

## **Monitoring of Urban Soil Contamination under Various Technogenic Impact: Comparison of the Two Seaside Cities**

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The aim of the research was to show how the environmental policy of city can affect the quality of soils. Studies were carried out simultaneously in the two cities of Ukrainian coast of the Azov Sea, which are significantly different in terms of technogenic impact. Berdyansk is a well known resort and wellness center, but until recently around 30 petrochemical, machine-building and other enterprises were located there. The largest industrial center Mariupol, where emissions from enterprises to the atmosphere exceed 300 thousand tons per year, is located about 60 km from Berdyansk in similar natural conditions.

Observations of soil contamination was performed on 60 monitoring sites not less than 2500 m<sup>2</sup>, located in industrial, administrative, cultural, residential and recreational zones of each city. The time series of observations: the first stage in 2002-2003, the second in 2007-2008, third in 2012-2014. The available forms of heavy metals in the soils were determined by atomic-absorption method after extraction of buffer solution with pH 4.8 as well as 1 N HCl. The content of mineral salts in a water extract was measured titrimetrically. The content of heavy metals in grass vegetation and phytotoxicity of soil was determined in 50% of monitoring sites.

Since 2002-2003, the level of soil contamination in the industrial zones of Berdyansk gradually decreased, but heavy metals began accumulate in soils of residential, cultural and administrative areas, and especially, in recreation objects. Probably, this is related to the reduction of the industrial sector and the increase of resort and tourist business. Consequently, the content of cadmium, chromium, and nickel in soils is reduced, but the content of micronutrients (Zn, Cu, Mn) increases. Currently the contamination of plants becomes less so the quality of local agricultural products is improved.

In contrast to this, due to the intensive activity of the enterprises of iron and steel industry in Mariupol the level of soil contamination in industrial, residential areas and parks has increased by 8-18%. This is caused by the accumulation of zinc, manganese, lead and mineral salts, sometimes in excess of the permitted rate. The contamination of plants in Mariupol is higher than soil contamination due to deposition of heavy metals directly from the atmosphere. Phytotoxicity effect has been discovered on the most of monitoring sites.

Conclusions. Due to extremely high heterogeneity and combination of pollution from multiple sources, the changes of urban soil quality can be objectively assessed using observations which are systematic in space and time. The quality of urban soils is improving over five-ten years after reducing the amount of industrial pollution, but heavy metals are continuing to dissipate from the industrial zone to the surrounding land. Soil quality is deteriorating significantly in case of a constant dominance of the steel industry over other activities.