



Ecohydrological problems of over-wetting and swamping of contaminated floodplains within dammed territories of the Chernobyl exclusion zone

D. Gudkov (1) and A. Nazarov (2)

(1) Institute of Hydrobiology, Ukraine, (2) State Specialised Scientific and Production Enterprise "Chernobyl Radioecological Centre", Ukraine (digudkov@svitonline.com / Phone: +380-44-4189183)

Despite the years since the Chernobyl NPP accident in 1986, the territory of the exclusion zone still remains an open source of radioactive contamination with a complex structure of distribution in various landscapes and a dynamic state of radioactive substances, influencing their migration and redistribution in components of ecosystems. The basic problems of radiation safety of the exclusion zone are connected with radionuclide washout with surface run-off into the river systems, radioactivity carry-over beyond the bounds of the exclusion zone and sharing in formation of water quality of the Dnieper River - the main waterway of Ukraine. In this connection the radiation condition of surface water of the Chernobyl NPP exclusion zone has huge importance. The Pripyat River is the main transport waterway of radioactive substances of Chernobyl origin and its flow into the Dnieper River. During 1986-2004 about 160 ÖBq (TeraBecquerel) of strontium-90 (Sr-90) and 130 TBq of caesium-137 (Cs-137) was flowing into the Dnieper River by the Pripyat River. The most contaminated region of the exclusion zone is the floodplains on the left bank of the Pripyat River. During 1991-1995 the complex of hydraulic engineering structures as flood protection dams was constructed here, which preventing washing away of radioactive substances from soils and changing a hydrological mode of floodplain flows during a high water. In its turn it was by the reason of strengthening of over-wetting and swamping processes within dammed territories. As a result - on a background of the common tendencies of increase of the mobile forms of Sr-90 in soils of catchment territories and bottom sediments of the exclusion zone, there is an increase of fulvic and humic acids concentrations in waterlogged soils of floodplains. It is also raises the pH-value in water and

intensifies a denuding of water-soluble forms of Sr-90 forming soluble complexes with fulvic acids. Thus the increase of concentrations of the mobile radionuclide forms and their inclusion into biotic circulation of aquatic ecosystems is observed. It confirms also an increase of Sr-90 content in water of floodplain lakes (against a background of stabilisation of this parameter for Cs-137 last years) as well as increase of Sr-90 content in terrestrial, riparian and aquatic vegetation. Hence, in the middle 1990ies specific activity of ^{137}Cs in tissues of higher aquatic plants was much higher than specific activity of ^{90}Sr , whereas in the late 1990ies these values became comparable, and at present specific activity of ^{90}Sr is much higher than that of ^{137}Cs , the concentration of which either decreasing or remaining practically constant. For some species of macrophytes, ^{90}Sr concentration compared with the early 1990ies has increased by more than an order of magnitude. The results of the executed researches confirm the tendency of the further complication of radiation condition of aquatic ecosystems within the Chernobyl NPP exclusion zone. Swamping of the contaminated territory results in acceleration of mobilisation processes of deposited forms of Sr-90, and also their migration and redistribution in closed aquatic landscapes. Thus there is a formation of the peculiar "depot" of the mobile forms of radioactive substances, which can be a source of increase of Sr-90 carry-over into the Pripyat River and then - beyond the bounds of the exclusion zone during the high water-level periods. In this connection there are necessities of performance of hydraulic engineering measures to prevent an underflooding of territories with high density of radioactive contamination, optimisation and perfection of radioecological monitoring system, and also further development of researches of radionuclide behaviour in aquatic ecosystems within the exclusion zone. All this activities are the important components in a complex of measures connected to forecasting and minimisation of consequences of the Chernobyl NPP accident.