

# NATURAL RADIONUCLIDES IN SOIL AND WATER AT THE SHURTAN GAS CHEMICAL COMPLEX DURING 2024 AND 2025

Khojiakbarkhoja Akhrorov

Sarvar Samadov

Dilorom Sheralieva

Valeriya Saipova

Javokhirbek Uktamov

Firuz Yuldasheva

Tashkent State Medical University, Uzbekistan

## Abstract

This analytical review examines reported environmental measurements at the polyethylene-production site of the Shurtan Gas Chemical Complex in Kashkadarya, Uzbekistan. Secondary descriptive analysis used annual summaries for 24 drinking-water samples, 24 wastewater samples, 120 soil samples and 240 gamma-field measurements across 2024–2025. Reported soil activities changed from 16.07 to 15.14 Bq/kg for Ra-226, 14.40 to 14.30 for Th-232 and 389.50 to 385.50 for K-40. Drinking-water and wastewater gross beta activities increased from 0.017 to 0.018 and from 0.021 to 0.026 Bq/L respectively. A table and two-panel chart summarize these different patterns. Small numerical changes do not establish a temporal trend or industrial attribution. The findings support continued site-specific surveillance with traceable sampling and method information.

**Keywords:** Natural radionuclides; soil; gross beta activity; industrial monitoring; Shurtan; environmental hygiene.

## Introduction

Monitoring around a gas-chemical facility requires differentiation between naturally present radionuclides and industrially influenced exposure. The CNSC describes naturally occurring radioactive material in several industrial residues [2]. This establishes a plausible topic for investigation, not evidence that a particular facility has contaminated its surroundings. Soil and water measurements therefore need a site-specific interpretation.

The supplied Shurtan manuscript [1] offers environmental observations for two years. This review focuses on the numerical contrast between soil and water indicators and on what those contrasts can support. Its aim is to identify useful baseline information while avoiding conclusions about public-health effects that cannot be tested with annual summaries.

Evidence base and analytical methods

The source describes 24 drinking-water samples, 24 wastewater samples, 120 soil samples and 240 gamma-field measurements over 2024–2025. These are totals for the study period; the number in each year and the pairing of locations are not reported. Laboratory work is attributed to the regional





sanitary-epidemiological radiological laboratory. Individual observations and uncertainty estimates were not available for reanalysis.

Annual tables were selected as the quantitative source because the accompanying prose assigns some water means inconsistently to a year. The gamma table has an ambiguous unit heading, whereas the results paragraph explicitly reports 0.17–0.22  $\mu\text{Sv/h}$ . Gamma values are consequently described in  $\mu\text{Sv/h}$ , following the explicit text. No conversion to annual personal dose was performed.

Absolute differences and percentage changes were calculated from the reported annual values. They are arithmetic descriptions, not estimates of significance. The source also supplies effective specific activity values, but the calculation coefficients are not documented. That composite indicator was therefore not used for a normative soil classification. A building-material comparison cannot automatically establish a soil-specific limit.

Results of the two-year comparison

Soil Ra-226 decreased by 0.93 Bq/kg, or 5.79%; Th-232 by 0.10 Bq/kg, or 0.69%; and K-40 by 4.00 Bq/kg, or 1.03%. K-40 had the largest numerical activity in both years, but comparing Bq/kg across radionuclides does not compare dose contributions. Nuclide-specific emissions and exposure pathways must be considered before such an interpretation.

Table 1. Annual summaries and arithmetic percentage changes calculated from [1]

| Indicator                       | 2024      | 2025      | Change                |
|---------------------------------|-----------|-----------|-----------------------|
| Soil Ra-226, Bq/kg              | 16.07     | 15.14     | –5.79%                |
| Soil Th-232, Bq/kg              | 14.40     | 14.30     | –0.69%                |
| Soil K-40, Bq/kg                | 389.50    | 385.50    | –1.03%                |
| Drinking-water gross beta, Bq/L | 0.017     | 0.018     | +5.88%                |
| Wastewater gross beta, Bq/L     | 0.021     | 0.026     | +23.81%               |
| Gamma range, $\mu\text{Sv/h}$   | 0.19–0.22 | 0.17–0.20 | Range comparison only |

No statistical significance is implied. Gamma unit follows the source results paragraph; sample totals span both years.

Drinking-water gross beta activity rose by 0.001 Bq/L, or 5.88%, while wastewater rose by 0.005 Bq/L, or 23.81%. The latter percentage reflects a small denominator and should not be described as a large increase in radiation risk. Gross beta activity does not identify the radionuclides responsible for the signal.

The reported gamma ranges were 0.19–0.22  $\mu\text{Sv/h}$  in 2024 and 0.17–0.20  $\mu\text{Sv/h}$  in 2025. Their overlap, 0.19–0.20  $\mu\text{Sv/h}$ , and the absence of point-level data prevent a statistical comparison. The source interprets observations as background-compatible; independent attribution requires comparable reference locations and instrument records.

