# Technogenic landslide monitoring

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Two-dimensional surveys in 2010 using Earth's natural pulsed electromagnetic field (ENPEMF) method on the main pipeline route in active geodynamic orogeny locations of North-Caucasian region revealed 20 landslide hazard areas. Radio-wave methods applied are based on the phenomenon of electromagnetic emission - dielectric materials emissive ability when they are acted on. Electromagnetic emission emerges in the process of charges generation and relaxation on fracture planes during the stress state of the rocks. Pulses emerge both when dielectric uniformity changes and when electrolyte-filled capillars rift. Observing electromagnetic emission allows the monitoring of stress-strained state of the rock formation.

All the landslides, developed along the gas pipeline route are divided into two categories based on disturbance type: viscoplastic and shift slides, with latter being a majority. A landslide on 53.5 km of the pipeline route was signified as most dangerous. Although, in November 2010 there were no major detached blocks yet, just emerging balmstone cracks about 10m length and 2-10cm opening. At that survey waypoint, the area with extremely high electromagnetic field values, interpreted as tension-stress zone, changes to extremely negative anomaly, related to compressing stress. Such a mosaic field structure indicates a complex volume-stressed state of the rock and possible landslide activity at this section of the pipeline. Landsliding probability is rather high at places where the field rapidly changes sign. During pipeline construction a steep (30‘ and over) slope was cut, and additionally satellite imagery interpretation revealed an intersection of two geological rifts at that place, that could provoke a technogenic landslide. That landslide posed a direct danger to the pipeline and required immediate managing decisions to protect industrial object. Currently a periodical inspection of stress-strained state of the rocks dynamics using ENPEMF method takes place at the site.

The report demonstrates the results of technogenic landslide development instrumental and geomorphological monitoring. Through the eight years of observations there was a considerable terrain change and landslide body increase. The new block detachments and subsidence areas are being confidently predicted. Instrumental observation data is coherent with geomorphological analysis results.