The Assessment of the Natural Radiation Dose Committed to the Population at the Shu River Valley in Southern Kazakhstan

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***Abstract*—** The Shu river, flowing between the borders of Kazakhstan and Kyrgyzstan, runs through one of the largest uranium deposits worldwide. Mining and milling activities have left large volumes of low-level radioactive waste, which now represent a route of potential contamination to the river waters. The present study looks at the calculation of the radiation doses from natural radionuclides content in water samples, soils and sediments for the population of this region. The total doses for mostly analyzed drinking water were in the range of 0.02–0.09 mSv/y, all being well below the level of the committed effective dose (0.1 mSv/y) recommended by the WHO for drinking water. The obtained data can provide basic information for the local consumer and competent authorities to better estimate the internal exposure risk for local population.

***Keywords*—** modelling, radiation doses, Shu river, U-series radionuclides.

I. Introduction

THE Shu river valley is the largest water ecosystem in the hydrographic network belonging to Muiynkum-Betpakdala artesian basin in South Kazakhstan and adjacent territories in Kyrgyzstan [1]. Uranium ore mining and milling operations were conducted in its basin from the mid-1950s for the nuclear weapons and nuclear energy programmes of the former Soviet Union. Until the mid-1980s, recovery of the uranium ore was accomplished by mining in underground mines and open pits. Since then, in-situ methods involving underground leaching by sulfuric acid have been used. During the Soviet period, recovered uranium ores were delivered to the nearby metallurgical industrial complex of Kara-Balta (Kyrgyzstan) for the further production of «yellow c Thus, the full nuclear cycle, from mining to processing located on a rather small area of Southern Kazakhstan Kyrgyzstan within the Shu river valley.

As a result of past ore mining activities, large volum low-level radioactive waste in form of rock deposits tailings were left behind in this area. In addition, durin years of geological prospecting within the Shu river b more than a thousand of hydro-geological boreholes drilled. Most of the boreholes with filled artesian spring now responsible for contamination of fluvial environ with natural radionuclides. The impact of these waste local settlements and main irrigation channels have rec increased attention in recent years, as concerns have expressed by local populations on the possible health e arising from potential contamination. Despite some effo evaluate the radiological situation of these sites, knowledge gaps still remain.

As water from the Shu river is used by local populatio domestic use, irrigation of crops and watering of cattl evaluation of radiological risk to people who are exp directly, as well as though the food chain should b essential part of any radiological assessment. Indeed, ele concentrations of uranium isotopes have been report samples collected from surface waters within the K deposit site, which is located about 60 km from the Shu and was the first industrial-scale deposit in Kazakhstan 1) [2], [3].

The purpose of the present study was to determi assessment of the radiation doses received by local popu from water intake and external gamma-radiation exp and modelling of accumulation of radionuclides in b local population. The study area was selected due location along the border between Kazakhstan Kyrgyzstan, and the nearby presence of large-scale dep Kurday and Kamyshanovskoe.

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