
# USAGE OF ATMOSPHERIC RAINWATER FOR SECONDARY PURPOSES IN THE CITY OF TASHKENT

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https://doi.org/10.5281/zenodo.10057055

**Abstract:** This article is devoted to the use of atmospheric rainwater for secondary purposes in the landscape of Tashkent city. The city of Tashkent, like many cities in the world, faces problems of water scarcity, especially in the context of population growth and urbanization. This paper explores an innovative approach to harnessing rainwater to alleviate water stress and promote sustainable water management practices. The specific context of Tashkent is important to the discussion as it provides insight into how a city with unique water challenges can adapt and adopt innovative water management solutions. Rainwater harvesting systems, infrastructure requirements and regulatory frameworks can be explored to understand how this approach is implemented in the city. This article highlights the intersection of urban development, water scarcity and sustainable practices. The ideas presented in the article apply not only to Tashkent, but also to any urban area facing water problems. This emphasizes the potential of rainwater to play a crucial role in ensuring a more water-resilient and sustainable future of the city. Researchers, policymakers, and urban planners will find this topic a valuable resource for addressing water challenges in urban environments.

**Introduction:** Our planet is rich in water. Every person on earth needs from 3 to 700 liters of water. In addition, the water supply on land is continuously replenished during its circulation. The abundance of water on Earth sometimes seems inexhaustible, and this causes people to be careless about water resources. As a result of such a wrong attitude to water resources, a sharp disproportion between the amount of available water and the demand for it appeared already in the middle of the 20th century. Water scarcity used to be the fate of some countries, but now it has a global character.

The problem of increasing scarcity of fresh water is caused by 3 main causes, namely:

1. As a result of the rapid growth of the world's population, the intensive increase in water consumption and the rapid development of economic sectors that require a lot of water reserves;
2. Depletion of fresh water reserves as a result of water use and reduction of river waters;
3. It occurs as a result of the pollution of water bodies with industrial and household waste water, as a result of the withdrawal of a certain amount of water from consumption and fresh water reserves.
4. In many regions of our country, there are serious problems with water supply due to the lack of water resources, and as a result, water-saving technologies are becoming very important here. Secondary use of wastewater after wastewater treatment can successfully contribute to solving crisis situations existing in regions with insufficient

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water resources. Before recommending the use of rainwater for secondary purposes, it is necessary to determine its composition and level of pollution in laboratory conditions.

**Note: Laboratory tests were carried out in the Laboratory under the Wastewater Department of "Suvsoz" LLC based on the requirements of UzDst950:2011. Samples were taken from three points of the city: Chilonzor, Uchtepa and Almazor districts.**

Table 1 Physical and chemical parameters of rainwater

| **Сана** | **№** | **The smell** | **Temperature, C°** | **Hardness, mg/ekdm3** | **pH** | **fat** | **Oil** | **Ammonium nitrogen mg/equiv liter** | **Dry residue** | **Iron mg/liter** | **Suspended substances mg/liter** | **Chloride ion** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **24/03/2022** | 1 ditch | 2 | 20 | 9,8999 | 6,38 | 0,1463 | 0,3357 | 0,7721 | 80,78 | 0,4786 | 277,2 | 0,3439 |
| | 2тарнов | 2 | 21 | 9,8995 | 6,79 | 0,3787 | 0,2238 | 1,4671 | 387,68 | 1,18 | 164,34 | 1,0317 |
| | 3 ponds | 1 | 21 | 9,8999 | 6,86 | 0,2581 | 0,5250 | 1,2865 | 549,25 | 0,99 | 214,83 | 0,3439 |
| **29/03/2022** | 1 ditch | 2 | 20,5 | 9,8999 | 5,62 | 0,1804 | 0,3323 | 0,7644 | 519,94 | 0,4737 | 264,33 | 0,3404 |
| | 2тарнов | 1 | 21 | 9,8995 | 6,25 | 0,1248 | 0,2215 | 1,4524 | 499,35 | 0,9810 | 180,18 | 1,0214 |
| | 1 ditch | 1 | 20,5 | 9,8995 | 5,51 | 0,3193 | 0,5198 | 1,2736 | 383,72 | 1,0949 | 265,32 | 0,3404 |

In general, rainwater harvesting systems are an efficient and environmentally friendly way to reduce freshwater consumption and reduce the load on sewage systems. However, before installing a rainwater harvesting system, measures must be taken to assess the quality of rainwater and ensure its safe use.

