

THE RELEVANCE OF GREENING OF RESIDENTIAL BUILDINGS IN THE CITY OF NOVOPOLOTSK

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*This article presents an analysis of the relevance of landscaping in Novopolotsk. On the basis of conceptual and implemented foreign landscaping projects their main advantages and disadvantages were identified.*

In Novopolotsk, the main sources of air pollution are oil refining, chemical industry, heat power engineering and motor transport. When conducting environmental monitoring for December 2018 high and extremely high pollution level in Novopolotsk were not detected. The horizontal and vertical greening of residential buildings are considered for a more balanced and healthy ecosystem of the city. This would improve the overall quality of the atmosphere, reduce the temperature in the city in summer, increase the amount of oxygen, reduce the cost of heating and air conditioning of buildings with green roofs [1].

An example is the project of the Gary Comer Youth Center and its roof-farm landscape-architectural company Hoerr Schaudt Landscape Architects-Chicago, Illinois, USA (Fig.1). The green roof is located directly above the gym and the cafe Gary Comer Youth Center and it is covered with a 60-centimeter layer of soil. Among the dozens of plant species you can find not only herbs and flowers, but even vegetables and fruits. This green layer provides good insulation below the premises, thus reducing the energy costs of heating and cooling the entire building.

During heavy rains, the vegetation-covered roof areas absorb rainwater, reducing the load on the city's drainage systems. This partially helps to solve the problems associated with rapid storm water runoff such as sudden floods and water pollution. Round metal rings in the interior of the garden play the role of both artistic elements and quite functional skylights that let natural light into the rooms below.

The air temperature on the roof is higher than at the bottom, which allows the use of garden plots from early spring to late autumn. The fertile soil gives rich harvests of cabbage, potatoes, tomatoes, carrots, lettuce, and even strawberries. For all its functionality, the green space is not just a garden, but it is also a beautiful place to relax. Planted along with vegetables and fruits, pale yellow daffodils, sunflowers, daisies, lilies and a variety of creeping herbaceous plants contribute to this.



Figure 1. – Gary Comer Youth Center

In Russia, an example is the business centre Crowne Plaza, located in St. Petersburg (Fig.2). Greening smooths out the sudden changes in temperature, helping to create a comfortable microclimate of the premises, detains dust and absorbs rain water, removing the load from the sewer systems. From an economic point of view, such roofs have also a number of advantages over conventional roofs despite the high initial cost: green protects the roof from ultraviolet radiation, extending its service life, protects the building from hypothermia and overheating, which reduces the cost of heating and air conditioning.



Figure 2. – Crowne Plaza Business Centre

In the Republic of Belarus, special attention has also begun to be paid to the greening of roofs. On June 27, 2017, the press conference of the pilot initiative "greening of building roofs", implemented within the framework of the project "Assistance to the transition of the Republic of Belarus to a "green economy", funded by the European Union and implemented by UNDP, held on the territory of Marjina Gorka grammar school. The aim of the initiative was to create and disseminate the best available practices in Belarus for the construction and operation of the roof with soil cover. The result is a unique experience in the development, design and construction of such an object [3].

The analysis revealed the main advantages and disadvantages of greening the roofs [2], [4], [5].

**The advantages include the following factors:**

- Air quality improvement

Green spaces on the roof improve air quality by absorbing carbon dioxide in the atmosphere and releasing oxygen. Atmospheric pollutants are washed out in green roof substrates through precipitation, where they are filtered out and cleaned from harmful particles and impurities. Green plants and plants also moisturise the air by evaporating clean water.

- Roof cover protection

The vegetation on the roof protects its surface from extreme weather conditions, temperature and ultraviolet radiation, thus extending the service life of the roof.

- Aesthetics

Greening the roofs is considered one of the most effective and aesthetic ways to make the city more beautiful, pleasing to the eye and perception of the city residents.

- More efficient temperature regulation

During the lifetime plants use the thermal energy of the environment and evaporate water. During the passage of condensation and evaporation cycles, plants are thus able to cool and moisten the surrounding air improving the microclimate.

- Improvement of storm water runoff

Storm water runoff is stored on a green roof substrate and then absorbed by the plants, from where it returns through evaporation to the atmosphere. In summer, green roofs can save 70-80% of the rain falling on

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them. In winter, they can retain 25-40% of moisture. Green roofs are also able to delay the time at which runoff occurs, which reduces the load on drainage and sewerage systems during peak storm water flow.

- Reduction of energy costs

Layers of green roof are able to improve its thermal characteristics, reducing solar heat penetrating into the building. The temperature under the green roof can be at least 3-4°C colder than the air outside, when the temperature ranges from 25°C to -30°C, therefore, reducing the cost of maintaining the air temperature inside the building. In winter, a green roof can also help reduce heat loss through the roof.

- Creating a positive social effect

Green roofs, among all other advantages and positive effects, create new competencies for the care of green roofs, directly involved in eco-education, including among children.

**Main disadvantages are:**

- Significant weight of the system on the building structure

A significant weight of the system on the structure of the building, which can reach several tons/m<sup>2</sup>, can adversely affect the strength of the structure, which must be taken into account in advance when designing.

- Increased risk of fire

In addition, when designing a fire system, it is necessary to take into account the increased risk of fire.

- Damage of waterproofing by plant roots

The device of the green roof should include anti-root insulation to protect the coating from the destructive power of the roots.

- High cost of greening and maintenance costs

**Conclusion.** The initial cost is higher compared to the conventional roof, but the given advantages of the costs are recouped due to the fact that the service life of waterproofing coatings of buildings increases up to 40-50 years and keeps the heat in the building. Saving money allows a significant reduction in heat loss -2 litres/m<sup>2</sup> of the building area annually, if we consider the equivalent value of petroleum products. Green roofs save money on storm drains, reducing the drain by 10-50%.

Thus, it can be concluded that at this stage of development of energy-efficient technologies, taking into account the climatic and social features of the region of the Republic of Belarus, the introduction of urban greening of residential buildings is important, as it contributes to the formation of an attractive, comfortable and environmentally friendly urban environment in Novopolotsk.

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