GREEN ROOF – INOVATIVE TECHNOLOGIES FOR SUSTAINABLE DEVELOPMENT AND IMPROVEMENT OF THE ENVIRONMENT IN CITIES

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Abstract: The share of green roofs on residential and public buildings is increasing rapidly in recent years. Only in 2008 in the U.S. have installed over 300,000 square meters Development and enforcement of this new type of technology in building fully comply with the principles of sustainable development and help achieve greater energy efficiency with reduced greenhouse emissions. Green roof means not only an impressive exterior, but also a longer life of the waterproofing, better insulation and sound insulation, that is greater energy efficiency and quality of construction - money that is subsequently returned. Besides the purely economic advantages of green roofs are proving very useful to re-establish ecological balance in the cities. Thanks to the plants was enriched air oxygen, reducing dust and the concentration of greenhouse gases.

This work has analyzed the experience and results of applying this new type of innovative technologies and has analyzed the effect of applying them to different local systems. It is emphasized that due to the inability to provide significant green spaces in cities and heavily polluted environment, green roofs are one of the best alternatives for the use of all available sites for development of plant areas and improve the quality of urban environment.

Roof gardening - still less popular among us can become part of our daily lives. The origin of roof gardens goes back thousands of years ago in Babylonian Empire, where we assume the existence of the earliest ones - Hanging Gardens of Semiramis, one of the seven wonders of the world.

In the Renaissance, the roofs of many houses and palaces in Italy and Germany accounted for gardens with rich collections of exotic plants.

After the appearance of the reinforced concrete roof landscaping acquire large mass scale in Western Europe, later in the U.S., Japan, Australia, Canada . It is built on residential buildings, hotels, industrial buildings, offices, hospitals, museums, and underground parking. The roof of the convention center in Vancouver, where an area of just over 24,000 square meters stretching one of the largest green roofs in the world. It is home to more than 400,000 plants.

ACROS Fukuoka, on Fukueka, Japan (Fukuoka City, Japan). 35 000 plants, 76 species - a wonderful view of the office window.

The emphasis on improving quality of life in urban areas makes the existence of green roofs more relevant than ever. In many countries grassed roofs are an essential part of architecture, while in our country roof greening is perceived more as an unattainable luxury than a necessity. Effect that can be achieved through the green roof is versatile.

On the one hand, green roofs are purely decorative significance, which enrich the architectural appearance of buildings during different seasons.

On the other hand - significantly reduce dust and the concentration of harmful gases in the air, ionizing it and increase the oxygen content in it.

There is a catch of course: the initiation of the roof garden will immediately reduce your carbon emissions. Planting of traditional roofs require special materials whose production also releases carbon. We need seven years to compensate for input and to begin charge. The development of low-carbon materials can reduce the years of 2-3. From an ecological standpoint roof gardens lead to a significant improvement of the microclimate in the cities. Another advantage of green roofs is the absorption and utilization of rainwater. Green roofs hold up to 70% of rainwater, resulting in increased evaporation from the leaf mass, which in turn leads to increased humidity and reduced air temperature. From a technical point of view roof garden increases the thermal insulation of the building protects the roof from UV rays.

The green roof on the lower body of the three buildings is generally 7000 m² and is the largest green roof, which is to be realized in Bulgaria

Where can build a garden roof?

If this is consistent with the architectural and technical requirements, roof garden, you can build any roof. The basis of well-functioning green roof design and implementation of waterproofing and drainage layers. According to the load on the roof and the depth of the root system of vegetation, there are three systems, roof gardens: Shallow SYSTEM, MEDIUM-DEEP SYSTEM, DEEP SYSTEM. In turn green roofs are divided into **extensive and intensive**.

It is very important to make the following clarification: roof gardens (intensive roof landscaping) call the green flat roofs with a rich, attended by people intensively supported and most often requires structural adaptation of the building before it was built or later .

