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Responding to geological hazards

Natural hazards can be inconsistent and unpredictable in their occurrence and intensity. This requires public safety operators to be highly adaptable, says CRJ Key Network Partner, **Pix4D**

In the case discussed in this article, a landslide had occurred on the outskirts of Tbilisi, the capital city of Georgia. The National Environmental Agency of Georgia was called in to assess the risk to the nearby infrastructure in the Vashlijvari suburb, in co-ordination with the Tbilisi Town Hall. The response required them to assess the situation to assess and predict terrain movement. To analyse a geological hazard, the team set out to measure the landslide, which started with a crack opening on the hillside. Measuring the site would lead to planning for redirections of flow and managing what volume of earth might be mobile. To do this, the team used drones and specialised photogrammetry software that can take measurements from images. When they are paired with the right software, drones are a great option for public safety operations. They empower operators to gain situational awareness about a scene, while being able to maintain a safe distance, thus lowering operational risks. Drones can also be transported to a site easily, making them a highly versatile tool.

Ideal solutions

The team used an eBee X drone with an Aeria X camera. This drone is a fixed-wing model and has a longer flight time. It is ideal for larger surveys, as in this case, where a large area of terrain was being analysed.

The crevice that opened measured 14 metres long, and the National Environmental Agency team ended up surveying the crevice itself, as well as 2.5 square kilometres around it.

A total of 889 images were captured and then processed with the specialised 3D mapping software, PIX4Dmapper. The team measured the torn landmass

and used checkpoints – locations with known geographic coordinates – to ensure the accuracy of the model.

This level of geolocal accuracy meant that team members could be confident in their analysis, which included determining the depth, volume, curvature and potential movement of the landmass. The team measured 500,000 cubic metres of terrain at risk of displacement.

The team generated a digital surface model (DSM) in PIX4Dmapper that showed both natural and constructed features on the terrain. All the processing was completed by the software in four-and-a-half hours, ready for analysis and to be shared between organisations.

The DSM was used to predict the velocity and flow accumulation of the landslide, which was critical to the overall mission.

After the results were generated, the National Environmental Agency shared its findings with Tbilisi City Hall and helped with preventative and protective measures. Later that year, the threat was declared over thanks to the joint efforts of these two organisations.

Naturally, not all emergency situations are as slow-moving as this one. Drones are still applicable in these cases, but it might be beneficial to use different measuring software to gain situational awareness such as PIX4Dreact, which generates 2D maps within minutes, entirely offline.

In this case, PIX4Dmapper was the ideal solution, thanks to its capabilities for 3D modelling and terrain analysis. The threat of the landslide has been eliminated, and the authorities now have an actionable DSM that can be compared with any changes to the landscape, and they can continue to monitor the landscape to see whether further action needs to be taken.

■ Pix4D is a CRJ Key Network Partner, see pix4d.com



In combination with the right mapping software, drones are invaluable tools for terrain analysis

Vitali Machavariani | Georgia National Environment Agency