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RPAS as a tool in geo-hazards mitigation: case studies from Norway and South Asia and best practices

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The collection of high-resolution imagery using Remotely Piloted Aircraft Systems (RPAS) is a rapidly growing technique that complements existing mapping techniques. RPAS-based surveys offer increasing accuracy, short acquisition times, and flexibility in hazardous or inaccessible areas, all at a reasonable cost. Low-cost RPAS can provide detailed high-resolution ortho-mosaics from which three-dimensional terrain models can be generated using Structure-from-Motion photogrammetry. These models allow for the measurements of areas, volumes and distances, and other parameters that are relevant in the context of risk assessment and risk mitigation.

Selected case studies from Norway and South Asia demonstrate the applicability of RPAS-acquired photogrammetry for mapping landslides, debris flows and rock falls. In particular, their usage for geohazards mitigation and risk assessment are presented. Amongst these case histories, the quick clay landslide that occurred on November 10, 2016 in Sørum municipality, 30 km north of Oslo, is of significance. The day after the event, a RPAS survey was flown to delineate the active area of the quick clay slide and to help assess safe access routes for the rescue workers. The video footage supported the emergency work and facilitated a rapid risk assessment of the area. Data processing performed within a few hours after the landslide allowed for the preliminary estimation of the back scarp height.

Ultimately, the differences observed between a previous DEM and the new DEM acquired with the RPAS-captured images allowed for an estimate of the landslide volume.

In addition, best practices and expected accuracy for such surveys performed with low cost RPASs is discussed and exemplified with results from relevant studies. For example, a sensitivity analysis on two sites in Norway shows the importance of the distribution of ground control points (GCP). It was determined that the total number of GCPs could be significantly reduced if those were well distributed throughout an RPAS-surveyed scene.