

## **Methods of Organizing Recreational Zones in the Quarry Areas Located on the Banks of the Chirchik River**

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**Abstract:** In the article, the main ecological methods of improving the reclamation condition of the quarry were considered. The current state of the Chirchik river quarry in Tashkent, Uzbekistan was studied. The negative impact of the situation on ecology has been determined. Proposals for the use of vertical greening methods have been presented to eliminate the identified negative deficiencies.

**Keywords:** stone quarry, quarry landscaping, quarry design, vertical landscaping, landscaping.

As a result of the active development of the mining and metallurgical industry, the extraction of minerals and mineral raw materials and the construction of industrial facilities in the 19th and 20th centuries, many abandoned quarry areas were formed in Uzbekistan. This, in turn, led to the destruction of the natural landscape, the destruction of plant and animal habitats. During quarry development, soil and air are polluted, water balance is disturbed, soil erosion develops. Quarry land reclamation, i.e. restoration of biological productivity, ecological status and economic value of land in abandoned quarry sites, plays an important role in the restoration of man-made landscapes and helps to improve the ecology and microclimate of the area.

If we define the term quarry at this point, quarry - an enterprise that extracts minerals in an open way; a set of pits formed during the open mining of minerals from the ground. The quarry consists of several systems of steps, usually the upper steps are located in the bedrock, and the lower steps are mined for minerals. In order to extract minerals, puch (overburden) rocks are pushed open [6].

Nowadays, we can see many quarries located in many cities of Uzbekistan, especially in Almalyk, Navoi, Bukhara, Tashkent and other regions. It is especially located between Sergeli, Yangi Hayot, Bektemir districts of Tashkent city Quarry along the Chirchik River (Fig. 1). Quarry along the Chirchik River soil and gravel in open mining of minerals as a result of formation soil and air were polluted, water balance was disturbed, soil erosion developed. The restoration of the quarries located on the banks of the Chirchik river is particularly urgent.



*Figure 1. A quarry located on the Chirchik river*

For this, we need to consider the current state of the quarry, which was formed along the Chirchik River. In the picture below, we can see the current state of this area. It is noted that the water level of the Chirchik river is decreasing year by year. The river is being polluted by the population and industrial enterprises. Due to the change of the river bed and many other reasons, it is causing serious damage to the ecology. We can observe this in the image taken from google map below (Figure 2).



*Figure 2. A quarry located on the Chirchik river*

At this point, it is one of the current issues to study the current state of this region, to provide solutions to the problems that are causing serious damage to the situation. For this, the necessary information on greening the quarry area was studied. The works of scientists who worked in this field on the greening of this area were studied.

N.A. Vergunov's work "Landscape design" is dedicated to the formation of gardens in natural relief forms, the placement of gardens on slopes and disturbed areas [1]. In the book "Urban Green Construction", Gorokhov explores ways of designing pits and terraces to form rocky slopes. The author shows the methods of design and construction of retaining walls, as well as their application [2]. M.P. Zgurskaya "Alpine garden and rock garden" the main focus of the book is based on the description of the design of structures and the selection of plants for rock gardens [3]. V.V. Leshinskaya "Rocks and Rocks in the Garden" in his book explores various vertical and horizontal structures made of stone, such as rock hill, rock garden, terraced flower garden, steps, water ramp, artificial rocks, etc., etc. Also provides background and descriptions of plants for vertical gardening [4].

Based on the results of the study, after biological reclamation, the quarries can be used as recreation centers, sports and children's playgrounds, natural museums. It helps to solve both environmental problems and cultural leisure of the population and performs aesthetic functions.

Quarries are divided into the following types according to the type of soil that forms the relief, depending on the rocks mined: stone, ore, sand and chalk. Improvement of stone-type quarries is a big challenge because they do not have a fertile soil layer. Limestone, marble, granite, and sandstone are mainly mined in such quarries. The sides of the quarries are rigid and do not require additional reinforcement [5]. The use of vertical gardening in quarries, the pros and cons of building various structures, and the features of landscaping in quarries remain neglected. Thus, the purpose of the work is to determine the most suitable vertical gardening options for beautification of the quarry along the Chirchik River.

The following tasks have been set to achieve the goal.

1. Review of types of vertical reclamation in quarries.
2. Identify various advantages and disadvantages
3. Selection of plants for vertical fencing of the quarry along the Chirchik River.

Reclamation of the quarry is an integral part of the restoration of man-made landscapes and helps to restore flora and fauna. The most common methods of quarry restoration include: water filling, stepped landscaping, and landscaping.

Water filling involves filling the quarry pit with water. If water filling is not planned in advance, but is carried out spontaneously due to lack of other options, it can lead to soil erosion. There is a risk of shoreline erosion. Due to artificial flooding, the water balance is disturbed. Most often, stone-type quarries are watered, which is the simplest method, but reduces the possibility of using the full water filling method.

To do this, by creating stepped landscape zones, preventing soil erosion, landslides and providing conditions for agricultural, forestry or other purposes. makes it possible. In areas with stony soil, vertical slopes of stony stepped terraces are built, which makes it possible to use the usable area at the highest level [7]. Terracing prevents soil erosion and facilitates landscaping.

Reforestation is the most labor-intensive, but at the same time, effective and aesthetically attractive method of quarries restoration. This will improve the environment and create recreation areas for residents. In addition to landscaping, various functional objects can be built in the quarry, which is more difficult to do when it is flooded.

Protective walls serve as a tool for creating terraces in the development of quarries. Installation of terraces allows you to cover the surface with soil for growing plants. In addition, flower beds and swimming pools can be placed on the terraces. An example of green terraces with a swimming pool is given in Nanjing Quarry Park, Nanjing, China, part of the Wet Botanical Garden (Figure 3) [8].



*Figure 3. Nanjing Quarry Park, China*

In the absence of established terraces, their creation can block the natural relief of the stone, which leads to a decrease in aesthetic appeal. The best solution is terraced with large steps and combined with a transit function. Examples of the use of retaining walls can be found in the quarry gardens at the Nanning Garden Exhibition Park in Nanning, China [9].

A terraced flower garden is a multi-level flower garden with a narrow terrace. Terraces can repeat each other or be designed in a different way, but they are united by following the same style and general composition. Narrow paths or ladders can be placed along the levels for easy maintenance of plants. The choice of plants is not limited, but preference is given to perennial plants and dwarf trees [4].

Stairs are not only a necessary element for climbing to different levels, but can also be used as a method of vertical gardening in landscape design. When used correctly, stairs can become the main element that combines functionality and aesthetics.

Water slopes are moisture-loving and favorable places for planting aquatic plants [4]. The basis of the landscape is Alpinian plants adapted to low temperatures, strong winds, acidic soils and high humidity.

When choosing plants, you should follow the following technique:

1. Availability of flowering plants;
2. Harmony of colors;
3. The right combination of sizes and shapes. At a large distance, only general contours and colored lines can be read.
4. It is appropriate to choose only perennial plants. It can be ground cover, small bushes, perennial herbs and flowers.

Thus, beautification of quarries is, of course, a labor-intensive process, but at the same time it is practical, environmentally friendly and aesthetic. The benefits of landscaping outweigh irrigation in terms of safety and functional use. Each type of landscaping should be considered in the context of the designed environment. For gentle slopes, terraced stairs with flower beds and flower beds, the possibility of installing slides, green walls are used for steep slopes.

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