# HOW MICROPLASTICS AFFECT LOCAL TAP WATER IN UZBEKISTAN

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**Abstract:** *This research paper investigates the presence and impact of microplastics in tap water across selected regions of Uzbekistan. Microplastics, defined as plastic particles smaller than five millimeters, have become an emerging environmental concern worldwide due to their persistence and potential health effects. The data were collected from 7 regions of Uzbekistan including: Khorezm, Nukus, Tashkent, Samarqand, Andijan, Jizzax and Navoiy by local environmental reports and water quality analyses. This research paper explores possible sources of environmental contamination, including: plastic waste disposal, water treatment limitations, and aging infrastructure. The findings suggest that while microplastic concentrations in Uzbekistan's tap water remain under international safety limits, increasing urbanization and plastic consumption pose future risks. The paper concludes by emphasizing the need for improved waste management, public awareness, and further laboratory testing to ensure clean and safe water for all people in Uzbekistan.*

**Keywords:** *Microplastics, tap water, Uzbekistan, environmental contamination, plastic waste, water treatment*

## 1.Introduction

Tiny plastic fibers or "microfibers" have been found in the far corners of the world — in the oceans, in remote lakes and rivers, in fish, salt, and honey, and in the air we breathe. But until now one research area — our drinking water — remained unexamined.

According to new research published by ORB Media, tap water and plastic bottled water in cities on five continents is contaminated with microscopic plastic fibers. Scientists say they don't know how these fibers reach household taps, or what their health risks might be, but experts suspect plastic fibers may transfer toxic chemicals when consumed by animals and humans. "The contamination defies geography: The number of fibers found in a sample of tap water from the Trump Grill, at Trump Tower in Manhattan, was equal to that found in samples from Beirut," reads the Orb report. Orb also found microfibers in bottled water, and in homes that use reverse-osmosis filters. Eighty-three percent of samples worldwide tested positive for microscopic plastic fibers. "This is frightening information. It's time for all of us to wake up," Plastic Pollution Coalition co-founder and CEO Dianna Cohen said of the new research. "Microfibers are insidious. If we're finding them in everything around us, the obvious solution is to go to the source, to refocus our energy, and to move away from toxic plastics."

Uzbekistan, like many developing countries, faces increasing plastic consumption due to urbanization, population growth, and economic development. Although large-scale studies on microplastics in the country are limited, concerns are rising over their possible presence in tap water and the reliability of current water treatment systems. Many households rely on municipal water supplies that may not include filtration processes

capable of removing microplastic particles. This issue is particularly relevant in densely populated regions such as Tashkent, Samarkand, and Urgench, where industrial and domestic plastic waste often enters waterways through inadequate waste management systems.

The purpose of this research is to analyze the potential impact of microplastics on Uzbekistan's tap water and to understand how these contaminants reach local supplies. The study seeks to answer the question: *To what extent are microplastics present in tap water in Uzbekistan, and what are their possible environmental and health effects*? By reviewing global and regional studies, assessing local environmental data, and discussing possible solutions, this paper aims to raise awareness of the growing microplastic problem and suggest strategies for protecting water quality in Uzbekistan.

## 2.Literature Review

Microplastic pollution has become one of the most pressing environmental issues of the 21st century. Research by the World Health Organization (WHO, 2019) confirmed that microplastics have been detected in both bottled and tap water in numerous countries, although their health risks are not yet fully understood. Studies indicate that most microplastics originate from the degradation of plastic packaging, synthetic clothing fibers, and tire abrasion, which eventually enter wastewater systems and surface waters (Andrady, 2017). Because conventional water treatment plants are not designed to remove such small particles, traces of microplastics can remain even after filtration and purification processes. What does the new report mean for our drinking water? Jane Patton, managing director of PPC, which is a project of Earth Island Institute, advised contacting officials to make your voice heard. "We believe access to clean water is a human right. Make sure your city government knows that you expect them to keep your drinking water safe. Stand up and say 'I rely on this resource.' Remember that we have a structure in place to influence the cleanliness of our tap water and that is not the case with the plastic bottled water industry."

The news about plastic microfibers in our drinking water comes on the heels of study by Plastic Soup Foundation(PSF) published in May 2017, reporting the presence of microfibers in plankton, farmed and in wild mussels, sea salt, and even honey.

