

Review of LCA of Passive Cooling by Green Roofing

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Abstract – This paper focuses on the LCA of the green roofing with passive cooling and environmental impacts is assessed and green roofing it requires plant that is suitable to the correspond climate and weather conditions. So for hotter regions, suitable plant is suggested on the basis of its easiness in availability and its survivability in dry as well as drought like conditions.

Key Words: Green roofing, Passive cooling, efficient plant selection.

1. INTRODUCTION

A green roof or a living roof is a roof of a partially or partially covered vegetable structure, which is planted above a waterproof membrane. It may also include other layers such as root canal and irrigation and irrigation processes. Rooftop garden gardens, where plants are stored in pots, are generally not considered to be a true green roof, although this is controversial. Rooftop pools are another type of green roof used to treat gray water. The vegetation, the soil, the water layer, the roof barrier and the irrigation system create a green roof. There are three types of green roofs:

1.1 Extensive greenroofs

These green roofs are generally 60-200mm thick and having weight density of 60-150kg/m², which is lowest and is within safety load on terrace of normal house. The maintenance of these kinds of is very low or negligible. Plants or shrubs that can be grown in these types of roofs are moss- sedum-herbs and grasses. These are used mostly as Ecological protection layer. These kind of green roofs do not require any irrigation, which is advantageous. But due to low thickness these types of roofs have some limitation in their survival in very dry or drought like conditions.

1.2 Semi intensive green roofs

These green roofs are generally 120-250mm thick and having weight density of 120-200kg/m², which is moderate and is within safety load on terrace of normal house up to few limitations. These green roofs require periodically maintenance. Plants or shrubs that can be grown in these

types of roofs are grasses-Herbs and Shrubs. These roofs are need to be specially designed. These kind of green roofs require regular irrigation but correspond to this it gives some advantages to some extent as compared to extensive and intensive green roofs.

1.3 Intensive greenroofs

These green roofs are generally 150-400mm thick and having weight density of 180-500kg/m², which is quiet higher and terrace is need to be pre-designed for load carrying. Plants or shrubs that can be grown in these types of roofs are Lawn or perennials, Shrubs and even trees. These are used for park like garden. These green roofs require high maintenance and regular irrigation as it contains trees and shrubs. These green roofs are obviously advantageous in dry and drought like conditions.

2. PLANT SELECTION

The climate and weather conditions vary from region to region and thus there is need of selection of species that most accurate for particular region and this paper is focused on selecting plant that is efficient for hotter region and few species were selected are as follows:

1. Sedum clavatum.
2. Sacrifrage pint.
3. White stonecrop.
4. Tasteless stonecrop.
5. Turfgrass.
6. Snodgrass.
7. Crassulaeaceae.
8. Euphorbiaceae.
9. Portulacaceae.

According to easiness in availability, and efficiency and survival ability in dry and drought like conditions, **Crassulaeaceae** is selected.



Figure 1. Crassulaceae. (Source: Google images)

2.1 Crassulaceae

Crassulaceae, also known as the stonecrop or orpine family, is a diverse family of flowering plants dicotyledon containing sweet leaves and a unique mode of photosynthesis, known as Crassulacean acid metabolism (CAM). Flowers usually have five floral organs. Crassulaceae are usually herbaceous but there are other fragments, and few are attractive plants such as pots or aquatic plants. Crassulaceae are a middle-class monophysical family in the inner eudicots, among successive saxifragales, whose diversity makes family separation very difficult. The family includes 1,400 species and 34 3435 species, depending on the Sedum summer population, and then distributes three sub-families. Members of Crassulaceae are found worldwide, but especially in the Northern Hemisphere and southern Africa, typically in arid and / or cold climates where water may be present.

Crassulaceae are mainly perennials and are of economic importance as garden plants. Most members have a complex, interesting appearance, and are quite complex, often requiring only a little attention.

3. ENVIRONMENTAL IMPACT

A green roof (also known as a rooftop garden or a living roof) is a vegetative layer grown on a rooftop. The popularity of green roofs has increased in the United States due to their many benefits. While pretty, green roofs serve a much greater purpose than simple beautification.

1. Unlike traditional black tar roofs, green roofs **reduce energy costs** by absorbing heat instead of attracting it and providing natural insulation for buildings. According to a study conducted by the National

Research Council of Canada, even a six-inch extensive green roof can reduce summer energy demands by more than 75 percent. By lowering air conditioning demand, green roofs decrease the production of associated air pollution and greenhouse gas emissions.

2. Green roofs help **reduce the Urban Heat Island Effect**, a condition in which urban environments absorb and trap heat.
3. A green roof's plants **remove air particulates, produce oxygen and provide shade**. Additionally, this natural protection against extreme heat enables green roofs to last twice as long as traditional rooftops.

Another important benefit of green roofs is their ability to **reduce and slow stormwater runoff** in urban environments. Because rooftops and streets in cities are hard surfaces, the volume and velocity of stormwater runoff increases tremendously and is a major source of flooding and pollution worldwide. Due to nonporous surfaces like pavement and rooftops, a typical city block generates more than five times more runoff than a woodland area of the same size. The ability a green roof has to absorb (and filter) water significantly lowers the risk of flash flooding and sewer overflows. In the summer, green roofs retain up to 90 percent of the precipitation that falls on them and up to 40 percent in the winter^[18].

4. CONCLUSION

According to the review it can be concluded that green roofs are the efficient way to save energy and green roofs have large potential to create environmental impact. It cannot create totally impact on environment but it can be a helpful factor for fighting global warming.

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