



THE TECHA RIVER: 50 YEARS OF RADIATION PROBLEMS

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In 1948, the first industrial complex that obtained plutonium was in the Chelyabinsk region. Later PA "Mayak" was formed on the basis of this complex. At first, the plant's work led to extensive radioactive pollution of the Ural region. There were several steps to the production of plutonium. Some formed great volumes of radioactive waste of medium- and low-level activity. Our scientists decided to dispose of radioactive waste in the Techa River.

The Techa River rises from the Irtyash Lake and empties into the Iset River that joins the Tobol River. The total length of this river system is approximately 1000 km. The length of the Techa River is 240 km. Before the disposal of radioactive pollution, there were 38 villages with a total population about 28,000 on the riversides of the Techa.

In 1949, the first radioactive waste was disposed in the Techa. About 80 percent of the water volume had low-level activity from the Kyzyltyash Lake to Techa and 20 percent was of medium-level activity from the plant. From 1949 to 1956, 76 million cubic meters of liquid waste with a total activity of about 2.075 million curies was dumped in the Techa River. At first, the disposed liquid contained about 10^7 - 10^4 Ci/l. After an accident, the liquid contained 10^5 - 10^4 Ci/l.

From March 1950 to November 1951, 95 percent of all activity was dumped in the Techa. During this period, 4300 Ci/l was dumped daily. The water contained: Sr-89, Sr-90 – 20.4%; Cs-137 – 12.2%; Zr-95, Nb-95 – 13.6%; Ru-103, 104, 105, 106 – 25.9%. During the next five years, waste in the Techa River was greatly decreased. There were 9500 Ci dumped in 1952 and 500-2000 Ci in 1953-1956.

The radioactive waste that was dumped in the Techa was diluted by 5-10 times by the water of Kyzyltyash Lake. During the flowing of this dirty water about 25 percent of all the activity was embedded in lake bottom sediments. The activity that was accumulated in animals living in and around the river exceeded the limited concentration by 75 to 100 times. The specific activity in the mud was about 20 mCi/kg.

In 1955, radioactive water polluted the bottomland of the Techa because of a flood. The inhabitants were using this place as grassland.

For inhabitants of Techa's riverside, the river was the basic source of water for food and irrigation. The riverside population incurred external radiation from

γ -background near the river and internal radiation from radioactive isotopes that enter organisms through water and food. External radiation was determined to be from Cs-137, Ru-106, and Zr-95. The largest doses (50 to 100 cSv/yr) were received by the people of Metlino village. Some people were taken ill because of external radiation. Internal irradiation of elderly people amounted to about 4.6 mCi from the river. Sr-90 and Cs-137 were the major radioactive isotopes.

In the autumn of 1951, an effort to stop the sources of pollution from PA "Mayak" to the Techa River started. In 1952, the radiochemical plant did not dispose technological waste in the Techa River. Activity of liquid waste contained not more than 20-30 Ci/day.

In 1956, radioactive waste disposal in the river stopped. In 1956 and in 1963, dams were built on the Techa River. These dams insulated technical objects of the plant from contaminating the bottomland at the source of the river. Cascades of ponds were built to prevent leakage of radionuclides. In addition, about 8000 hectares of bottomlands that were polluted because of floods were drawn from land settlement.

These steps led to an improved radiation situation in the region. But the idea to evacuate people from some villages was accepted. From 1955 to 1960, about 7500 people from 19 villages were evacuated. But evacuation of people was untimely and this step was not effective because the people had already received a large dose of external and internal radiation. Some of Metlino's people received the biological equivalent of about 200 roentgens per year. Cluster sampling showed about 935 cases of radiation sickness.

Creating Techa's cascade ponds posed several problems such as rehabilitation (cleaning water, reduction and utilization of radioisotopes) and stabilization of closed ponds.

The PA "Mayak" solves the complex problems of the industrial ponds on the Techa River using the following:

Hydrological and hydro-geological studies of the Techa cascade ponds, and

Development of methods and technologies for cleaning the bottom of the ponds.

The final solution to Techa's problems is possible only with the collaboration of the South Ural Nuclear Power Plant.