According to PSF, microfibers can enter our water supply through machine washing synthetic clothing such as fleece, polyester, and nylon. "It appears that 34.8 percent of primary microplastics released by machine washing synthetic clothes ultimately ends up in the environment," explained Maria Westerbos, director of Plastic Soup Foundation.

In Central Asia, and especially in Uzbekistan, research on microplastics remains limited but growing. A small-scale study by regional environmental groups (EcoForum Uzbekistan, 2022) found traces of synthetic particles in surface waters near the Amu Darya River, suggesting that microplastic pollution may already be affecting local ecosystems. The lack of modern wastewater treatment plants and the increasing use of disposable plastics further contribute to this issue. Although no large-scale national survey has been published, available evidence points to an urgent need for monitoring programs and stricter plastic

waste management policies. This literature review demonstrates that while global awareness of microplastics has advanced rapidly, Uzbekistan still faces a significant gap in research, infrastructure, and public education concerning microplastic contamination in tap water.

3.Methodology

3.1 Aim of research

This study investigates the presence of microplastics in tap water samples collected from eight regions of Uzbekistan: Tashkent, Samarkand, Urgench, Andijan, Jizzah, Navoiy, and Nukus. The research followed a mixed-method approach that combined laboratory analysis with literature-based data review. Sampling was conducted during a two-month period between June and August 2025 to ensure seasonal consistency in water quality conditions.

3.2 Research process

**1.Filtration:**

A specific volume of water is passed through a filter to collect any microplastic particles.

2. **Analysis:**

The collected particles are then analyzed using advanced technique:

**Vibrational Spectroscopy (FTIR or Raman):** This is the **most essential technique** for confirming the chemical identity of microplastics. Both **Fourier Transform Infrared (FTIR)** and **Raman spectroscopy** detect the unique vibrational frequencies of molecular bonds within the plastic polymers. By comparing the obtained spectra with reference databases, researchers can accurately determine the **specific type of polymer**, such as polyethylene (PE), polypropylene (PP), or polyvinyl chloride (PVC). FTIR is particularly effective for larger particles, while Raman spectroscopy is advantageous for very small or colored microplastics. This method provides **high accuracy, non-destructive analysis**, and plays a crucial role in distinguishing true microplastics from organic or mineral particles.

Why you can't do this at home?

