

Vertical cool water into the air and

[Environment](#), [Global Warming](#)



Vertical and rooftop gardens are organic structures that are usually based on and around urban centers, and have many benefits including insulating properties and energy conservation.

The insulating properties of living walls and rooftop gardens in the winter and summer differ but in general consists of four factors: insulation because of the layers in the wall or rooftop, cooling by evapotranspiration, shade, which is the plants absorbing the solar radiation, and having a wind barrier. In the winter, the insulating properties come from the soil and organic matter and mass which keeps the heat from escaping and passing through the layers. The wind barrier of the wall or roof will also decrease heat loss in winter. In the summer, the wall or garden will act as a mass of material layers and keep the heat from penetrating through the wall and into the building. The solar thermal energy will also be absorbed by the plants and will not be able to penetrate as deeply into the building. Along with these insulating properties, in the summer the plants will also actually cool the building by a process called evapotranspiration which is both evaporation and transpiration from the plants.

In other words, the soil based medium will have evaporation and let off cool water into the air and act as moisturizer and water will also transpire from the plants. Exterior living green walls can reduce wall surface temperatures by as much as 10 degrees °C, resulting in significant energy savings and lower air conditioning costs. The evaporation will also permit a living wall to be more efficient as water will evaporate upwards and some of the moisture will be re used by the plants that are above it. Insulations have an R-value rating, but the equations that describe energy transfer through evaporation, <https://assignbuster.com/vertical-cool-water-into-the-air-and/>

reflection, convection, and thermal mass are fairly complicated. Green roofs and walls do not just sit there resisting heat flow, they are an active energy device, collecting, processing, and releasing energy according to the immediate need, therefore cannot be given an R-value. We do know that the specific heat capacity of soil is from 800-1480 and that of water is 4200, which leads us to believe that thermal energy transfer through this medium along with the plants will be limited, and therefore it will take less energy to heat it in the winter and less energy to cool it in the summer.

There are different energy pathways involved in green walls and roofs. The major energy that is being used by the plants is solar energy which is created by the sun through nuclear fusion. One pathway involves light energy hitting the plants and being changed to chemical energy through photosynthesis. This stores energy in the form of sugars in the plants. If you have a living roof, you can grow edible plants which will then turn the chemical energy from the plant into a source of energy for humans when it is consumed. This provides thermal and kinetic energy for the consumer. Solar energy is also changed into thermal energy. There is a transformation from thermal to kinetic as the water is heated and eventually evaporates which rises and gives the particles gravitational potential energy.

It is difficult to calculate the efficiency of living roofs and walls because the wall and roof don't create energy other than photosynthesis, instead it saves energy. The efficiency can't be exactly calculated as the output and input of energy will vary and cannot be measured. There are several environmental benefits in addition to energy savings. One of which is that the wall or

garden uses carbon dioxide which helps reduce global warming and produces oxygen, which humans and animals require for energy production by cellular respiration. There are also benefits such as having greenery around which improves people's general mood, it can act as a soundproofing barrier, and it may save some cost on your next energy bill. The environmental drawbacks are the cost it takes to set up the garden as well as the machinery and energy put into maintaining it. Overall Vertical and rooftop gardens are good insulators and have many energy pathways that take place in them.

They are good for the environment with few drawbacks.