GREEN ROOFS – NEW TREND IN URBAN DEVELOPMENT

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Abstract: *Urban agglomerations have a negative impact on environment, impact materialized in high temperature, greeenhouse gases, grey landscapes etc. To reduce to some extent the negative effects generated by urban agglomerations, a solution may be the widespread use of green roofs, roofs that are covered by vegetation. The greenroof can only have a decorative role, or it can be formed by plants used in human or animal food. In this paper we have focused on green rooftops as a trend in urban development worldwide.*

Key words*: global warming, urban, trend, farming system*

INTRODUCTION

Population growth and the migration to urban areas into more and more regions are affecting limited global resources [5].

According to World Data Atlas, in 2020, urban population for World was 56.2 %. Over the last 50 years, urban population of world grew substantially from 36.7 to 56.2 % rising at an increasing annual rate [14]. The increasing population living in the cities has impact on environment and so, the environmental issues become more pressing, forcing the cities to rethink their systems and the impact on the environment [13]. Many cities around the world have already begun to adopt more eco-friendly practices, and some trends are starting to emerge. The sustainable cities of the future will build on these, taking today's environmental practices a step further [8].

At international level, there are various initiatives on transforming cities into greener areas, covering the three types of buildings encountered in cities: residential, commercial and industrial, the latter comprising all types of buildings not included in the first two, i.e. production buildings, offices, administrative buildings, etc.

Urban green spaces can be a comprehensive tool for long term protection of environmental sustainability through improving the quality of life and air quality, increasing property value due to their amenity and aesthetic characteristics, and reducing the energy costs of cooling buildings [4].

MATERIALS AND METHODS

Roofs can represent up to 32% of the horizontal surface of built-up areas [2] and are important determinants of energy flux and of buildings' water relations [6]

Through many eco-friendly practices, also the green roofs can be noticed. Green roofs can be found in many human settlements worldwide. From London, Paris to Bangladesh or countries in Africa, we encounter green roofs.

They have an important role to play in adapting to the effects of climate change, a vital role, if one can say so [12]. In urban environments, vegetation has largely been replaced by dark and impervious surfaces (e.g., asphalt roads and roofs) [1,7]. Green roof's role is underlined by the reduction in the need for artificial air conditioning in hot summers such as leakage reduction or rain water trapping, while offering different habitat types for wildlife. In addition to these benefits, the esthetic, visual benefit should also be mentioned, as green roofs have to some extent balanced the concrete in the cities [3,10].

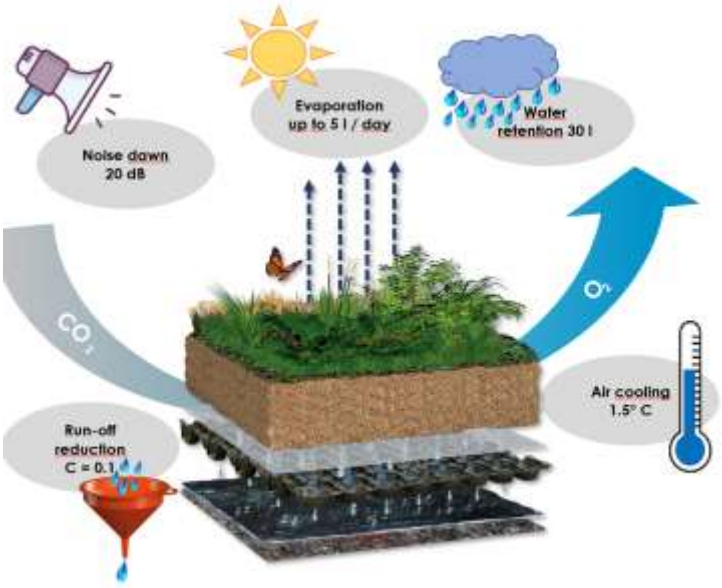

Figure 1. Green roofs impact
Source: https://dontwastemy.energy/2021/01/27/green-roofs/

According to the GRO Green Roof Code " A green roof is created when a planting scheme is established on a roof structure. The roof can be at ground level, often with an underground car park beneath, or many storeys higher. Green roofs can be designed as recreational spaces to be enjoyed by people, as visual, sustainable or ecological features to support wildlife or a combination of both" [11].

