

УДК: 04.00.01

*Makulov Jasur Taxirjanovich,
Lecturer of the Department of Geography
Akaboyev Ismatullo Ziyadullayevich,
Lecturer of the Department of Geography
The Republic of Uzbekistan, Namangan city, NamSU.*

ANALYSIS OF DRAINAGE AND RAIN INTENSITY TO SOLVE THE FLOOD PROBLEM IN TASHKENT

Annotation: This article focuses on the geographical location, climate, precipitation, floods, and drainage problems of Tashkent and develops recommendations for their solution.

Keywords: flooding cities; intensity of rainfall; drainage analysis; flood risk map; Hyetograph; 3-phase drainage; sustainable development.

*Макулов Ясур Таксирьянович,
Преподаватель кафедры географии
Акабоев Исмадулло Зиядуллаевич,
Преподаватель кафедры географии
Республика Узбекистан, г. Наманган, НамГУ.*

АНАЛИЗ ДРЕНАЖА И НАПРЯЖЕНИЙ ДЛЯ РЕШЕНИЯ ПРОБЛЕМЫ С ЗАВОДОМ В ТАШКЕНТЕ

Аннотация: Данная статья посвящена географическому положению, климату, осадкам, наводнениям и проблемам дренажа в Ташкенте и разрабатывает рекомендации по их решению.

Ключевые слова: затопление городов; интенсивность осадков; анализ дренажа; карта риска наводнений; Hyetograph; 3-х фазный дренаж; устойчивое развитие.

Introduction. Tashkent is one of the largest ancient cities in Central Asia and the capital of the Republic of Uzbekistan, as well. It is one of the largest

industrial-transport crossroads and cultural centers of Central Asia. The city is located in the middle of the Chirchik River Valley, which flows between the Korjantov, Ugom, Piskom, Koksuv, and Chatkal ridges of Western Tianshan, in the low-lying foothills on the right bank of the river, 41° north latitude, 69° east. With an area of 0.34 thousand km², the population as of October 1, 2018, is 2497.9 thousand people [2]. The city is developing a strong infrastructure and human activity in the area is increasing. As floods have become more frequent in recent times, this situation is of concern to the public. The floods caused by heavy rains in April 2019 clearly showed that there were problems with the drainage system in Tashkent. Prompt resolution of problems in the drainage system is an urgent issue facing the city administration. The Decree of the President of the Republic of Uzbekistan, dated 01.06.2017, PF-5066 "On measures to radically increase the effectiveness of the system of prevention and response to emergencies." also mentions this issue.

Literature review. Heavy rains on April 23-25 this year caused flooding on several streets in Tashkent and obstructed the movement of public transport and cars. In many areas, water has seeped into the basements of apartment buildings. Here, the question arises: why did rainwater overflow on the road instead of leaking through special drainage systems, causing various difficulties to the population? Why aren't these aspects taken into account when building roads? In general, what is the state of drainage and collector system of the capital's roads today?

In Tashkent, for example, April 2002 and April 2009 were similarly rainy. The wettest April was observed in 1990 in Tashkent. At that time, the average monthly rainfall was almost 3 months. The average monthly rainfall was in a day. It can be seen that the floods occurred around the ditches and canals connected to the drainage complexes. These canals are the Zakh, Khanum, Bozsuv, Anhor, Karakamysh, and Borijar canals in the pre-Tashkent area and crossing the area of Tashkent city [3]. The absorption of water in the city is

often greatly influenced by the voids created by the habitat of plants and animals (rodents). The tubular, sometimes circular, cavities that run down the surface of the earth are enlarged by rain and surface water infiltrating and leaking from a low point, followed by long-term runoff of fine soil particles. Such gaps are located in the pre-Tashkent regions of Uzbekistan [3]. Absorption is low. Drainage systems are used in urban construction to prevent rainwater from flooding the roads. It should be noted that most of the buildings and roads in the city were built 40-50 years ago, and drainage systems were designed to suit the climate of that time. However, it should be admitted that most of the buildings built in Tashkent in recent years as well did not take into account these systems [1]. Besides, raising the environmental awareness of the population will help prevent such floods, said Nomonjon Shokirov, head of the State Committee for Ecology and Environmental Protection. A 30-year waste strategy was recently approved. According to it, the work is aimed at raising the environmental awareness of citizens, their attitude to waste, and its recycling. Besides, this year, Article 91 of the Code of Administrative Offenses was amended to increase fines for waste disposal. It should be noted that in this process it is difficult to achieve any result without public control. In particular, during the cleaning of irrigation canals in Tashkent last year, 1471 illegal objects were found. They were all demolished. If those facilities had not been demolished and cleaned up, the situation could have been even worse after April rains. There was even the possibility of flooding people's homes.

Research methodology. The methodological basis of this analysis is the use of general methods such as theoretical logic and systematic analysis, historical and comparative analysis. During the continuous rains in Tashkent, the daily rainfall is set at 50 millimeters. But even in 2014, when the floods were the strongest, the figure reached 30 millimeters, only. The flood itself caused so many disasters. It's hard to imagine what would happen if the normal amount of water accumulated.

