Contaminated area instability – the example of Ångerman River, northern Sweden

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Industrially utilized river basins are frequently exposed to contaminants originating from polluting activities. However, the physical instability, and risk of mass movement mobilisation of contaminated soil into rivers have only received little attention. In this study, we present a GIS-based method to produce a regional overview of where and how contaminated areas are at risk of being exposed to slope instability. A five kilometre buffer along the Ångerman River was used as a case study, exemplifying the method performance in a case where the slope instability is not known, but where more generally available land-cover data exist. A landslide susceptibility-index was created through calculating statistical correlations between land-cover parameters and landslide scars. These data were then used to study the degree and distribution of overlap between contaminated sites and unstable ground. A contaminated area instability risk classification was produced integrating mass movement probability and the contamination risk classification used by the Swedish environmental protection agency. Our results indicate that mass movement can be tied mainly to a slope gradient $\geq 16°$, a proximity to the river that is < 500m, a distance of < 500 meters from roads, concave surface curvature, and sand- and silt soils. 46 (22%) of all considered contaminated sites are located within areas with a non-negligible risk of mass movements, of which a majority, 30 sites (14%) are situated on ground with a low or moderate risk. 3 sites with a class 2 contamination risk (the 2nd highest class) are located on ground with a very high risk of mass movement.