

Peculiarities of changes in the soil cover of landscapes adjacent to a megalopolis

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The progressive growth of cities has a significant impact on the soil cover of territories adjacent to the same. Megalopolises are centers of anthropogenic impact on the soils. Generally, forms and intensity of the urban impact on the soil cover weaken with increasing distance from the city's boundaries. In this respect, ample opportunities for the analysis of urban impact on the adjacent territories are provided by the study of the soil cover in the Leningrad Region (the LR). Saint Petersburg is a major European megalopolis, which is the administrative center of the LR. The time period of Saint Petersburg's impact on the environment does not exceed 300 years, which allows us to identify very clearly the character and areas of its impact on the soil cover.

Over the past decades, there have been significant changes in the soils and the soil cover of the LR. In a large territory, there appeared new anthropogenic soils and soil cover organization forms, having no natural analogues, with a dramatic increase in the surface area of degraded soils.

To access the current state of soil cover, to identify the role of anthropogenic factors of changes in this state; to carry out land reclamation, remediation and rehabilitation measures; to perform land cadastral valuation etc., we need an information resource containing data on the current state of soils and soil cover in the LR, the key element of which should be a map.

We carried out mapping and created a 1:200 000 digital soil map (DSM) for the LR's territories.

Diagnostics of soil contours were performed using traditionally drawn-up (paper) maps of soils and soil-formation factors; satellite images (Google, Yandex); data of remote sensing (Spot 5, Landsat 7,8); digital maps of main soil-formation factors (topographical ones, etc.).

The digital soil map of the LR has been created in the geographic information system – QGIS.

The map clarifies the contours of natural soils and soil combinations, and shows, for the first time, the contours of:

- non-soil formations;
- soils of the initial soil formation;
- soils of agricultural lands within their existing boundaries;
- soils and soil combinations that are specific for human settlements and horticultural land plots;
- fallow lands;
- anthropogenically disturbed soils.

During the analysis of the created digital medium-scale soil map, we identified some changes in the soil cover of the territories adjacent to Saint Petersburg.

Virtually in all the landscapes, we found a large number of soil cover structures, the components of which, along with natural soils, are anthropogenically disturbed soils, anthropogenic soils and non-soil formations.

We revealed that the human impact on the soil cover is manifested within the range that varies from insignificant changes in soil parameters to radical transformations of the soil profile, complete destruction of soil and "creation" of new soil forms and soil cover organization forms.

We have developed a typology of anthropogenically changed and anthropogenically created soil cover structures, taking into consideration the types of the economic impact on and the quality of environmental functions performed by the soils.