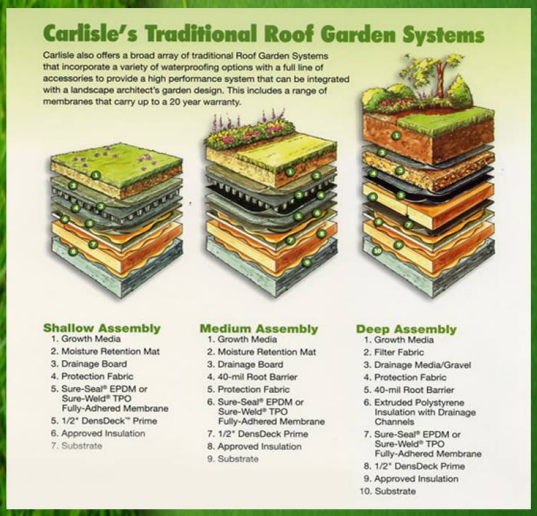
All other options are to a lesser or greater degree of expression etc. extensive roof landscaping, which is slightly flatter and includes a set of plants and special restrictions in the used substrates. Its advantages are that it is cheaper, less burdensome for the building and therefore with greater opportunities for mass application, require little maintenance. In most cases, extensive green roofs are not Visited except for purposes of maintenance, can be met and pitch.

The components of the roof garden, in succession on the concrete slab are: concrete slope, vapor barrier, insulation, anti root barrier, drainage membrane, drainage layer of washed gravel, geotextile, soil and vegetation. Already in Bulgaria can be found all appropriate drivers, so there is everything to make every roof in Green Paradise.

Some structural detail, depending on the thickness of soil layer from which plants need.

• Intense (deep) green roof is planted with large size vegetation rich in tree and shrub species. Often these areas can be treated as a small park or garden. For ease of maintenance is needed and providing irrigation and drainage systems.

•Extensive (shallow) Green roof is significantly thinner layer of soil. Is predominantly grassed roof with soil types, grass and succulent. Frequently used genera Sedum, which provide quick and lasting effect.



Green roofs lead to the following positive effects:

• Besides its economic benefits green roofs are proving very useful to re-establish ecological balance in the cities, Some favorable role of plants for this purpose: lower daily maximum temperatures a few degrees in summer. It is estimated that if all the roofs are planted in cities, urban temperature will be reduced by 7 ° C.

• It is proved that roof landscaping reduces the noise level by 3 to 8 db

• Increasing humidity, enriched with oxygen, reducing dust and the concentration of greenhouse gases, help reduce pollution because plants have the ability to absorb significant amounts of carbon dioxide, sulfur dioxide, nitrogen oxides, volatile organic compounds, heavy metals and other pollutants from the air, falling rain and smog

One square meter green roof filter approximately 0.2 kg. aerosol particles of dust and smog of the year. And nitrates and other harmful compounds from air by rainfall, they are retained in the soil layer.

• They provide reliable insulation in winter and green buildings are quite warm in summer - cooler. This leads to a reduction in energy used for heating and cooling. Living buildings are as natural air conditioners for the city, as they reduce the heat emitted from vehicles, concrete, asphalt and other buildings. Roof greening can save cost of about 1-2 L/m² oil building.

• Green roofs and walls can also reduce from 50 to 90% runoff in rain, thus preventing flooding and clogging of drainage systems, which in our streets is common. And when plants breathe, the water evaporates and the natural water cycle is closed.

• Another alternative for building a green roof is the integration of photovoltaic modules or solar collectors in it. Thus reducing the power consumption of the network and reduce costs for hot water. The prices of these systems, however, are still high and such investment is redeemed after twenty or even more years.

•Local warming in cities significantly reduced quality of life and deteriorating health of residents. Green areas and parks can take up to 80% of energy, but in more densely populated areas green spaces are rare or absent.

•Through numerous studies in recent years has shown that air pollution in cities may cause serious adverse health consequences. Driven by nitrogen oxides, carbon dioxide, volatile organic compounds and gases emitted by diesel engines, creating a dangerous combination of toxic substances. Vegetation improves air quality.

• They can lead to cost savings. This is achieved by using high quality materials with great strength and durability, whose maintenance is easy and cheap

• They are a prerequisite for reducing the harmful effects to the environment. Through the choice of coatings with greater stability and longevity of the replacement rate is reduced. If you select materials, recyclable, pollution is reduced significantly, and avoiding materials that are a source of toxic substances.