Analysis and results. The situation in Tashkent is aggravated by the deterioration of drainage systems on city streets. It is known that most of the streets in the city were built to the standards of 50 years ago. Their asphalt has been renewed, but the drainage systems are still the same. Also, irrigation ditches along the streets were clogged with debris from citizens, causing the road to leak without reaching the collectors [1].

Table 1

Climate data of Tashkent city
(1981-2010)

Month	Average monthly temperature		Average monthly rainfall in mm	Average daily rainfall
	Max	Min		
January	+6.9	-1.5	57.8	11.1
February	+9.4	0.0	57.2	9.6
March	+15.2	+4.8	64.8	11.4
April	+22.0	+9.8	59.8	9.5
May	+27.5	+13.7	40.9	7.0
June	+33.4	+18.1	10.8	3.2
July	+35.6	+19.7	3.5	1.3
August	+34.7	+18.1	1.9	0.7
September	+29.3	+13.0	5.9	1.5
October	+21.8	+7.8	29.3	4.8
November	+14.9	+4.1	41.3	7.3
December	+8.8	0.0	53.6	9.5

In this regard, the analysis of climatic data in Tashkent for 1981-2010 shows that in the months with low temperatures, the amount of precipitation is high. Precipitation is highest, especially in March and April. Currently, there is more than 100 km of collectors in the capital. The water collected in them is discharged into large canals. The collectors are built according to the established norms for each street. There should be no such floods, but the roads are blocked due to the constructions arbitrarily built on drainage systems and irrigation ditches by the population. As a result, rainwater flows into the city streets. There

were reports of floods, damaged water pipes, and fallen trees in the following areas as a result of the rains.

As a result of heavy rains in Yakkasaray, Sergeli, Mirzo Ulugbek, Almazar, Yunusabad, Yashnabad, Mirabad, Shayhantahur, Uchtepa Chilanzar districts, 1 car was damaged on Bagidil Street. Also, the sewer pipes around the 1st and 3rd narrow streets of Ok Oltin, Kumushkon Street, Kibray Street, Karabulak Street, Dombirabad Street were damaged. Besides, Shoshli 1st Street, Badriddin Hiloliy 3rd Street, Askiya Street, "South Station", International Airport named after I. Karimov, 4 apartments on Kumarik Street, Koshkurg 'on street, home 74, Choshtepa street, Nemat street, Buyuk ipak yoli street, Darkhontepa 2-narrow street, Usta Shirin street floods were registered in the areas.

Water pipes along Amir Temur Shah Street, along the road from Toshkentland Park to Radisson Hotel and along Mirzo Ulugbek Shah street, in the area from Parkent Street to Baykorgon narrow Street 2 have been updated.

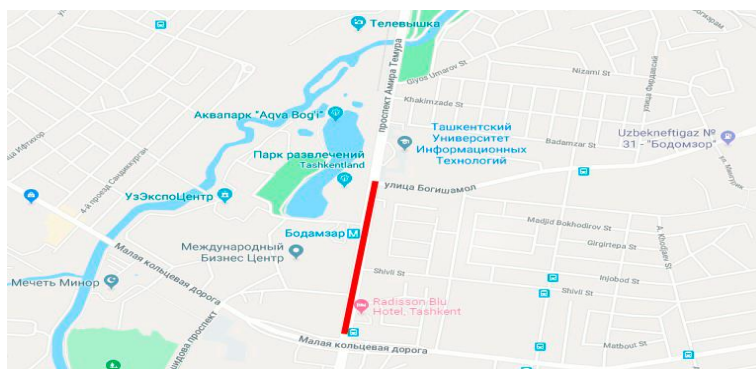


Figure 2. Source: https://t.me/poytaxt_uz

Conclusions and suggestions. The city of Tashkent is getting a new look. Along with the construction of new high-rise buildings in the city, special attention is paid to landscape design. Such renewal and development will also require changes in the city's drainage system and systematic restructuring. The network should include several drainage collector channels as a drainage phase. Channel 1 of this phase is the surface-shaped channels That is, they are roadside ditches. The second phase passes under the main roads, absorbs the water

collected in the first phase, and directs it to the third phase. These main city roads and adjacent streets are connected to the drainage network.

In the construction of drainage in the city, builders need to form a three-phase drainage system, that is connecting the first phase of the concrete tray system located on the sidewalks to the second drainage system in every hundred meters and the second system to the third drainage system in every thousand meters.

- Dispose of household waste in the designated area so that drainage canals or garbage channels do not become clogged and cause flooding in the urban area. It is necessary to organize a series of measures to remove waste from the city.
- Laws on the cementation of cities need to be developed and implemented.

Separate areas should be allocated for natural infiltration in cities. They should be conveniently located in an urban setting. Then the floods in Tashkent in 2019 will be a thing of the past.

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