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Heavy metals and hydrocarbons contents in soils of urban areas of Yamal autonomous region (Russia)

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This investigation is devoted to evaluation of heavy metals and hydrocarbons contents in soils of different functional localities within the Yamalo-Nenets autonomous region (YaNAR, North-Western Siberia, Russia). Geo-accumulation indices Igeo (Müller 1988) were calculated in order to assess soil contamination levels with heavy metals (Cu, Pb, Cd, Zn, Ni, As, Hg) in the studied settlements: Harsaim, Aksarka, Labytnangy, Harp and Salekhard. The degree of soil pollution was assessed according to seven contamination classes (Förstner et al. 1990) in order of increasing numerical value of the index. Cd's regional soil background concentrations of the Yamal peninsula (Moskovchenko 2010), Hg's Earth crust clarke (Greenwood & Earnshaw 2008) and concentrations of the rest trace elements in natural sandy soil from the Beliy island, YaNAR (Tomashunas & Abakumov, 2014) were used in calculations. In general terms, obtained Igeo values in all samples were under or slightly above the 0 level, indicating low to moderate pollution of the studied soils. However, considerable Igeo values of Zn, Pb and Ni were revealed in several samples, suggesting different soil pollution levels, namely: Zn Igeo in Harsaim soil sample of 2.22 – moderate polluted to highly polluted soil; Pb Igeo in Aksarka soil sample of 4.04 – highly polluted to extremely polluted soil; Ni Igeo in Harp soil sample of 4.34 - highly polluted to extremely polluted soil. Soil contamination level was additionally evaluated, comparing with the maximal permissible concentrations (MPCs) of the trace elements in soil (SANPIN 4266-87), established by the national legislation. Almost all samples exceeded the MPC for As in soils (2 mg•kg-1). Concentrations of Ni in several soil samples taken in Harp were 19 times higher than recommended level (20 mg•kg-1). Moderate excess of Zn, Pb and Cu MPCs was also noted. Data obtained will be used in further environmental researches and environmental management purposes in this key oil and gas exploration region.
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