^2), excess water drains to a gutter underneath the system. Irrigation frequency is regulated by a timer. Irrigation and fertigation with liquid fertilisers are carried out simultaneously [4]. The patented system has been installed at sites in the UK, Holland, Belgium, Spain and the Middle East by Scotscape [5].

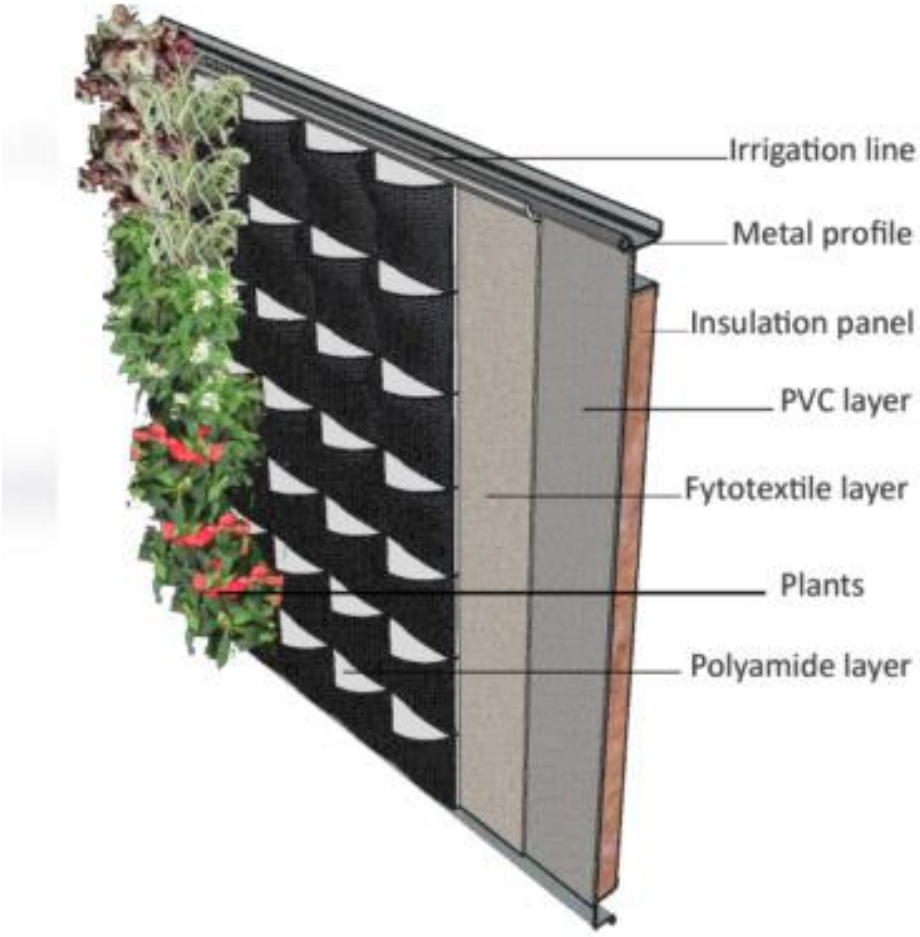

Figure 15: Cross section of the Terapia Urbana Fytotextile system
Source: **https://www.scotscape.net**

