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## Landslide hazard assessment through forcing activation of a landslide and conducting of monitoring



Kazeev, A.I., Postoev, G.P., Fedotova K.J.

Sergeev Institute of Environmental Geoscience RAS, 101000, Russia, Moscow, Ulanskii per. 13/2, box 145. E-mail: [opolzen@geoenv.ru](mailto:opolzen@geoenv.ru)

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The potential landslide hazard often cannot be assessed fully enough in the process of engineering-geological surveys on the site of the designed construction. The artificial activation of the landslide process on the construction site is one of the methods for the identification of possible mechanism of landslide deformations. It also serves for the identification of landslide peculiarities on the studied area and the nature of formation of the sliding surface and its possible shape. Herewith, the identification of main regularities of landslide deformations development and the scale of the triggered landslide are being established by a specially organized monitoring [1].

The building of the embankments of the road bed at the adjacent to the bridge was carried out in 2012. It was provided in connection with the construction of a new road bridge over the Sura river. But in May 2012 the deformation of the embankment started, while the road bed had not yet reached the project profile (Fig. 1). As a result, all construction works on a new road were stopped and haven't been renewed until 2014. The reasons and the mechanism of deformations occurred during the construction of the road were discussed at numerous meetings. Also the necessary protective measures had to be elaborated. But no final decision was found.



The landslide process was not considered by some professionals as the main reason of occurred deformations. Weak soils at the base of the embankment, possible subsidence properties of soils (loess soils), excessive watering of Foundation soils were supposed as the reason of deformations.

Fig. 1. Landslide crack on the embankment.

Various protective measures were suggested. However, the reason and the mechanism of destruction of the highway embankment and the volume of displacing ground masses remained unclear.

In July 2014 it was decided to perform the activation of the landslide process at the site with carrying out inclinometric monitoring, in accordance with the proposal of IEG RAS. The task was to identify the landslide slip surface along which the embankment of the road is hazardously deforming. The explanation of possible design solutions and protective measures had to be done.

It was established that the main slip surface of the landslide was located at a depth of about 18 m. Slope stability analysis were performed. As the result of provided investigations it was proposed to change the construction project of the road parts which adjacent to the bridge. Also the most effective protection measures and monitoring schemes were developed.

*References:*

- [1] Postoev G.P., Erysh I.F., Salomatin V.N. et al. (1989) Artificial activization of landslides. Nedra, Moscow. 134 p.
- [2] Postoev G.P. (2010) The main features and characteristics of landslide occurrence. In: Geoecology. № 2. Pp. 140–148.