**Table-2**

**Physico-chemical parameters of wastewater obtained from atmospheric rainwater after the experiment**

| № | Specification | Normative | Result obtained |
|---|---|---|---|
| 1 | Temperature | 2°C | 20 |
| 2 | Smell | 2 points | 2 |
| 3 | Color | 5-10 points | 8 |
| 4 | Rigidity | 10 mg / l | 9,89 |
| 5 | pH | 6,5-7,5 | 6,38 |
| 6 | ЁF | 1.0 mg / l | 0,14 |
| 7 | Oil | 1.0 mg / l | 0,33 |
| 8 | Nitrogen ammonium | 1.0 mg / l | 0,77 |
| 9 | Iron | 0.03 mg / l | 0,47 |
| 10 | Chloridioni | 350.0 mg / l | 0,34 |
| 11 | Chrome-B | 0.1 mg / l | 0,17 |
| 12 | Nitrate | 9.1 mg / l | 23 |
| 13 | Nitrite | 0.2 mg / l | 2,01 |
| 14 | Phosphate | 2.5 mg / l | 2,07 |
| 15 | BPK | 15.0 mg / l | 22 |
| 16 | XPK | 500.0 mg / l | 277 |
| 17 | Kuruk residual | 1000 mg / l | 80,7 |
| 18 | Hanging substances | 150.0 mg / l | 277,2 |

Laboratory analyzes showed that the composition of rainwater wastewater: iron 0.06...1.55 mg/l, fats 0.012...0.383 mg/l, oil products 0.124...0.699 mg/l, level of pollution 135...365 mg/l, dry residue 328...865.4 mg/l, hardness 8.2...9.97 mg-eq/l, odor 1...3 points, pH was 6.1...7.7. As can be seen from the table, the physical and chemical composition of atmospheric rainwater is almost not bad. According to the results of the analysis, it is necessary to undergo the process of mechanical cleaning of atmospheric rainwater.

In order to use rainwater for secondary purposes, for example, for watering garden and park green areas, washing street sidewalks, supplying water to decorative fountains, washing vehicles, it should be pre-treated.

**Figure 1. Methods of using atmospheric rainwater for secondary purposes**

The mechanical cleaning method removes undissolved and partially colloidal impurities from wastewater. First, large waste: rags, paper, animal and vegetable waste, etc. will hold. The main mass of impurities is in the form of minerals, and those whose gravity is greater than the gravity of water are sand, stones and other mineral substances. Then the floating, sedimenting and organic matter in the wastewater is captured, that is, the mechanical sedimentation of suspended floating suspended and partially organic matter is captured. Basically, this method is put before biological, physico-chemical and chemical cleaning methods. In general, the mechanical treatment method is a method of pre-treatment of wastewater.

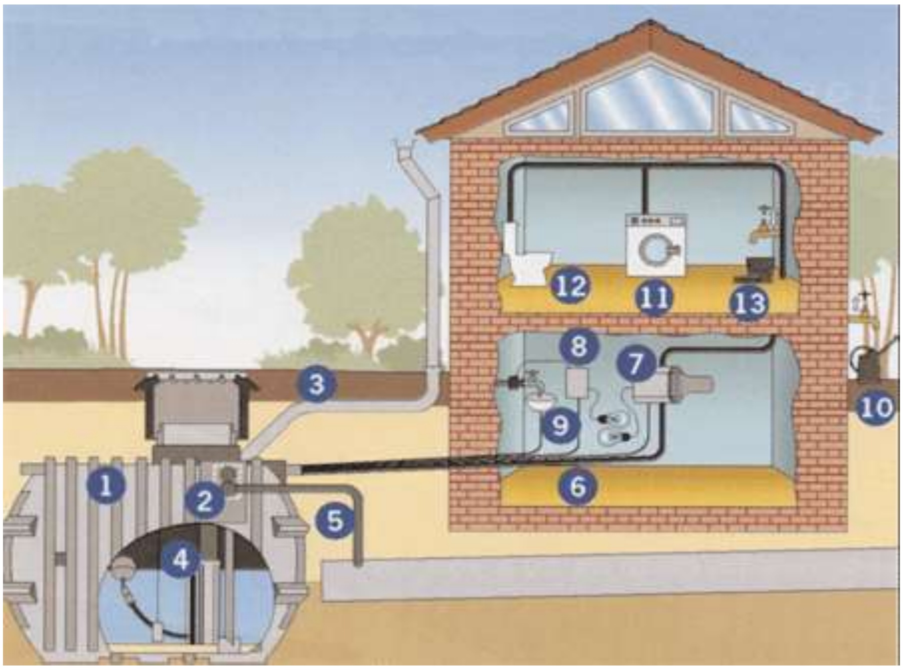


**Figure 2. Scheme of the rainwater reuse system**

1 – underground storage reservoir; 2nd filter; 3-rainwater supply; 4-underground pump; 5-drainage of rainwater; 6- provision of prepared rainwater using a pipe; 7-pump control device; 8 working electronic level correction device; Connection to the drinking water network in the event of a shortage of rainwater collected in the 9th reservoir; 10-13 rainwater harvesting points

Thus, it pays for itself from the ecological and economic point of view by using the underground capacity of rain and snow wastewater. But the right choice of design work is required.