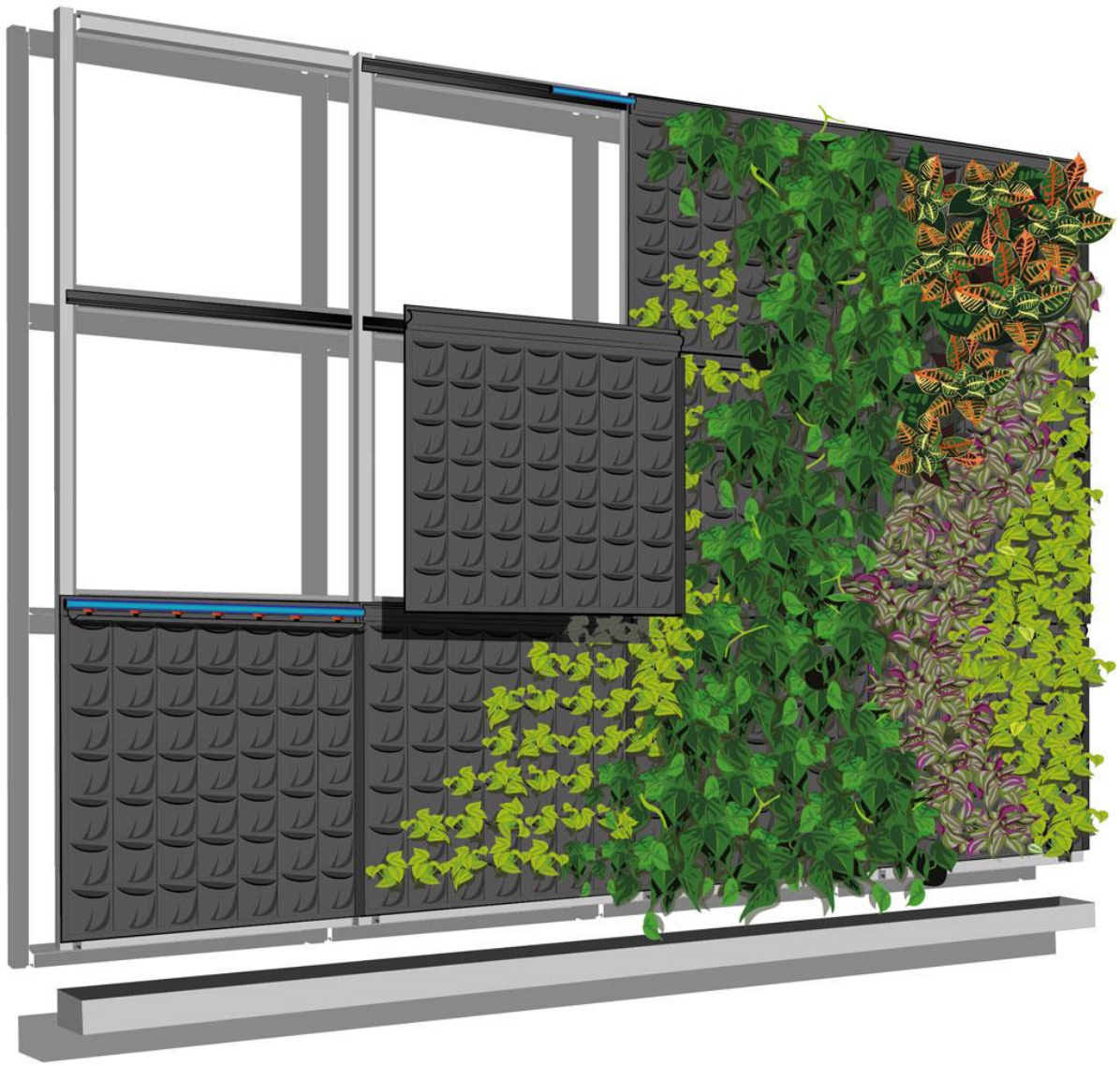

Figure 16: Modular assembly of the Terapia Urbana Fytotextile system
Source: **https://www.terapiaurbana.es/wp-content/uploads/2015/10/2_estructura-para-jardin-vertical.jpg**

c) Poliflor Flexiverde Vydro system (IT)

This hydroponic system is made of layers of spun coconut fibre, Polyfelt Rock PEC (a composite product made from nonwoven polypropylene geo-fabric and high-strength polyester fibres), and a polyurethane foam substrate. The coconut fibre outer layer is cut in order to create planting pockets. The geotextile mat is attached to a steel frame on the wall. The maximum size of each panel is 1800 mm wide x 10,000 mm high, holding 40 plants per square metre. Transversal drip-lines run at intervals through the mat for irrigation and fertigation [6].

Figure 17: Poliflor Flexiverde Vydro system
Source: **http://www.poliflor.net/wp-content/uploads/2016/02/poliflor-flexiverde-vydro-parma-barilla-8.jpg**

d) Sempergreen Flexipanel system (NL)

This hydroponic system consists of a thermoplastic polyolefin (TPO) membrane backing and a specially developed and compressed substrate mat finished with a gutter and frame. The standard panel size is 62 cm x 52 cm. Each Flexipanel has a channel at the top for a drip hose which is used for delivering water and nutrients to the plants. The Flexipanel has been tested and certified in the highest European fire safety class (B - s2, d0). The preplanted panels are suitable for either indoor or outdoor use [7].

Figure 18: Sempergreen Flexipanel system
Source: https://pbs.twimg.com/media/CuE50QsXgAAcsuQ.jpg

e) Tracer Vertiflore system (FR)

The Vertiflore® system provides sound absorption and sound insulating properties (A3 and B3 standards), and thermal insulation. The panels consist of a steel grid enclosing the growing medium (compost and minerals) contained within a dual layer of geotextile matting [8]. The small size of the panels means that they can be moulded to the shape of the facade, as seen on the Amiens Chamber of Commerce (Figure 19).

