

# TECHNOLOGICALLY ENHANCED RADIATION EXPOSURE OF POPULATION DUE TO RADIUM 226 IN WASTE WATER

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In the nuclear fuel cycle radium is of major concern for radiation exposure of population by mining and milling of uranium ores. In the field of technologically enhanced radiation exposure, coal burning power plants have been identified as sources for airborne emissions of radium and other natural radionuclides.

Data for radium emissions in waste water from technological sources have been reported only occasionally. In the Federal Republic of Germany, a comprehensive research project was carried out in order to evaluate relevant radium 226 emissions from industrial and mining activities. In most cases samples were taken continuously and radium 226 was measured by emanation techniques. The yearly emissions extrapolated from the samples ranged from less than 1 mCi to almost 1 Ci.

Radioecological investigations were carried out along the river Lippe which receives most of the pit water from coal mines, in order to evaluate the resulting radiation exposure of population. Besides fish consumption the soil - grass - cow - milk pathway and external irradiation on areas that are occasionally flooded were identified as relevant pathways. In these areas radium concentrations of up to 10 pCi/g were measured in soil. The transfer of radium to grass and milk is lower than known from studies in areas of enhanced natural activity. Milk concentrations are in the range of 0.1 to 1 pCi/l. External radiation reaches in some spots 15  $\mu$ R/h and more, about 3 times the normal background radiation.

The resulting doses for members of the public are less than the doses that are calculated by radioecological models used in environmental impact assessments for nuclear facilities.