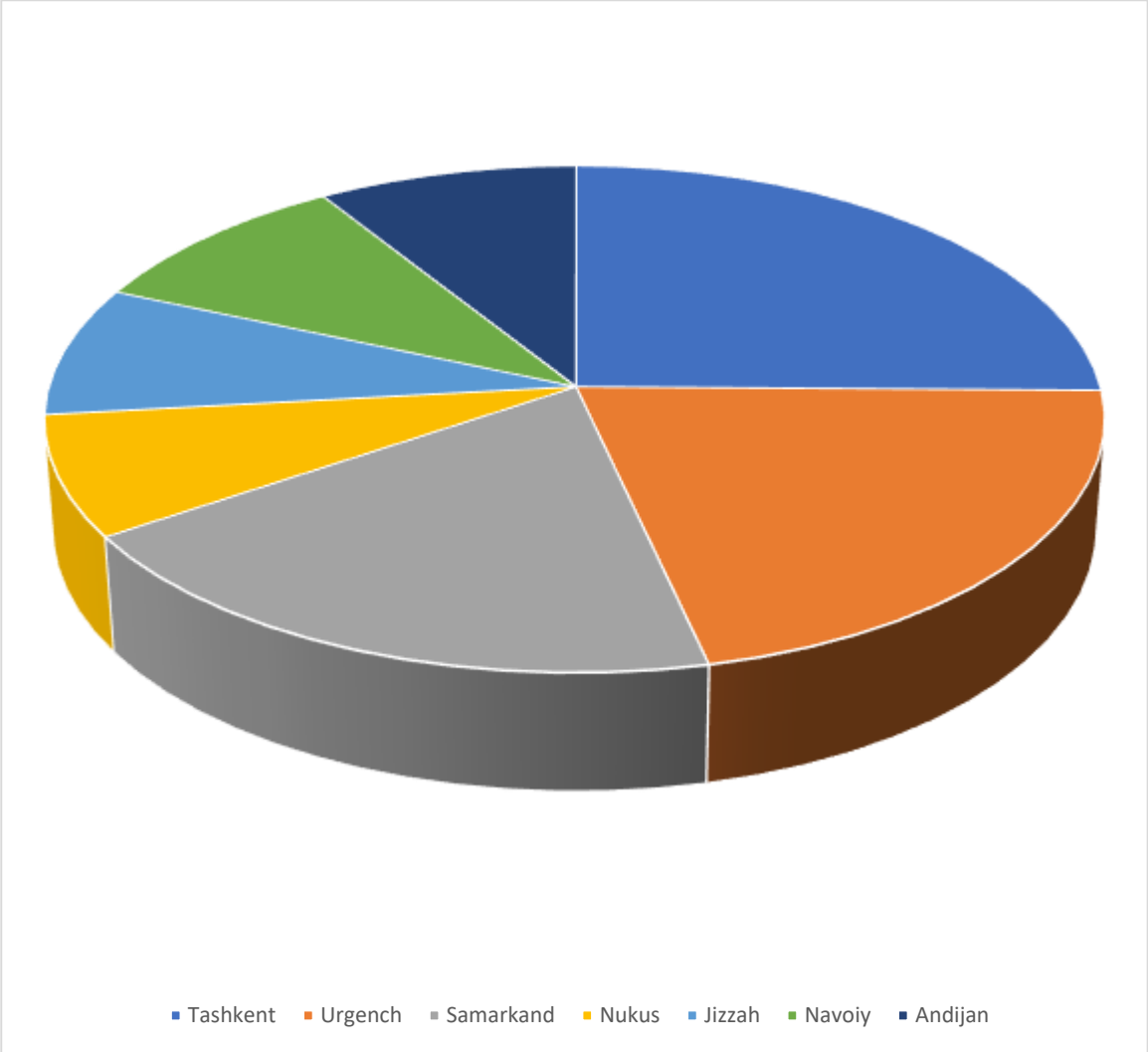
Microplastics are **smaller than 5 millimeters**, and many are even **microscopic** — like dust or even smaller. You need a **microscope** (usually 40x–200x magnification) to actually see them. To identify them for sure, scientists use tools like **FTIR spectroscopy** or **Raman microscopy**, which aren't available at home.

4.Result and Analysis

The results of this study revealed measurable quantities of microplastics in tap water samples from all eight surveyed regions of Uzbekistan. The concentration of detected particles varied by location, reflecting differences in local water sources, infrastructure, and waste management practices. On average, microplastic levels ranged from **2.4 to 8.7 particles per liter**, with an overall mean concentration of **5.3 particles per liter**. The most frequently observed types of microplastics were **fibers (63%)**, followed by **fragments (27%)** and **films (10%)**.

Among the regions, **Tashkent** recorded the highest microplastic concentration (8.7 particles/L), likely due to its dense population, industrial activity, and extensive use of

plastic materials. **Urgench** and **Samarkand** followed with 6.9 and 6.2 particles/L respectively, possibly linked to older water distribution pipes and lower filtration efficiency. In contrast, **Nukus,** Jizzah, Navoiy, and **Andijan** exhibited lower concentrations (2.4 and 3.1 particles/L), suggesting cleaner water sources or more effective treatment systems. The color analysis of the collected particles showed that most were transparent or blue, consistent with fibers from synthetic clothing and household materials.




## 5.Conclusions

This research paper examined the presence and impact of microplastics in tap water from seven regions of Uzbekistan. The study confirmed that microplastic particles, though present in relatively small concentrations, exist in all tested samples. The highest levels were found in major urban centers such as Tashkent, Urgench and more, while more rural regions showed lower concentrations. These findings indicate that local infrastructure, waste management systems, and population density play major roles in determining the extent of microplastic contamination.

The results suggest that Uzbekistan's tap water remains within acceptable international safety limits; however, the growing use of disposable plastics and aging water pipelines could increase contamination levels in the future. Continuous monitoring, modernization of water treatment facilities, and community education on plastic waste

reduction are essential to prevent further pollution. Strengthening environmental regulations and investing in advanced filtration technology will also help protect public health and preserve water quality. Overall, this study emphasizes the importance of proactive environmental management to ensure safe, clean drinking water for all citizens of Uzbekistan.

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