A green roof have environmental advantages, but it can support a family creating a number of opportunities. It can be a garden or a relaxing space [15].

When we say the green roof, many of us think of the fact that such a roof could destabilize the structure of a building. But if construction criteria are respected, a green roof can protect a building from direct heating from the sun, loss of winter heat, rain water or snow etc.

The roof gardens have developed to such an extent that in USA the chains of shops have developed real heavy roof gardens, thus shortening the supply chain, the customers being the main beneficiaries with fresh products

RESEARCH RESULTS

Their positive environmental impact has led to increased popularity for green roofs. Although they can be adapted to different geo-climatic and building conditions, they are classified in five categories, as seen in figure 2.

Each type of green roof has its own characteristics, varying from the use of the roof till the cost and the benefits it bring to the buildings developers, owners and their users.

Green roofs provide a multitude of benefits to the people who interact with them and the cities and regions in which they exist.

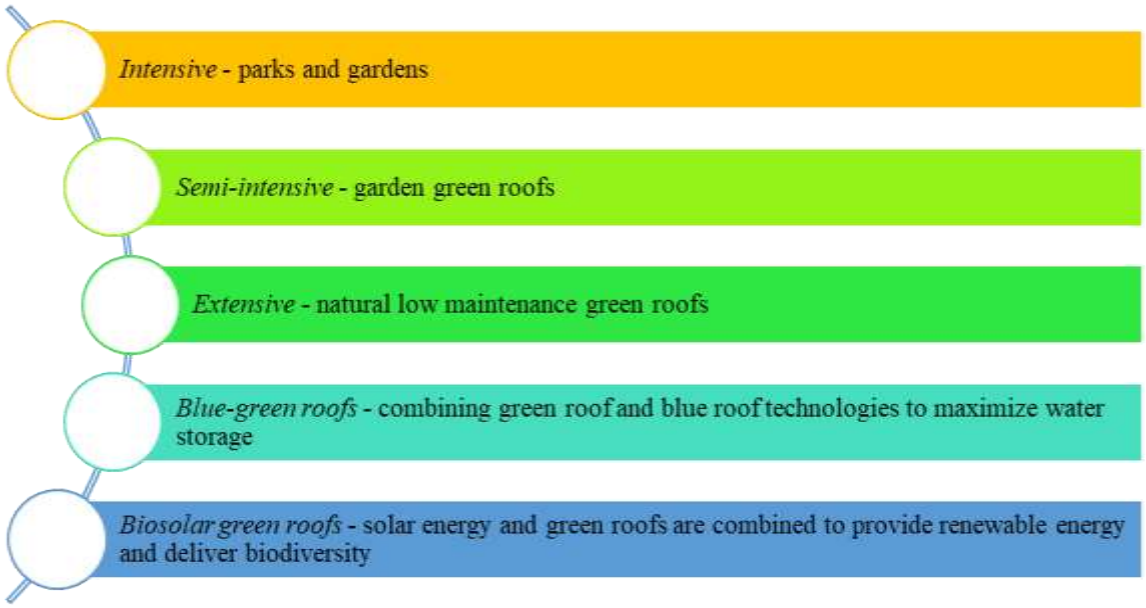

Figure 2. Green roofs classification

Source: Green Roof Organisation, The GRO Green Roof Code, 2014 [5]

Benefits are delivered across three spheres, environmental, economic and social, making green roofs a truly sustainable feature (Figure 2). In fact, it would be hard to argue that any other architectural element of a building can have such wide and profound benefits as a green roof does [15].

Table 1.