Figure 19: Tracer Vertiflore living wall, Amiens Chamber of Commerce (FR)
Source: Sarah Milliken

f) Nedlaw living wall biofilter (CA)

This hydroponic indoor living wall cleanses air through a natural processing of contaminants, including volatile organic compounds, by the exposed root system of a mass of tropical plants. The biofilter system has three major components: a water reservoir; the infrastructure that supports the plants; and the plants themselves. Submersible pumps located in the reservoir lift the water to an emitter system that disperses it across the top of the wall at a rate of approximately four litres per second per metre of width. The infrastructure component of the system comprises the air diffuser (which draws air through the plant material), and the growing medium. The function of the diffuser is to ensure uniform airflow. The diffuser is an array of vertical perforated ducts, which are connected to the return air duct of the building's air conditioning system via a horizontal manifold. Two layers of

geotextile growing medium are physically fastened directly to the internal diffuser system with stainless steel fasteners. Water from the pumps trickles down through the core of the growing medium, creating a vertical hydroponic system. Nutrients and microbes are delivered via the circulating water in the form of low concentrations of hydroponic fertilizers. Plants are selected based on four criteria: their ability to form good relationships with the beneficial microbes that do the actual cleaning of the indoor air; their tolerance of the unique conditions of a vertical hydroponic system; the specific conditions of each installation in terms of light, temperature and water conditions; and aesthetics [9].

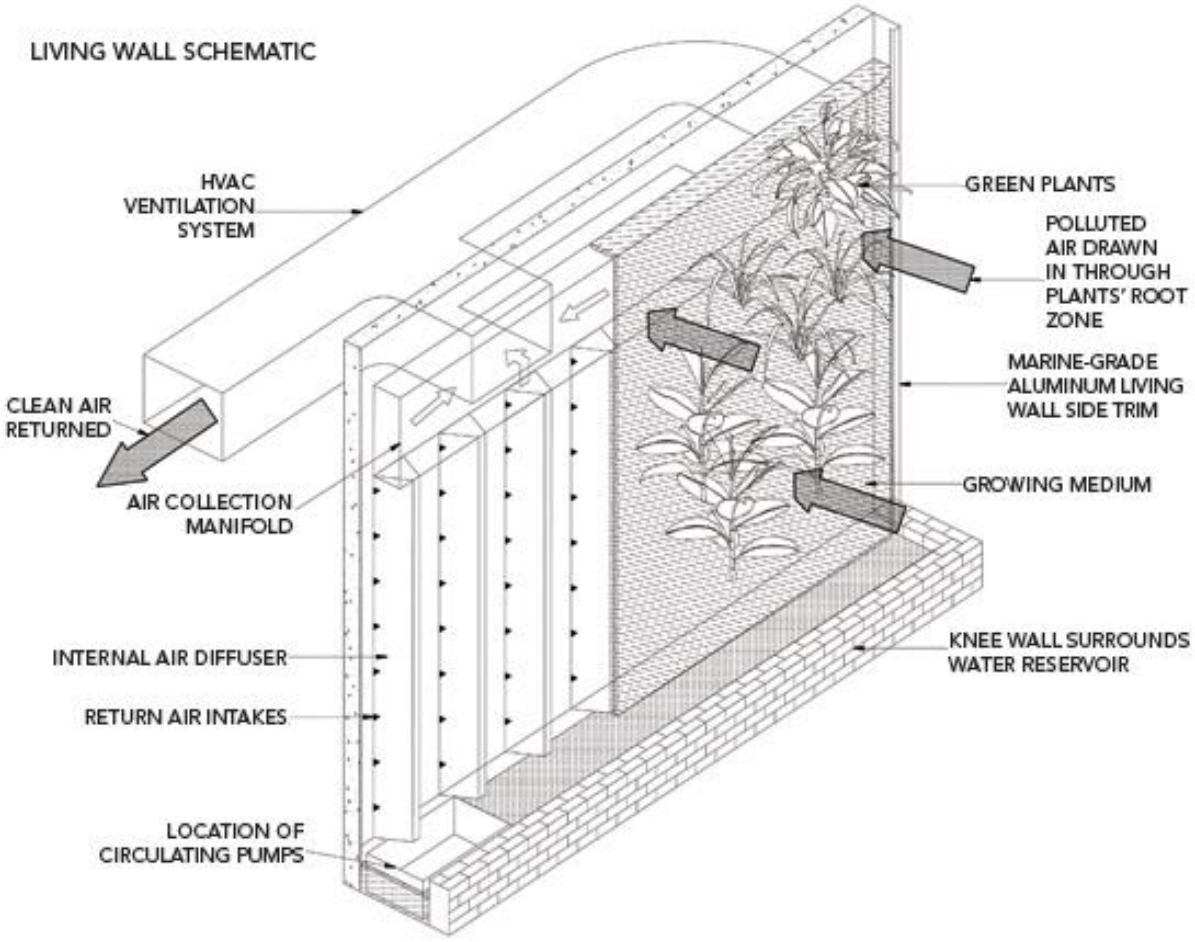

Figure 20: Nedlaw living wall biofilter
Source: **http://mcgrawimages.buildingmedia.com//CE/CE_images/2013/Jun_Nedlaw-Living-Walls-3.jpg**