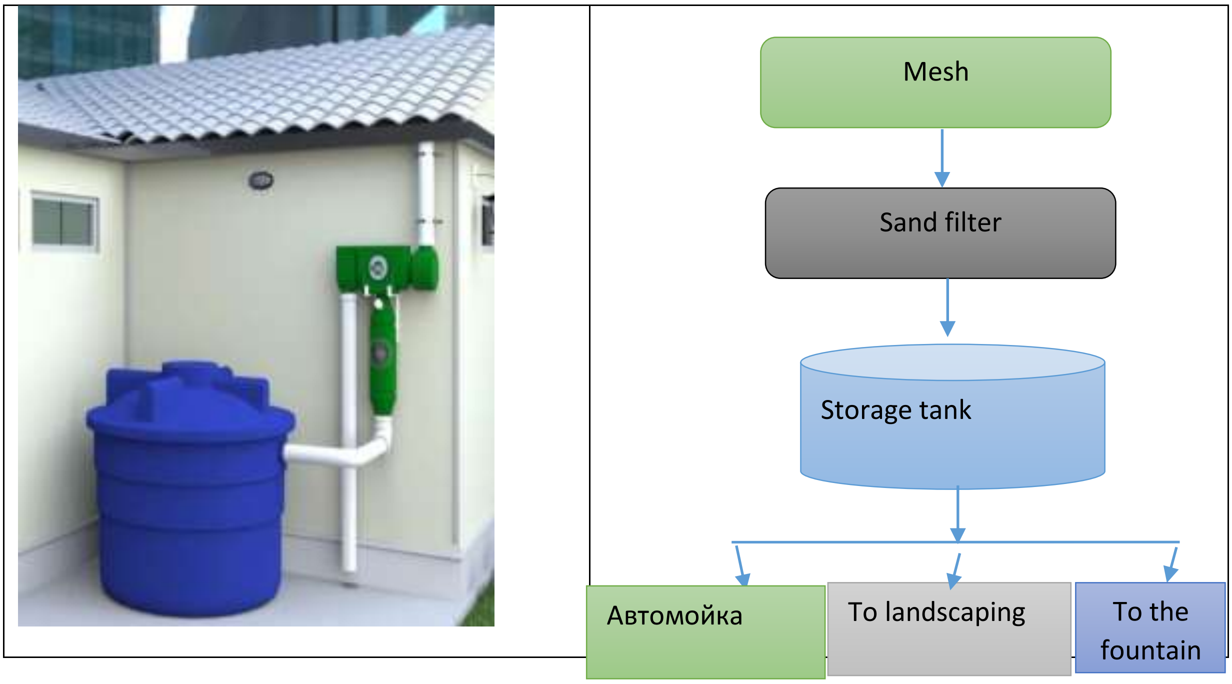


**Figure 2. Rainwater treatment method**

In recent years, there has been a lot of rainfall in the city of Tashkent. This, in turn, requires treatment of rainwater and its efficient use.

For the purpose of primary treatment of stormwater, we first aim to capture larger and smaller debris by using grates. Then, we suggest to collect the water cleaned from the sand filter in the reservoir, and use the water collected in the tank as a result of precipitation for the purpose of greening. These reservoirs are designed underground and the bottom and sides are covered with concrete to prevent any type of sewage from seeping underground. Reservoirs are used to store heavy rain and snow water, and it is necessary to prevent excessive pollution during snow melting. Another task of wastewater collection tanks is to clean them of insoluble impurities. On the first day, the water settles and separates 65 percent of the solid part of the pollution. This relationship allows you to keep the entire system in perfect working order. It can be concluded from the above that limiting the upstream flow and ensuring the normal operation of the treatment system, the water in the accumulated reservoir is cleaned by partial sedimentation, which facilitates further cleaning. Reservoirs are a guarantee of well-organized operation of water flow and prevention of emergency situations during rain or snow melt.

**Summary:** In the city of Tashkent, more than a hundred areas where rainwater collects during the rainy season have been identified. This, in turn, requires treatment of rainwater and its efficient use. In order to clean and efficiently use rainwater, we have set ourselves the goal of collecting rainwater through primary treatment and implementing its efficient use in the future.

Our proposed stormwater treatment method is for the primary treatment of stormwater, where we aim to use grids first, followed by sand filters. Then we offer to collect the primary purified water in a tank (reservoir), to use the water collected in the tank as a result of precipitation for the purpose of landscaping, washing sidewalks, and washing motor

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vehicles. These reservoirs are designed underground and the bottom and sides are lined with concrete to prevent any type of leachate from seeping underground. And the sediments that form after the collection of rainwater are pulled out with the help of an assinizer machine. We aim to contribute to the partial prevention of the water problem, which is one of the global problems in the world today.

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