

Land degradation within the right-of-way of overhead transmission lines and impacts on soils in Western Siberia (Russia)

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Abstract

Anthropogenic impacts from the construction and operation of high-voltage transmission lines on a land in a right-of-way (ROW) result in soil cover disturbances varying in scale, age and origin. This affects soil diversity. We found that the distribution of disturbed soil areas follows a power distribution. The following main types of anthropogenic soils were identified within the ROW: filled soil, slightly disturbed resectozem, moderately disturbed resectozem 2 and abrazem. The areas of disturbed soils are superimposed on the natural heterogeneity of the remaining forest soils. We found that soil diversity within a ROW consists of 2.2% filled soils, 3.9% resectozem 1, 11% resectozem 2 and 10.4% abrazems. The total area of anthropogenically changed soils is 27.5% of the entire study area. Soil degradation causes resectozem 2 and abrazem. An increase in a surface slope angle till 2°–4° results in the growth of moderately degraded areas, whereas, an increase of more than 10° leads to highly degraded areas. The degree of soil cover degradation in the ROW is 3 out of 5. Comparison of disturbed areas based on the types of anthropogenic soils revealing significant differences between resectozems 2 and abrazems. The form factor of disturbances occurring during construction has a modal value of 0.8–0.9, whereas, that during operation is 0.7–0.8. Currently, the soil cover contains accumulated traces of degradation. Thus, the cumulative potential for soil degradation accumulated over the past 60 years of intensive economic development must be considered.

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