Characteristics of different types of green roofs

No crt	Type	Extensive	Semi-intensive	Intensive
1	Use	Ecological landscape	Garden Ecological landscape	Garden Park
2	Type of vegetation	Moss Herbs Grasses	Grass Herbs Shrubs	Lawn Perrenials Shrubs Trees
3	Benefit	Water Thermal Biodiversity	Water Thermal Biodiversity Amenity	Water Thermal Biodiversity Amenity
4	Depth of substrate, mm	60-200	120-250	150-400
5	Weight, kg/m^2	60-150	120-200	180-500
6	Cost	Low	Periodic	High

Source: Green Roof Organisation, The GRO Green Roof Code, 2014 [5]

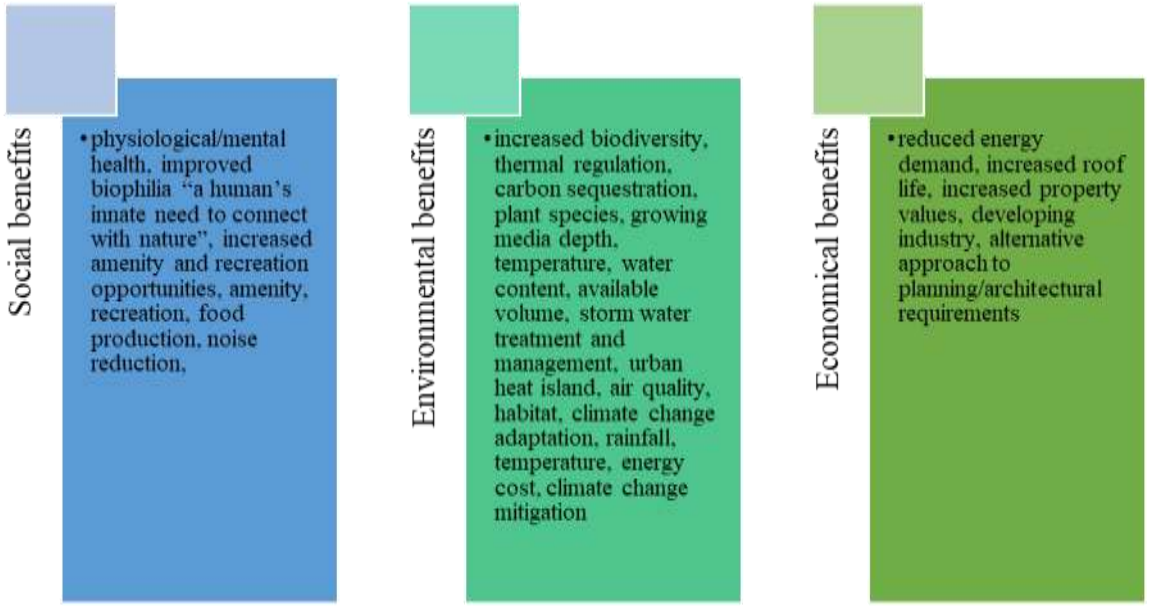

Figure 2. Green roofs classification

Source: World Green Infrastructure Network, Key definition: Green Roof, 2021 [10]

While in some countries green roofs are built to help combat climate change, in less developed countries, green roofs, more precisely roof-based gardens, can be a source of food for the population, with an indirect impact on the income of the population in this case. If we step outside the scope of self-consumption agriculture, i.e. products which are produced from that garden are sold, we have a direct impact on the income of the population practicing these types of farming.

Where the green cover constitutes a relaxation area, access to it is limited to a relaxation area located at ground level and thus the risk of vandalization and destruction of this space is reduced.

CONCLUSIONS

Regardless of the type of green roof adopted, conditions for its development are also needed for geo-climatic conditions and the part of design and execution. Thus, in order to develop, a green roof needs adequate levels of: sunlight, humidity, aeration of the soil, nutrients, etc. All these elements must be in balance in order the roof to become a vegetation place, to support the growth of plants. Geographical position, orientation, wind exposure, appearance are factors that have a decisive influence on the capacity of a roof to become a green roof, not to remain a brown, inert roof.

The design process of a green roof is a complex process, which in addition to technical requirements for the execution of the strength structure, the roof, requires knowledge of agriculture, horticulture or even tree growing, in addition to landscape.

In order to have more green roofs, cleaner air, lower temperatures in summer, mentioning only two of the benefits of green roofs, more support is needed from the authorities and more initiatives from the population and business side. Lower taxes on buildings, or even suspending their payment for a certain number of years, together with much more accessible advice, are measures that could help increase the amount of green space on the covers.

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