

# INTEGRATING FOOD, WATER AND INDUSTRIAL MEASUREMENTS FOR RADIATION HYGIENIC SURVEILLANCE IN KASHKADARYA

Dilorom Sheralieva

Valeriya Saipova

Javokhirbek Uktamov

Khojiakbarkhoja Akhrorov

Sarvar Samadov

Tashkent State Medical University, Uzbekistan

## Abstract

This review develops a regional surveillance framework from four supplied manuscripts describing food, water and industrial environmental measurements in Kashkadarya. The analysis preserves separate sampling programmes and evaluates whether their records support combined interpretation. The principal food dataset contains 27 food and nine water samples from 2025, while the Shurtan study reports 24 drinking-water and 24 wastewater samples, 120 soil samples and 240 gamma-field measurements over 2024–2025. A separate Cs-137 manuscript describes 17 food and four water samples. Discrepant manuscript versions, different units and incomplete uncertainty information prevent statistical pooling. A comparison matrix and monitoring-coverage chart identify the evidence domains and data requirements. The proposed framework prioritizes source provenance, individual results and exposure-specific reporting.

**Keywords:** Integrated surveillance; radiation hygiene; data quality; environmental monitoring; Kashkadarya.

## Introduction

A regional surveillance system must connect measurements that answer different questions without treating them as interchangeable. Food radionuclides concern potential ingestion; water gross activity is a screening indicator; soil activity and gamma fields describe environmental conditions. The IAEA 2025 monitoring guide [5] provides a current framework for designing and interpreting these programmes.

The supplied Kashkadarya manuscripts contain valuable local observations but also illustrate difficulties in combining environmental evidence. The aim of this review is to construct a practical integration model from their reported data. Integration here means coordinated records and interpretation, rather than adding measurements or declaring a common radiation-risk score.

## Evidence selection and reconciliation

Four supplied manuscripts were examined. The dated food-and-water version [1] reports 27 food and nine water samples in summer–autumn 2025. The alternative version [4] reports different food values and incomplete Sr-90 accompanying quantities. It was used to identify reconciliation requirements,





not treated as an additional cohort. The date alone does not prove that one version is analytically correct.

The Cs-137 manuscript [2] describes 17 food and four water samples without a confirmed year. The Shurtan manuscript [3] describes 2024–2025 environmental monitoring. Their relation to the regional samples is undocumented. No combined sample size, pooled mean or temporal trend was calculated across these programmes.

Annual Shurtan tables were prioritized over inconsistent narrative year assignments. The gamma unit follows the explicit  $\mu\text{Sv/h}$  statement in the results. Regional-water units were preserved as Bq/kg, whereas Shurtan water uses Bq/L. These editorial reconciliation rules preserve quantitative provenance; primary laboratory records remain necessary for final data validation.

### What the evidence domains contribute

In the dated food dataset, Cs-137 means range from 1.9 to 7.5 Bq/kg and Sr-90 from 0.22 to 1.07 Bq/kg. Regional-water gross alpha and beta means range from 0.05 to 0.07 and 0.80 to 0.90 Bq/kg. The Shurtan soil table reports Ra-226, Th-232 and K-40 separately. These findings identify complementary surveillance domains, but different measurements cannot be ranked directly as equivalent health risks.

Regional external gamma observations are reported as ranges, with the listed locations spanning 0.08–0.18  $\mu\text{Sv/h}$ . The table contains a duplicated or misspelled Guzar entry; no district-wide average was calculated. Shurtan gamma observations span 0.17–0.22  $\mu\text{Sv/h}$  across both years. The difference between ranges cannot establish an industrial contribution without matched methods, locations and exposure conditions.

The coverage chart depicts counts of different record types within each programme. It intentionally keeps the separate Cs-137 study in a separate panel and does not add the panels. More gamma readings than water samples does not demonstrate better population protection: the records have different units of observation and sampling purposes.

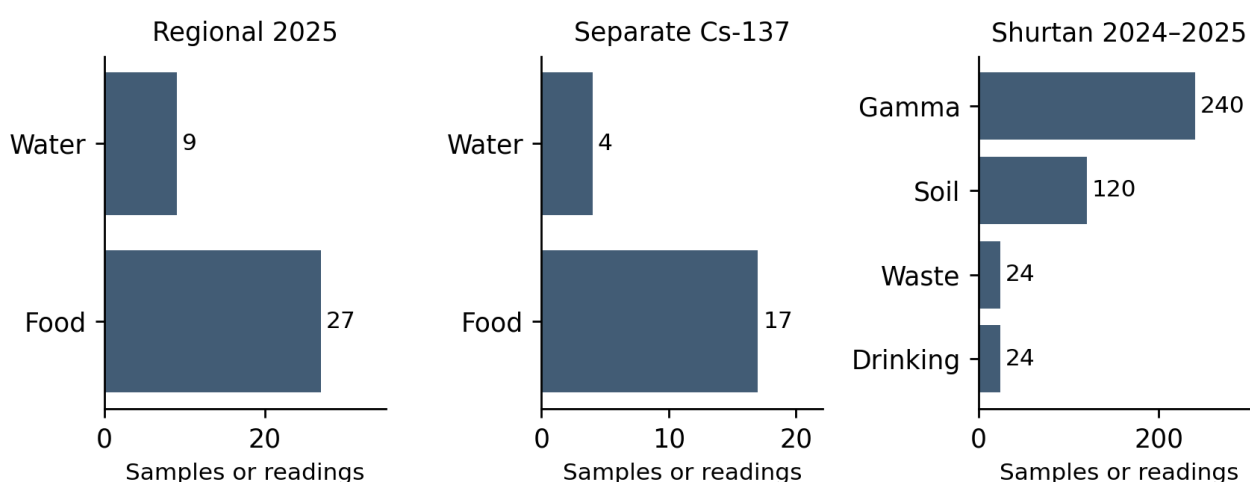


Figure 1. Reported coverage by programme. Sample and reading counts are different observation types; panels must not be pooled.

### A proposed integration model

The first layer should preserve the original sample or reading identifier, source document, date, location, analytical method and unit. The second layer should record uncertainty, detection limits and quality status. A third layer can organize observations by exposure pathway and define whether they support screening, confirmation or a dose assessment. This prevents document editing from silently changing the evidence base.

An initial reconciliation task is to match the two food-manuscript versions against laboratory protocols. The next task is to identify any overlap with the separate Cs-137 sample set. For Shurtan, annual sample allocation and effective-activity calculation coefficients should be recovered. The source's comparison of soil with building-material values should remain an explicitly limited analogy rather than a soil compliance determination.

The authors propose a pilot registry with separate food, drinking-water, surface-water, wastewater, soil and gamma modules. Each module should retain appropriate denominators and criteria. Results could then be linked by location and period when the sampling design justifies it. UNSCEAR [6] supplies exposure context, but it does not supply missing local contact or consumption information. The proposed system should report completeness of individual records, reconciliation status and confirmation follow-up. It should not infer absence of disease or universal regional safety from category means. Its practical contribution is to make reliable local findings usable while showing where additional evidence is necessary. The model remains a proposal until tested with primary records.

### Conclusion

Kashkadarya's supplied datasets support complementary surveillance of food, water and industrial environments. Their differences and possible overlap currently preclude pooled statistical interpretation. Integration should begin with provenance and quality control, preserving exposure-specific modules before moving to coordinated regional reporting.

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