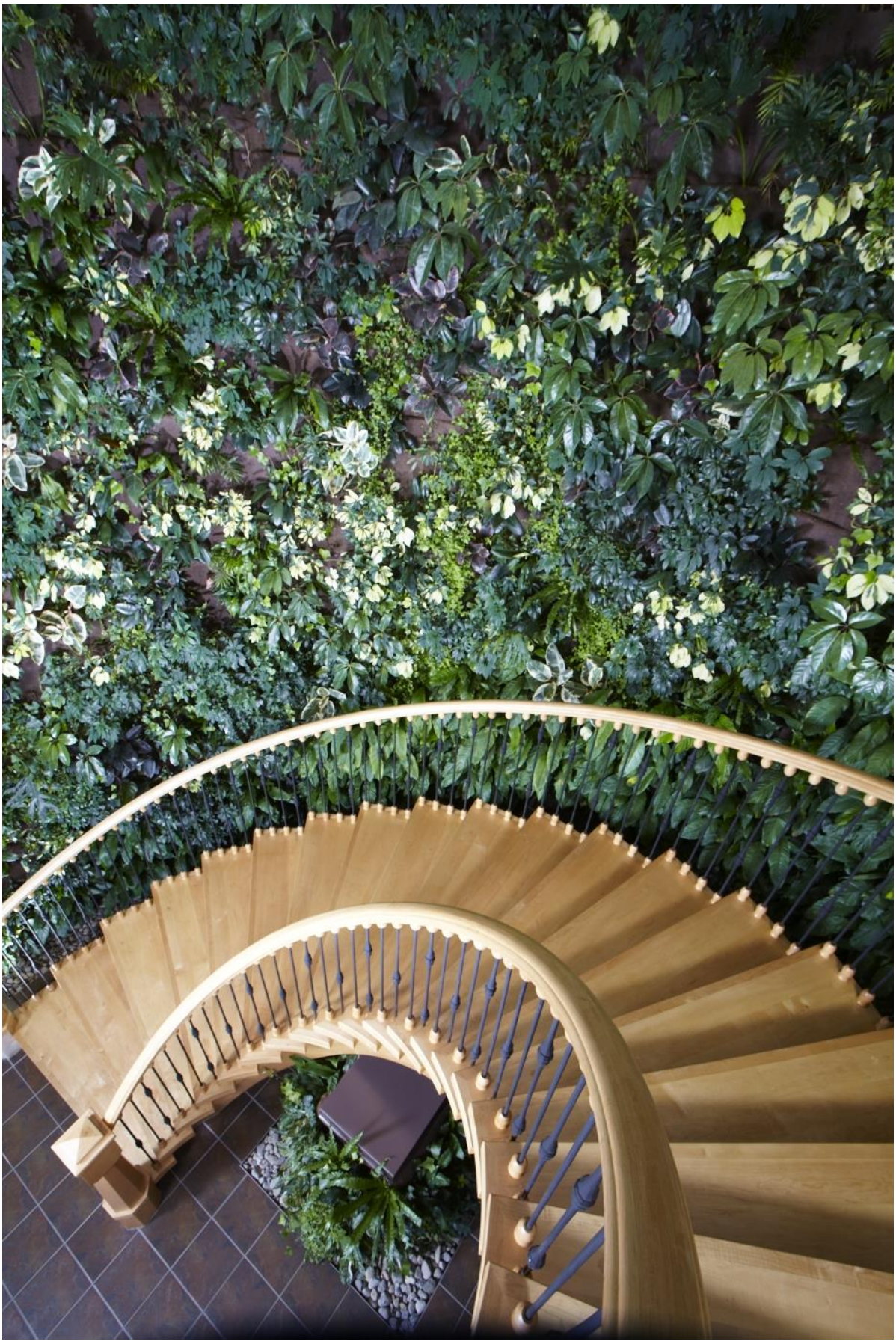

Figure 21: Nedlaw living wall biofilter
Source: **http://www.nedlawlivingwalls.com/wp-content/uploads/MG_0927.jpg**

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