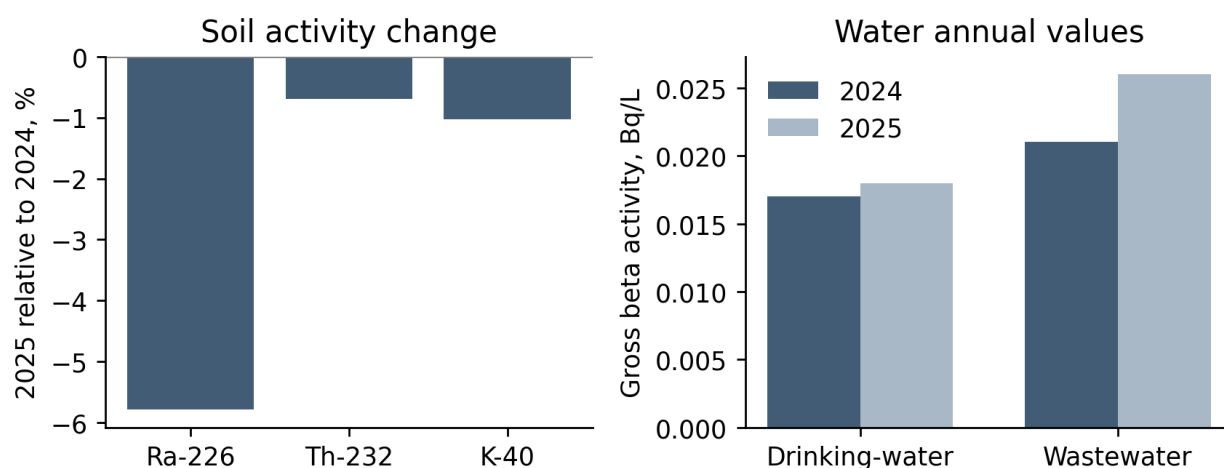


Figure 1. Relative soil activity change and annual water gross beta activity. Panels use different scales; no dose comparison is implied.

### Discussion and surveillance implications

The contrasting direction of water and soil summaries argues against treating the observations as a single increasing or decreasing regional radiation pattern. Sampling time, laboratory preparation, location selection and hydrological conditions could influence the measurements. The available summaries do not distinguish these mechanisms. Two annual observations are insufficient to demonstrate a sustained trend.

Water results should retain their separate functions. Drinking-water can contribute to intake when consumed, while wastewater requires an assessment of discharge, receiving media and access. WHO drinking-water guidance [3] concerns drinking-water quality; its criteria should not be applied automatically to wastewater as if the settings were identical.

For future work, the authors propose stable sampling points and parallel reference sites outside plausible facility influence. Water records should include flow or source conditions; soil records should specify depth, dry or wet mass and sample preparation. These additions would make site comparisons more interpretable without assuming in advance that the production process is the cause. The IAEA 2025 monitoring guide [4] provides a recent framework for connecting environmental observations to protective decisions. ALMERA resources [5] support analytical verification, while UNSCEAR [6] supplies broader exposure context. Together they support quality-assured continuation of the local programme, rather than a claim that the facility has no possible effect on population health.

### Conclusion

Reported Shurtan soil activities were numerically lower in 2025, whereas water gross beta summaries were numerically higher. The changes remain descriptive because annual sample allocation and measurement uncertainty are unavailable. The dataset is useful as site-specific baseline material, provided that soil, drinking-water, wastewater and external gamma observations remain analytically distinct.



