



## Soils and landscapes as legacies of the sugar industry land use

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The sugar industry has been widespread in the world for centuries, accumulating huge amounts of production waste. The development of modern technologies for sugar beet processing has led to the abandonment of dumps and sumps; not all of them were remediated later. In Russia, the industrial production of sugar from sugar beets was established in the early 19th century. For the first time, soils and landscapes formed on abandoned sites of sugar production waste in the Chernozem zone of Russia were studied. The distribution and chronological sequence of abandoned sites were identified using space images and field observation. Sugar production wastes discharged into sumps and landfills contained mainly carbonic lime ( $\text{CaCO}_3$ ), caustic lime  $\text{Ca}(\text{OH})_2$  and organic material, and an admixture of nitrogen, phosphorus potassium and sulfur (about 1-3%). It was revealed that in about 50 years, alkaline soil-geochemical landscapes were formed, which are unusual in the study area. Series of ponds temporarily filled with rainwater – former waste sumps – are covered with dense reed beds (*Phragmites australis*); there, strongly alkaline ( $\text{pH} \geq 9$ ), rich in organic matter and bioturbated soils with a thickness of up to 50-60 cm are formed. They can be attributed to Garbic Technosols (Carbonic), but their classification position in WRB needs to be clarified. Reed has spread widely in the surrounding water bodies and rivers; newly formed landscapes enrich waters with nutrients, contributing to their eutrophication. Soil mantle is also complicated by Technosols of industrial sites of sugar factories, soils in the remediated and no-remediated landfills, and soils irrigated with sugar mills' wastewater. All these soils are repositories of large volumes of organic carbon. The study of newly formed soils and landscapes, overgrowing of dumps and sumps is extremely important both for nature conservation and for understanding the seasonal patterns of carbon dioxide emissions from accumulations of organic substances. Integrated soil-geochemical and geobotanical studies of areas affected by the sugar industry can be pioneers, among other things, to expand the horizons of soil and geobotanical classification.

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