

GREEN ROOFS ON SUSTAINABLE BUILDING

Any building that utilizing green roofs can be classified as a sustainable building, which means that this type of a structure is environmentally responsible and efficiently using resources to reduce the impact on human health and the environment through reduction of energy use, air pollution, stormwater and heat stress. In the United States, the cost of installing green roofs is in the range of \$10 to \$45 per square foot depending on the type of vegetation and material to be used.

Costs for green roofs vary very much between different countries, and are generally higher in countries where there are few entrepreneurs that install green roofs. An extensive green roof is normally less expensive than an intensive one. Site-built green roofs are often cheaper than prefabricated mats. The following factors are affecting the price per meter (Prokop et al., 2011): 1. Size of roof – the larger the area the cheaper per square meter the roof will be 2. Height of the roof. This will affect the price in terms of the cost of raising the elements to roof level 3. Type of green roof 4. Initial maintenance and establishment costs 5. Type of waterproofing and insulation used (difference in labor costs) 6.

Other factors (Roof elements that intrude above the roof such as outlets, roof lights and industrial plant and other additions such as access hatches, safety lines can lead to increase in price per meter squared.) 7. Involvement of manufacturers and contractors.

Figure 5 Weilburg, Germany (not too far from Frankfurt) a Sustainable Building with Green Roofs



Figure 6. Featuring more Green Roofs on Mixed-Used Development



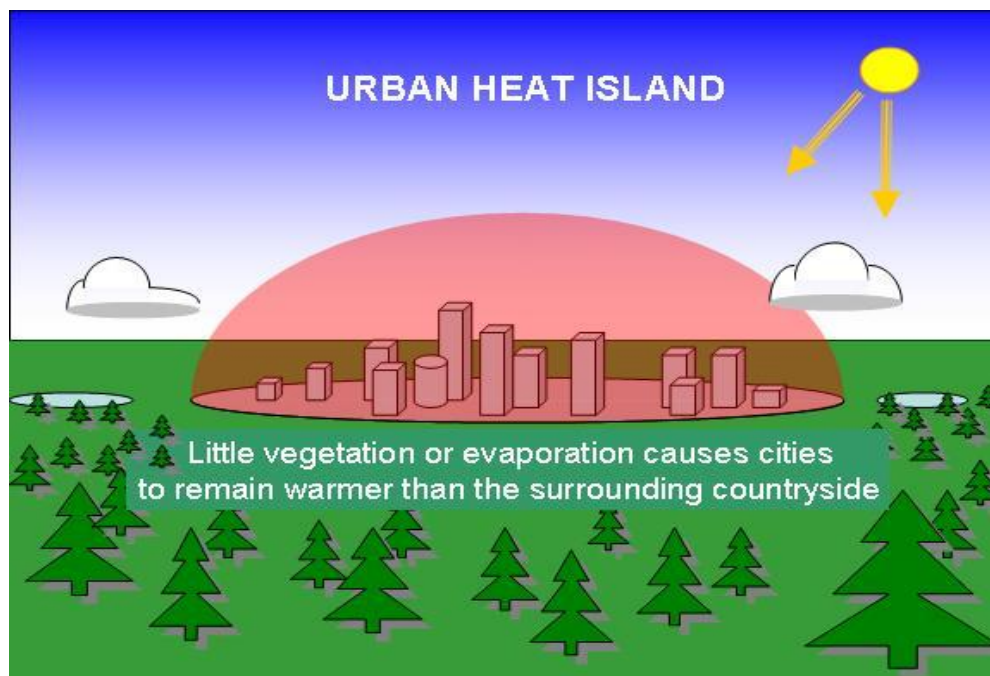
Green Roofs Reduce Storm Water

The effect of green roof on the retention of storm water increases as ⓘ soil medium depth increases, up to a point. Probably little effect over 12 cm compared to increased building cost. (ii) As roof slope decreases (Snodgrass and McIntyre, 2010).

Green Roof can Mitigate Heat Island Effect

The annual mean air temperature of a city with 1 million people or more can be 1.8-5.4oF (1-3oC) warmer than its surrounding and in the evening, the difference can be as high as 22oF(12oC) (USEPA 2011). On hot summer days, the surface temperature of a green roof can be cooler than the air temperature, whereas the surface of a conventional rooftop can be up to 90oF (50oC warmer) (Liu and Baskaran, 2003). Green roofs absorb heat and act as insulators for buildings, reducing energy needed to provided cooling and heating (USEPA, 2010a). It also, improved human health comfort by reducing heat transfer through building roof, can improve indoor comfort and lower heat stress associated with the heat waves (USEPA, 2010a).

Figure 7. Urban Heat Island Effect



Pro and Con to use this Measure

Pros

- Water retention: depending on their design green roofs can retain a significant amount of rain water
- Substitute for lost areas of landscape, increase green space in cities.
- Longer life for the roof membrane; due to less UV and less daily changes in temperature.
- Marketing: A better surroundings gives higher rent, better marketing and better working environment.
- Lower cost from a life-cycle standpoint.
- Binding dust and toxic particles: Dust from the air are filtered
- Improved noise protection: reduction of sound reflection and sound proofing.
- Improved building thermal performance (insulation): Reduction in summer cooling needs and reduction in winter heat losses when a green roof is used. This reduced demand for energy would also mean a reduction of CO2 production.
- Reduction of the urban heat island effect
- Biodiversity: refuge for wildlife and “red listed” species in urban areas

- Intensive green roofs could include urban agriculture/horticulture, and bring food production close to people.

Cons

- Higher initial cost
- Maintenance costs: usually minor for extensive roofs, and as a garden for intensive roofs.
- Restrictions involving climate and weather conditions (e.g.: rooftop gardens are inappropriate in very windy places; plants are fragile and can be blown away).
- If “black listed” plant materials are used, new species can spread from roofs (no reference).
- More costly repairs and fixings (finding and repairing eventual leaks is more expensive and difficult).
- Plants can be unreliable and affected by the surrounding environment.
Therefore their life length is uncertain and they require some maintenance.

Source: <http://www.iwawaterwiki.org/xwiki/bin/view/Articles/GreenRoofs>