## References

1. Ли М.В., Юлдашева Ф.У. Гигиеническая оценка радиационной безопасности продуктов питания и воды Кашкадарьинской области Республики Узбекистан. Предоставленная рукопись «Статья ЮФУ-02.02.2026», данные 2025 г. Неопубликованный материал.
2. Niyazova, O. A., Yuldasheva, F. U., & Norqulov, S. J. (2025). SLEEP HYGIENE OF STUDENTS. In Innovate Conferences (pp. 13-16).
3. IAEA. Monitoring for Protection of the Public and the Environment. Safety Standards Series No. GSG-19. Vienna; 2025. doi:10.61092/iaea.i7sy-xqd1.
4. Юлдашева, Ф. (2020). Organization of work universities during the covid 19 pandemic. In International Conference, San Francisco, California, USA.
5. IAEA. Protection of Workers Against Exposure Due to Radon. Safety Standards Series No. SSG-91. Vienna; 2024. <https://www.iaea.org/publications/15711/protection-of-workers-against-exposure-due-to-radon>
6. IAEA. ALMERA Proficiency Tests. IAEA-TERC-2023-01/02 environmental radioanalytical exercises. 2023. <https://analytical-reference-materials.iaea.org/almera-proficiency-tests>
7. Тахиров, М. Т., Бекжанова, Е. Е., & Юлдашева, Ф. У. (1991). К обоснованию ПДК зерновой пыли в атмосферном воздухе. Гигиена и санитария, (8), 14-16.
8. Sherkuzieva, G. F., Salomova, F. I., Samigova, N. R., & Yuldasheva, F. U. (2023). RESULTS OF TOXICITY STUDY OF BIOLOGICAL FERTILIZER" YER MALHAMI. FOR INHALATION CHRONIC EFFECTS.
9. Шеркузиева, Г. Ф., Саломова, Ф. И., Самигова, Н. Р., & Юлдашева, Ф. У. (2023). Результаты изучения токсичности биологического удобрения «Ер малхами» при ингаляционном хроническом воздействии. Журнал новый день в медицине, 5, 55-58.
10. Шеркузиева, Г. Ф., Саломова, Ф. И., & Юлдашева, Ф. У. (2023). Токсичность “Ер малхами” при ингаляционном хроническом воздействии.
11. Sherkuzieva, G. F., Salomova, F. I., Samigova, N. R., & Yuldasheva, F. U. (2023). RESULTS OF TOXICITY STUDY OF BIOLOGICAL FERTILIZER" YER MALHAMI" FOR INHALATION CHRONIC EFFECTS. Central Asian Journal of Medicine,(1), 110-115.
12. Юлдашева, Ф. (2018). Socio-Hygienic Study Of The Health Of Children Born With High Weight. International Scientific Journal ISJ &Applied Scince Philadelphia, USA,(11).
13. Salomova, F. I., Yuldasheva, F. U., Sherkuzieva, G. F., & Sharipova, S. A. (2024). STUDYING THE EFFECT OF IRRATIONAL NUTRITION ON THE STUDENT'S BODY.
14. Sherkuzieva, G. F., Salomova, F. I., & Yuldasheva, F. U. (2023). RESULTS OF STUDYING THE INFLUENCE OF BIO-FERTILIZER “YER MALHAMI” ON THE QUALITY OF WATER BODIES. Central Asian Journal of Medicine,(4), 109-120.
15. Абдукадилова, Л. К., Юлдашева, Ф. У., & Мирсагатова, М. Р. (2022). Анализ Изучения Состояния Организации Здорового И Доброкачественного Питания В Детских Дошкольных Учреждениях.
16. Юлдашева, Ф., Стожарова, Н., Рустамова, Х., & Зупарова, Д. (2015). Факторы риска развития злокачественных новообразований у детей. In Сборник научных трудов Республиканской научно-практической конференции “Профилактическая медицина: Гигиеническая наука и практика” Ташкент–2015г. С (pp. 87-89).



17. Imamova, A. (2023). FEATURES AND PROSPECTS OF THE DEVELOPMENT OF CHILDREN'S NUTRITION IN THE PRESCHOOL INSTITUTION.
18. Imamova, A. (2023). Studying the health of frequently ill children of older preschool age and methods for forming a healthy lifestyle.
19. Миррахимова, М. Х., Садуллаева, Х. А., & Кобилжонова, Ш. Р. (2022). Значение экологических факторов при бронхиальной астме у детей (Doctoral dissertation, Россия). Рустамова, ХЕ, Нурматова, КЧ, & Машарипова, Р. Некоторые аспекты состояния здоровья населения Узбекистана. ББК, 51, 118.
20. Akhmadaliev, N. O., Imamova, A. O., Niyazova, O. A., Muratbayeva, A. P., & Umarov, B. A. (2023). Hygienic characteristics of harmful factors of working conditions of infectious diseases doctors. Neo Science Peer Reviewed Journal, 8, 57-60.
21. Imamova, A. O., & Bobonazarova, M. N. (2022, November). Renewable energy sources as a measure to prevent the depletion of the ozone layer. In Uzbekistan-Japan International Conference «Energy-Earth-Environment-Engineering.
22. Саломова, Ф. И. (2008). Особенности физического развития школьников с нарушениями осанки. Вестник Санкт-Петербургской государственной медицинской академии им. ИИ Мечникова, (4), 48-50.
23. Юлдашева, Ф. (2022). Совершенствование работы мобильных бригад в амбулаторно-поликлинических учреждениях системы железнодорожного транспорта в условиях пандемии COVID-19 в Республике Узбекистан. In Международная научно-практическая конференция «COVID-19 и другие актуальные инфекции Центральной Азии» Шымкент.
24. Рахимов, Б. Б., Мирсагатова, М. Р., & Садирова, М. К. (2024). ВЛИЯНИЕ МОНИТОРИНГА КАЧЕСТВА ВОЗДУХА НА ОБЩЕСТВЕННОЕ ЗДОРОВЬЕ И ЭКОЛОГИЧЕСКУЮ УСТОЙЧИВОСТЬ В УЗБЕКИСТАНЕ. International Conference on Innovations in Applied Sciences, Education and Humanities.
25. Шеркўзиева, Г. Ф., Саломова, Ф. И., & Юлдашева, Ф. У. (2023). Озиқ овқат қўшимчалари ва аҳоли саломатлиги.